

2020

Methodologies for Identifying Occupations for the 2020 List of Occupations in High Demand, Critical Skills List, and List of Priority Occupations

Labour Market Intelligence
research programme

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Fouché Venter, Michele Capazario (DNA Economics)





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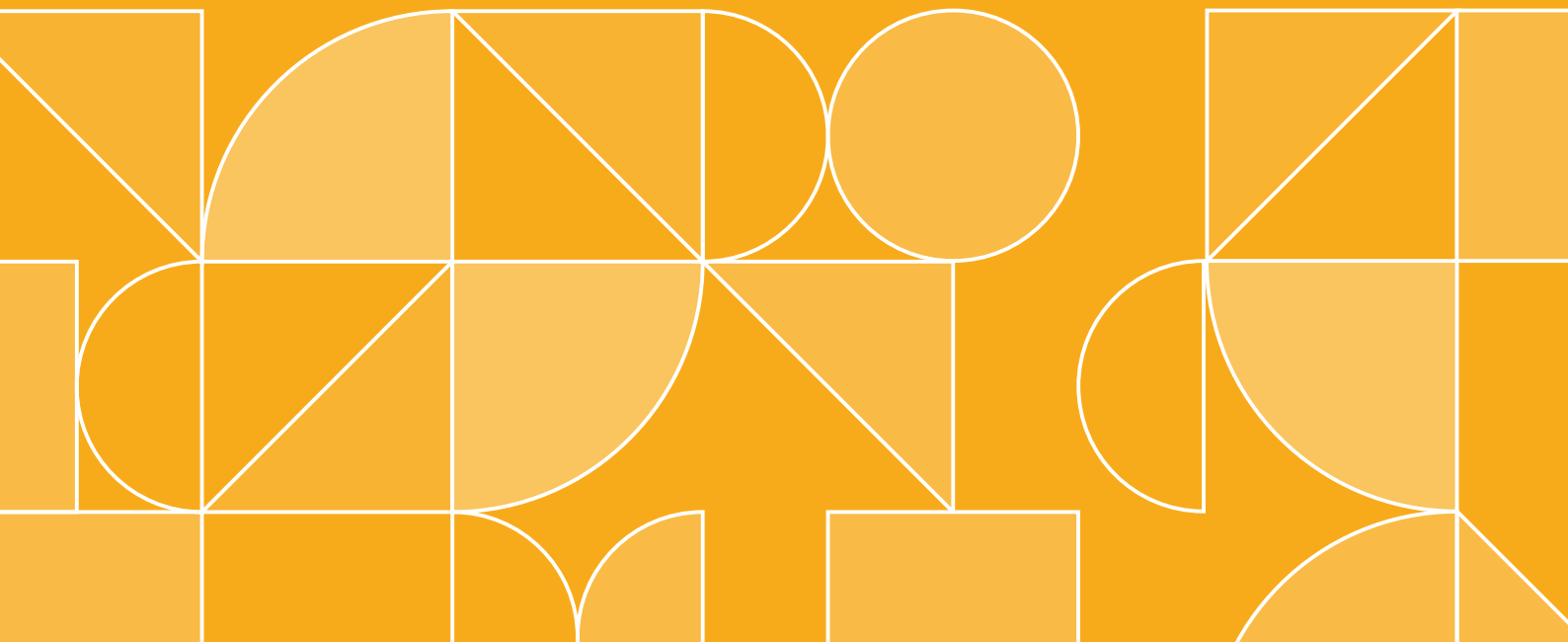
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List of acronyms

CFE	Call for evidence
CJ	Career Junction
CSL	Critical Skills List
D1	Dimension 1
D2	Dimension 2
D3	Dimension 3
D4	Dimension 4
DEL	Department of Employment and Labour
DHET	Department of Higher Education and Training
IPAP	Industrial Policy Action Plan
JIPSA	Joint Initiative for Priority Skills Acquisition
JOI	Job Opportunities Index
LMI	Labour Market Intelligence
LPO	List of Priority Occupations
MAC	Migration Advisory Committee
MTSF	Medium-Term Strategic Framework
NDP	National Development Plan
NGP	New Growth Path
NQF	National Qualifications Framework
NSF	National Skills Fund
OECD	Organisation for Economic Co-operation and Development
OIHD	Occupations in high demand
OFO	Organising Framework for Occupations
PCA	Principal component analysis
PSET	Post-school education and training
PSP	Priority Skills Plan
PIVOTAL	Professional, vocational, technical, and academic learning
QLFS	Quarterly Labour Force Survey
SETA	Sector Education and Training Authority
SEZ	Special economic zones
SIP	Strategic integrated projects
TWG	Technical working group

PART 1

Introduction



Understanding occupational dynamics and labour market requirements is vital to meeting the goals of South Africa's National Development Plan (NDP), 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 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.

As part of the five-year Labour Market Intelligence (LMI) research programme, the DHET has commissioned research to inform the publication of the List of Occupations in High Demand (OIHD), the List of Priority Occupations (LPO), and, on behalf of the Department of Home Affairs (DHA), the Critical Skills List (CSL).

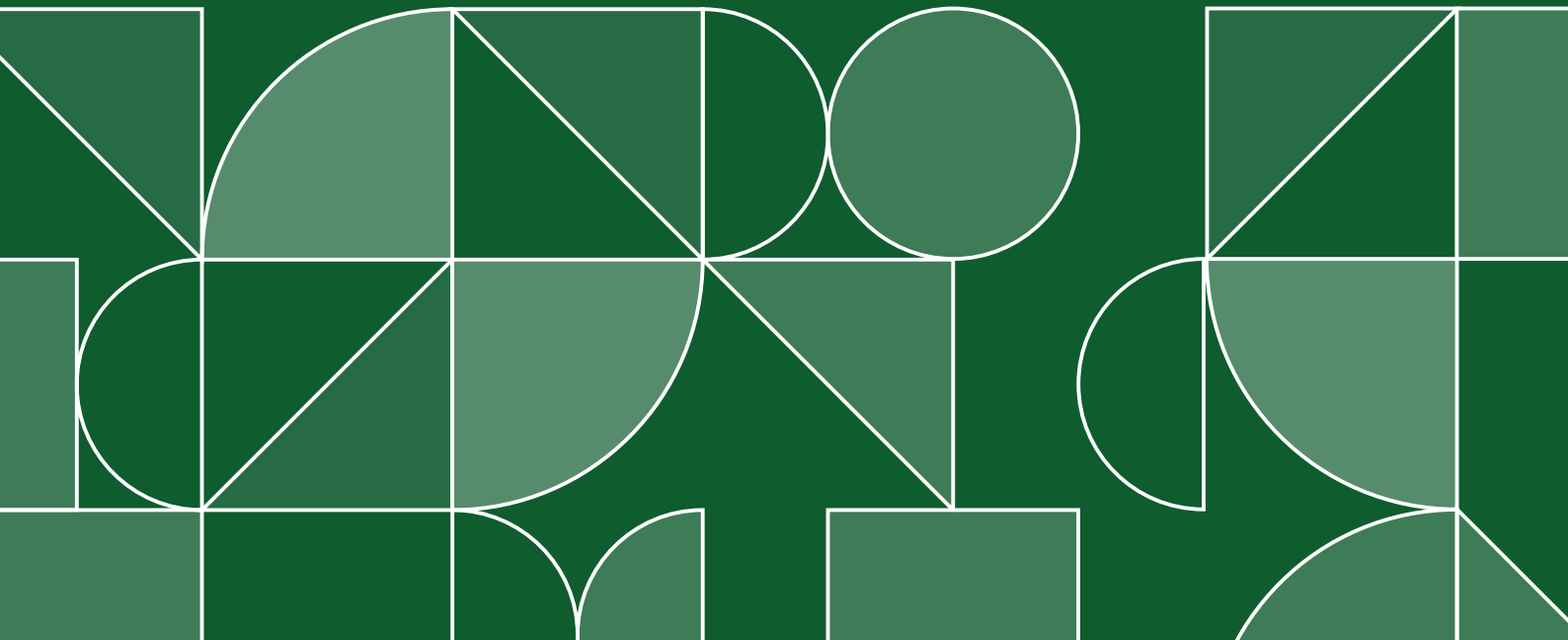
Before 2014, the South African government identified the need for a credible institutional mechanism for skills planning (as reflected in the Medium-Term Strategic Framework). As part of the skills planning mechanism, government, in partnership with the PSET sector, is, among other things, required to identify occupations in demand – now and in the future. The list of OIHD represents the government's response to this requirement. The first list was published in 2014 and has been updated every two years since. The 2020 list of OIHD will be the fourth iteration.

The LPO and CSL are new additions to this portfolio. The LPO responds to the requirements of the Medium-Term Strategic Framework (MTSF) as well, turning both the list of OIHD and the LPO into tools that can be utilised to create vital skills planning mechanisms in the country. The CSL, on the other hand, responds to Sections 19(4) and 27(a)(ii) of the Immigration Act, requiring the Minister of Home Affairs to determine which skills or qualifications are critical for the country when considering an application for a critical skills visa or permanent residence permit.

This report provides an overview of the three lists in terms of their purpose and relationship to one another. This overview lays the foundation for the main aim of the report, which is to present an in-depth description of the respective methodology of each list in question.

PART 2

Definitions and purpose of the list of OIHD, the CSL, and the LPO



Definitions of the list of OIHD, the CSL, and the LPO can be found in Table 1 below.

TABLE 1: Definitions of each list

LIST	DEFINITION
List of Occupation in High Demand (OIHD)	<p>Consists of occupations for which the labour market demand is high and growing (excluding elementary occupations).</p> <p>Demand for occupations is measured by:</p> <ul style="list-style-type: none"> • Growth in the number of vacancies and the average duration of vacancies; • Growth in wages; • Growth in the number employed and the average duration of employment; and • The importance of particular occupations for South African strategic priorities.
List of Priority Occupations (LPO)	<p>Consists of occupations specifically required by the priority and growth sectors identified as part of the re-industrialisation of the South African economy, to enable their expansion.</p>
List of Critical Skills (CSL)	<p>Consists of occupations critical for improvement in economic growth and without which certain projects and work could not be undertaken, requiring high-level skill that will enhance the skills pool in the economy, which in turn will encourage and potentially accelerate growth in the economy (Rogan & Chabane, 2020).</p>

The LPO and CSL should not be considered entirely separate lists from the list of OIHD. **All three lists** consist of occupations for which labour market demand is high and growing. However, the occupations in the LPO and CSL have additional criteria. More than just being in high demand:

- Occupations in the LPO are specifically required for the expansion of the government’s priority and growth sectors. The list will be used to facilitate a targeted approach to funding priority occupations needed within strategic sectors to grow the economy. Funding will come from Sector Education and Training Authorities (SETAs), the National Skills Fund (NSF), and other sources to support the implementation of interventions.
- Occupations on the CSL are required in the short-term and cannot be produced by domestic PSET institutions in time.

From these definitions, the purpose of each list can be inferred. Fundamentally, the common purpose across each list is to **inform or signal**. The difference between the lists, however, lies in the decisions they inform.

FIGURE 1: Purpose comparison



The table below expands on Figure 1 by providing detail on the intended users of each list and how the information produced should be utilised (i.e., the list’s purpose).

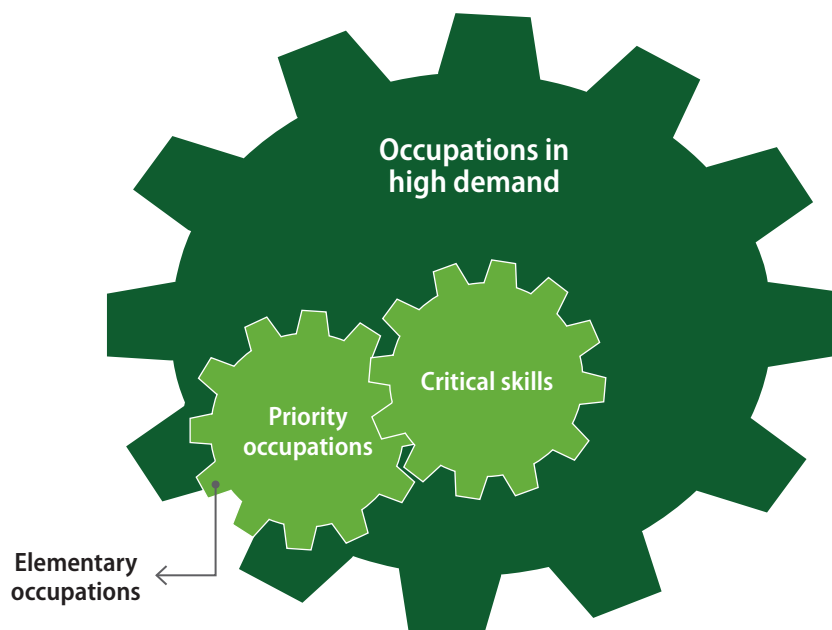
FIGURE 2: Overview of list utilisation

LIST OF OCCUPATIONS IN HIGH DEMAND	CRITICAL SKILLS LIST	LIST OF PRIORITY OCCUPATIONS
Purpose		
<p>The list of OIHD is one piece of evidence (of many) that informs planning for the PSET system. The list:</p> <ul style="list-style-type: none"> Assists in developing new qualifications for occupations that are shown to be in high demand, while also signaling whether existing qualifications require updating based on the market’s demand for labour; Acts as a signpost for enrolment planning (assists in the process that streamlines inefficiencies within the PSET system by outlining methods needed to produce higher quality graduates and best leverage the PSET system); and Informs career guidance for learners and work-seekers. 	<p>The CSL is the main tool used to inform the recruitment of critically skilled foreign nationals where the South African labour market is unable to create such skills in the short-term.</p>	<p>The LPO is one piece of evidence (of many) that informs the PSP of the national government. This PSP is intended to detail the nature, extent, and timing of interventions required by the PSET system to ensure the supply of labour market participants with the ability to be absorbed into priority occupations (i.e., those seen as key for government and its development strategies).</p>
Potential users		
<ul style="list-style-type: none"> The DHET PSET institutions SETAs NGOs and NPOs engaged in career guidance The NSF The Quality Council for Trades and Occupations (QCTO) Learners, graduates, and work-seekers Social partners representing business, labour, and the community 	<ul style="list-style-type: none"> The DHA The Department of Trade, Industry, and Competition The Department of Employment and Labour The DHET Social partners representing business, labour, and the community 	<ul style="list-style-type: none"> The DHET The NSF The QCTO SETAs Other government departments at the national, provincial, and local level Social partners representing business, labour, and the community
Timeframe		
Informs medium- to long-term responses	Informs a long-term response	Informs short-, medium-, and long-term responses

The lists are not mutually exclusive. The occupations in the CSL and most of the occupations in the LPO are included in the list of OIHD too. As shown in Figure 3, there may be some occupations in the LPO not included in the list of OIHD. These will be elementary occupations (requiring low-skill levels but nonetheless considered a priority), which are excluded from the list of OIHD, but not from the LPO.

Figure 3 below illustrates the relationship between the three lists diagrammatically.

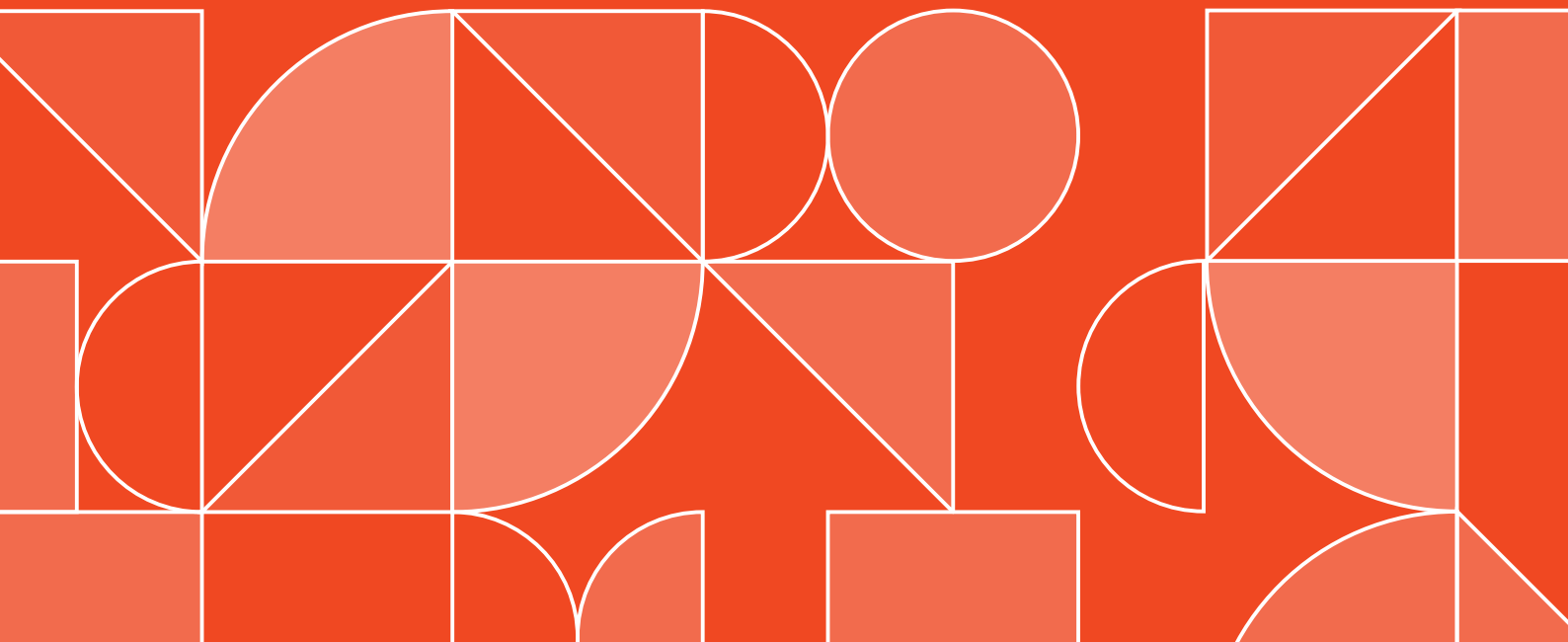
FIGURE 3: Relationship between the three lists



The methodologies used to create the three lists were built around the various definitions, purposes, and relationships discussed above. These methodologies are outlined below. First, however, it is important to explain South Africa's Organising Framework for Occupations (OFO), as it represents an essential building block for understanding the methodologies employed.

PART 3

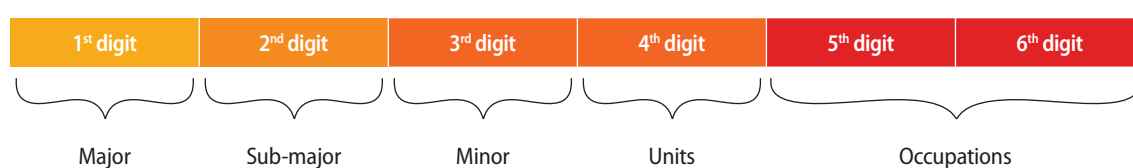
Organising Framework for Occupations



According to the DHET, the OFO is a classification framework that attempts to “establish a common language for talking about occupations”. As the authors of the 2018 list of OIHD technical report (Reddy, Rogan, Mncwango, & Chabane, 2018, p. 10) put it:

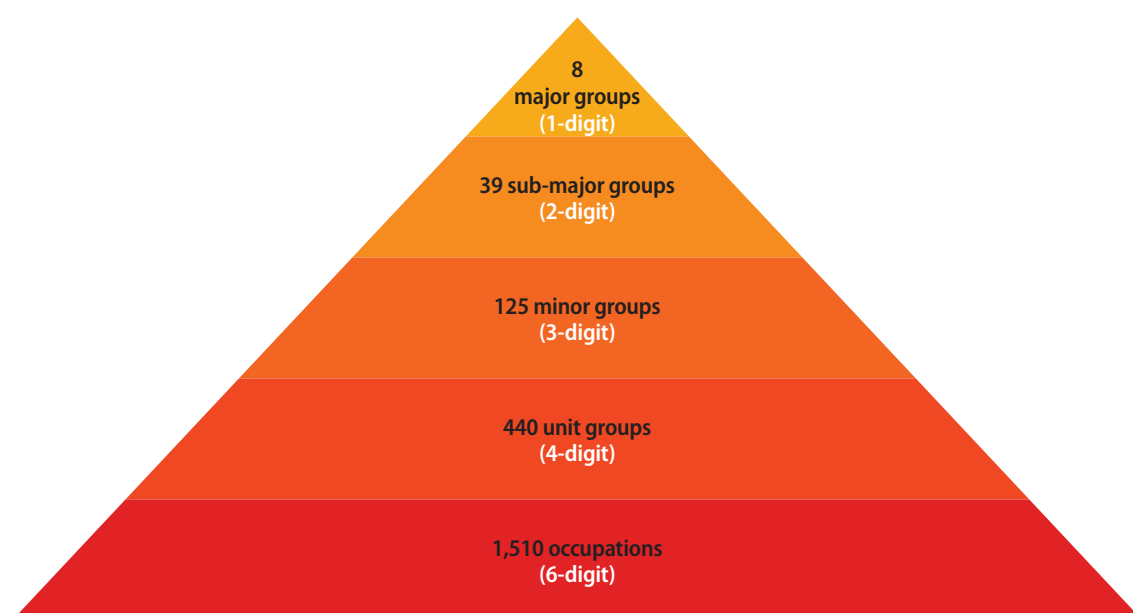
The OFO is a skill-based, coded classification system of occupations which is used by the DHET for “identifying, reporting and monitoring skills demand and supply” in the labour market. It captures almost all occupations in the country and classifies them by skill level and skill specialisation.

The framework gives each occupation a six-digit numeric code. Occupations are then grouped into four-digit unit groups, which are grouped into three-digit minor groups, two-digit sub-major groups, and finally, one-digit major groups. Within the six digits of the occupation, each number refers to a specific grouping.



As shown in Figure 4, the eight one-digit major groups together encapsulate the entire set of 1,500 six-digit occupations.

FIGURE 4: Number of classifications in the OFO



Source: DHET (2019)

The eight major groups will be of specific interest when analysing the composition of the lists in their respective technical reports. The major group indicates the skill level and the broad area of specialisation. Figure 5 maps the major groups to the National Qualifications Framework (NQF) levels. It shows that, as the major groups move from 1 to 8, the NQF levels decrease.

FIGURE 5: Relationship between OFO major categories and NQF levels

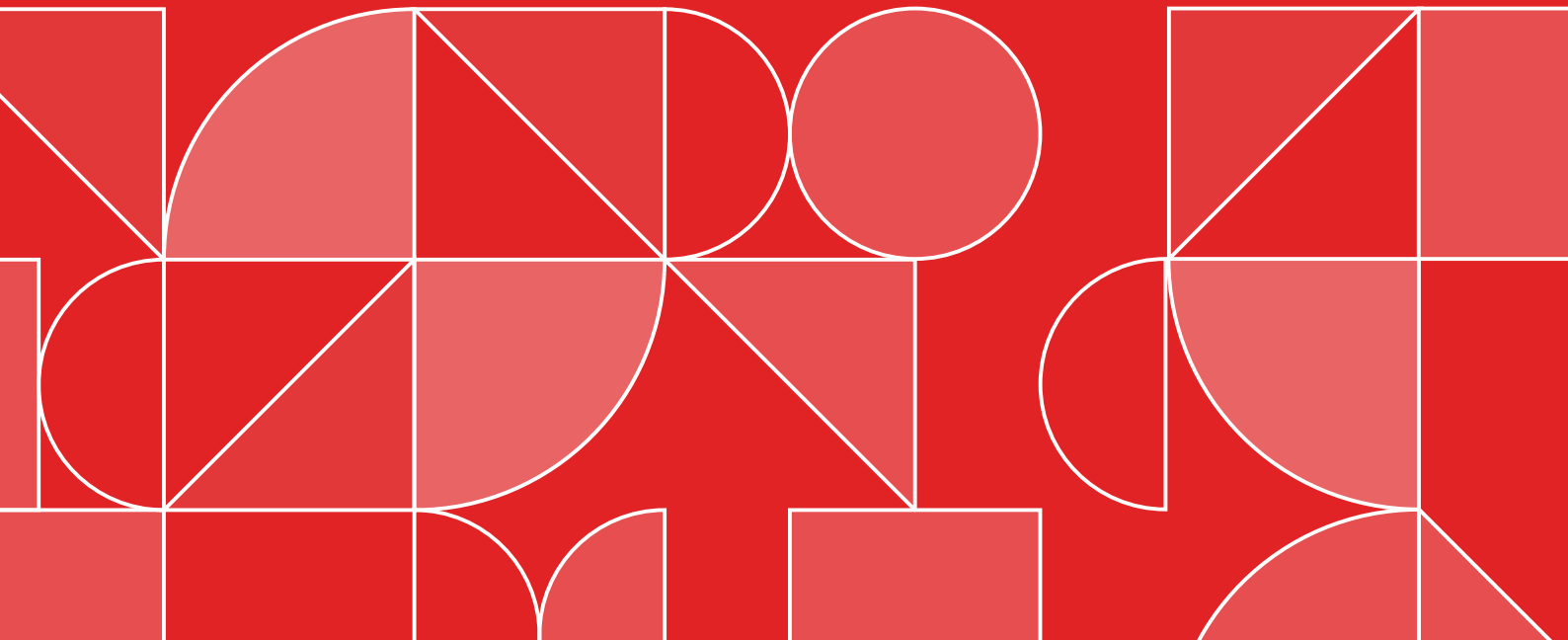
NSDS (LEVEL OF SKILL REQUIRED FOR A GIVEN NQF LEVEL)	NQF	OFO MAJOR GROUP			
High	10	2 Professionals		1 Managers	
	9				
	8				
	7				
Intermediate	6	3 Technicians and associate professionals			
	5	4 Clerical support workers	5 Service and sales workers	6 Skilled agricultural, forestry, fishery, craft, and related trade workers	7 Plant and machine operators and assemblers
4					
Entry	3				
	2	8 Elementary occupations			
	1				

Source: DHET (2015)

The OFO provides the basis for the respective methodologies. The link between the OFO and the methodologies is made explicit in Section 5. First, however, it is necessary to provide context regarding the theoretical foundation for the methodologies.

PART 4

Theoretical foundation for methodologies



The methodology of the list of OIHD has evolved significantly since its first publication in 2014. This evolution was directed by the lessons learned from each previous publication and informed by methodologies employed internationally. In turn, this experience has formed the foundation for the methodologies used for the CSL and LPO.

An evaluation report for the 2018 list of OIHD outlined the approaches followed for the previous iterations of the list, and highlighted the development of the methodology over time (DNA Economics, 2020). The below table summarises the report’s findings.

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"> • Various sources were used qualitatively, such as SETA PIVOTAL lists and Sector Skills Plans (SSPs), Strategic Integrated Projects (SIPs), the Joint Initiative for Priority Skills Acquisition (JIPSA), and so forth. • 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.). • This created a list of occupations (at the six-digit level), which was then validated and added to by a broad set of private and public sector participants.
2016	<p>Included quantitative analysis of data from the Quarterly Labour Force Survey (QLFS) and Job Opportunities Index (JOI) in addition to documentary review.</p> <p>Included quantitative forecasting of occupational growth.¹</p> <p>Broader validation process with private and public sector stakeholders.</p>	<ul style="list-style-type: none"> • Data from the QLFS and the JOI were analysed to assess occupational growth and job vacancy trends. • Forecasts (up to 2025) of occupational growth were made and then used to ascertain the top 20 job prospects in the country. • Various sources, such as SETA PIVOTAL lists, the SIPs, the DHET’s call for evidence (CFE), literature in South Africa, etc., were used qualitatively. • These findings were amalgamated and presented to various private and public stakeholders for validation (although the sample of “validator” was far smaller than the sample used in the 2014 list).
2018	<p>Developed a multi-dimensional index of demand.</p> <p>Included data from Career Junction (CJ).</p> <p>Two-stage approach consisting of a bottom-up quantitative method and top-down qualitative method.</p>	<ul style="list-style-type: none"> • Data from the QLFS and CJ were analysed, and a four-digit OFO-coded list was produced. • 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. • This list was then validated by a limited number of stakeholders in both the private and public sectors.

¹ 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 the 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 characteristic of the methodological evolution was the increasing importance of quantitative data. While there are several international approaches to identifying skills and occupational shortage, there are two that are most responsible for this shift: namely, the Shortage Occupations List produced by the UK's Migration Advisory Committee (MAC) and the Organisation for Economic Co-operation and Development's (OECD) Skills for Jobs Indicators (Reddy, Rogan, Mncwango, & Chabane, 2018).

Both approaches create a multi-dimensional index comprised of a range of proxy indicators of occupational shortage and demand; that is, they combine several indicators into a single indicator. This technique has been employed in the methodology underpinning the list of OIHD, the CSL, and the LPO.

The index score for a particular occupation is constructed by assigning either a zero or one to each of the selected indicators based on whether the predetermined **statistical threshold** is satisfied. In most cases, this threshold is the median value. The formula below shows how the index score is calculated using a weight assigned to each indicator.

EQUATION 1: Formula for calculating a multi-dimensional index score

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

w_i = weight assigned to indicator i

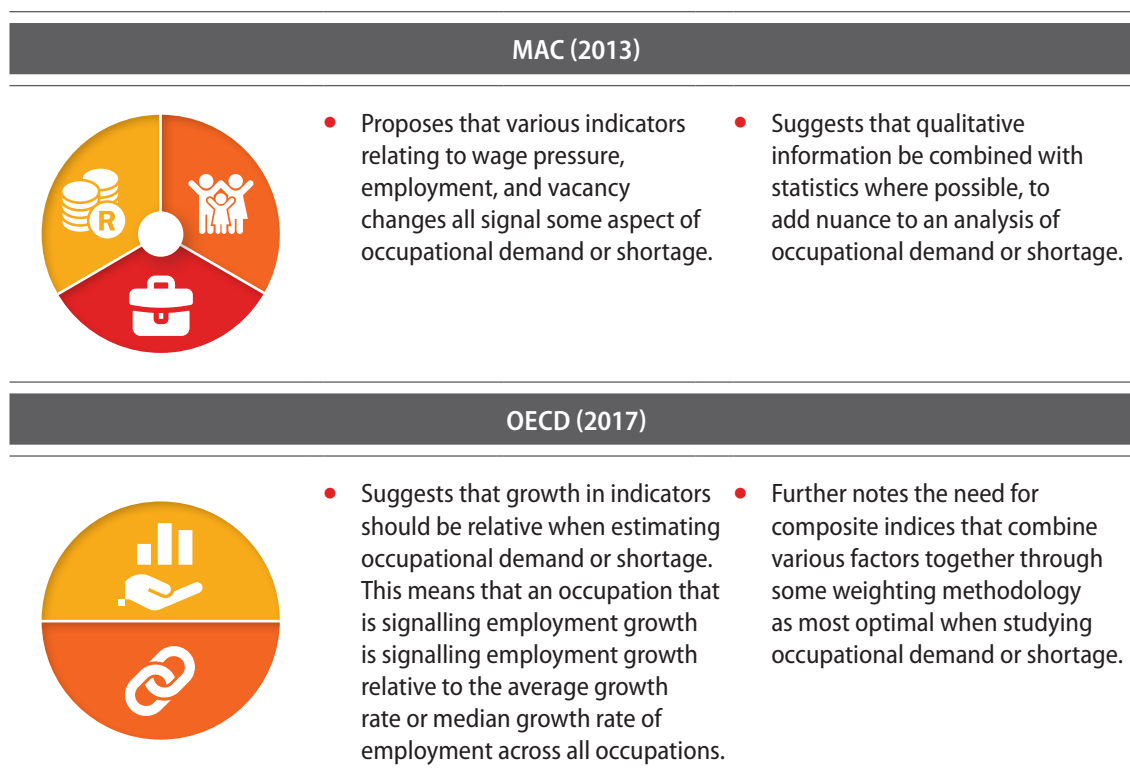
$s_i = 1$ if **statistical threshold** of indicator i satisfied

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

The strength of such an approach is twofold. Firstly, there is no single indicator that can completely encapsulate occupational shortage or demand. Creating the index out of a selected set of proxy indicators 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.

The increased prominence of the quantitative component should, however, not be at the expense of robust qualitative analysis. 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 6 below.

FIGURE 6: Literature synopsis



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

Although based on the same theoretical foundations, the methodologies for each list are adapted to serve their stated purpose (see Section 2). While the methodologies underpinning the three lists (the list of OIHD, the CSL, and the LPO) use a combination of quantitative and qualitative criteria to identify the appropriate occupations, they differ in terms of the indicators they use, and the specific inclusion and exclusion criteria employed. The subsequent sections describe each methodology in detail.

PART 5

Approach to the development of each list



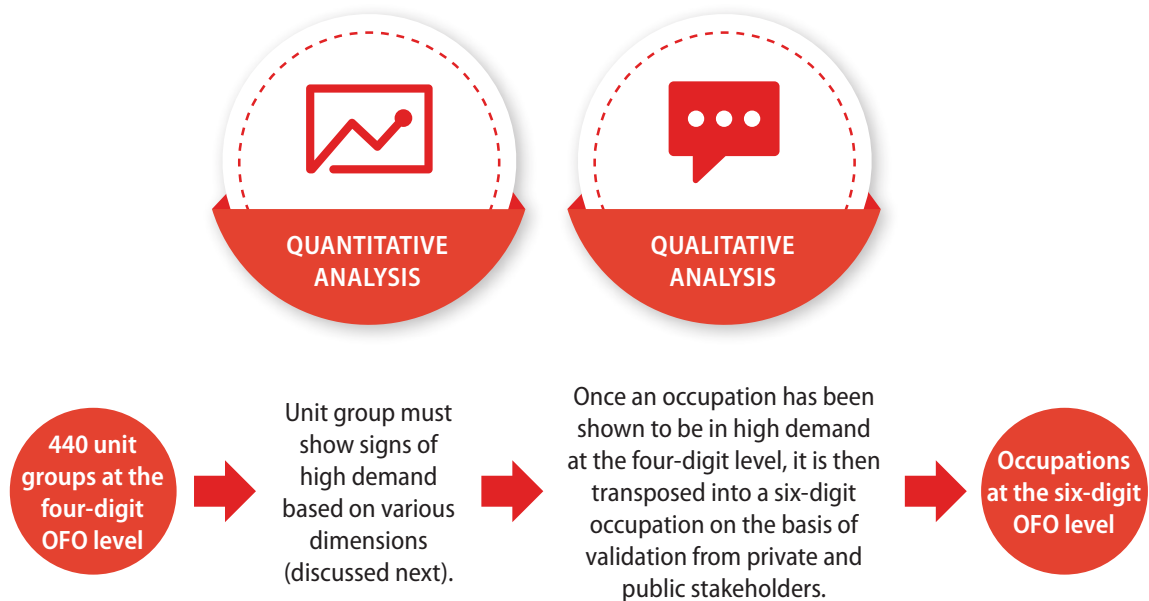
5.1 The List of Occupations in High Demand

The list of OIHD consists of occupations for which **labour market demand is high and growing** (excluding elementary occupations).

Its purpose is to inform planning for **PSET** by guiding the development and updating of qualifications, acting as a signpost for enrolment planning, and informing career guidance for learners and work-seekers.

The thinking behind the methodology used to create the list of OIHD is to identify those occupations for which demand is highest and growing the fastest. To do this, we employ a two-stage approach starting with a quantitative analysis to identify the in-demand occupations, followed by a qualitative analysis to confirm those findings.

FIGURE 7: High-level view of the methodology underpinning the list of OIHD



The data used for the analysis are at the four-digit OFO level. Therefore, the quantitative analysis ranks the 440 unit groups of the OFO according to demand. The highest-ranking unit groups are then analysed further through 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 identified are then put through a process of validation to finalise the list. This process is explained in more detail in the following sub-sections.

5.1.1 Step 1: Quantitative methodology

The multi-dimensional index 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 the indicators associated with each. The source of the information and the “statistical threshold” are also presented. The meaning of the “statistical threshold” in the calculation of the index was discussed in the previous section.

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 ² mean wage growth	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 listing.

² Conditional on age and province.

DIMENSION	REASON FOR INCLUSION OF DIMENSION	INDIVIDUAL INDICATORS	DATA SOURCE	STATISTICAL THRESHOLD
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.

As discussed in Section 4, the indicators presented in Table 3 are combined into a single multi-dimensional index of 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) is equally weighted by $\frac{1}{4}$. If there are three indicators in a dimension, each indicator is 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 is 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 to make the results more robust. This was as follows:

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. In addition to being an objective means of 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).³

These weighting schemes are applied to the data on all indicators in Table 2 to create indices of occupational demand. The higher the index score in each case, the “louder” the signal of occupational demand. If the occupation is ranked in the top 25% (>75th percentile) of unit groups, it is deemed to be in high demand – at least in terms of the quantitative analysis.

The equal-weighting approach is used as the primary technique, with the other two techniques used to test robustness. If one weighting scheme produces a sufficiently different list to another, the unit groups that differ are included in the stakeholder validation process (explained under Section 6).

³ For example, mean and median wage growth are highly correlated with one another.

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 the 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 sub-section.

5.1.2 Step 2: Qualitative methodology

The main aims of the qualitative analysis are twofold:



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

The following sources are reviewed for evidence of high occupational demand to justify either inclusion or exclusion at the six-digit level:

- SETA professional, vocational, technical, and academic learning (PIVOTAL) lists across 21 SETAs;
- Submissions to the DHET’s CFE; and
- A literature analysis of other published secondary materials or grey literature.

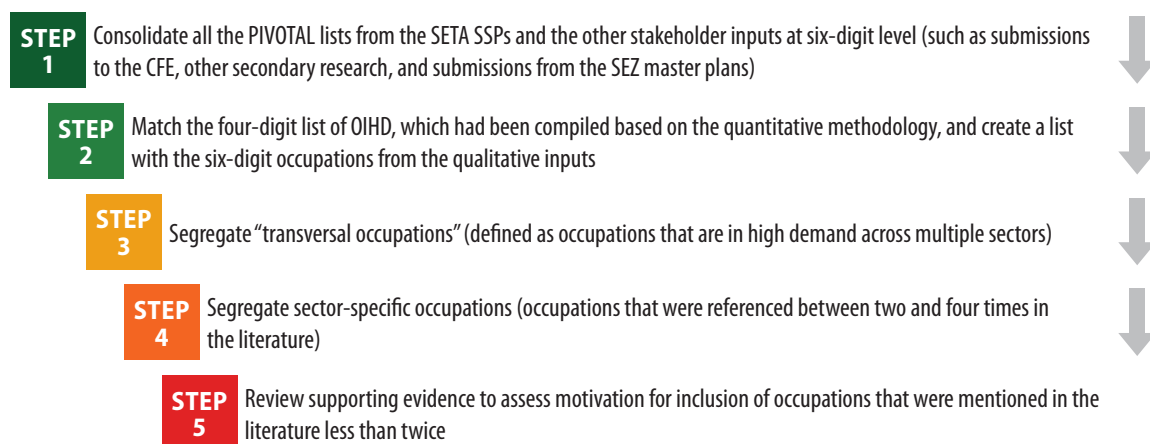
The evidence from the literature review is then overlaid against the evidence from the quantitative analysis using the following inclusion/exclusion criteria:

FIGURE 8: Inclusion/exclusion criteria for qualitative analysis

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

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

FIGURE 9: Five-step qualitative methodology approach



Once this five-step process is completed, the draft list of OIHD at the six-digit level is complete. It is then ready for validation. The validation process for all three lists is described in Section 6. The validation is run as a single process, and it therefore makes sense to describe it in this way to avoid duplication.

5.2 The List of Priority Occupations

The LPO consists of occupations specifically required by the priority and growth sectors identified as part of the re-industrialisation of the South African economy, to enable their expansion.

It informs the PSP of the national government, which is intended to detail the nature, extent, and timing of interventions required by the PSET system to ensure the supply of labour market participants who can readily be absorbed into priority occupations (those essential for government and its development strategies).

Two dimensions of criteria have been put forward as the basis for identifying occupations that could potentially qualify for the LPO as per their definition and the purpose of the list.

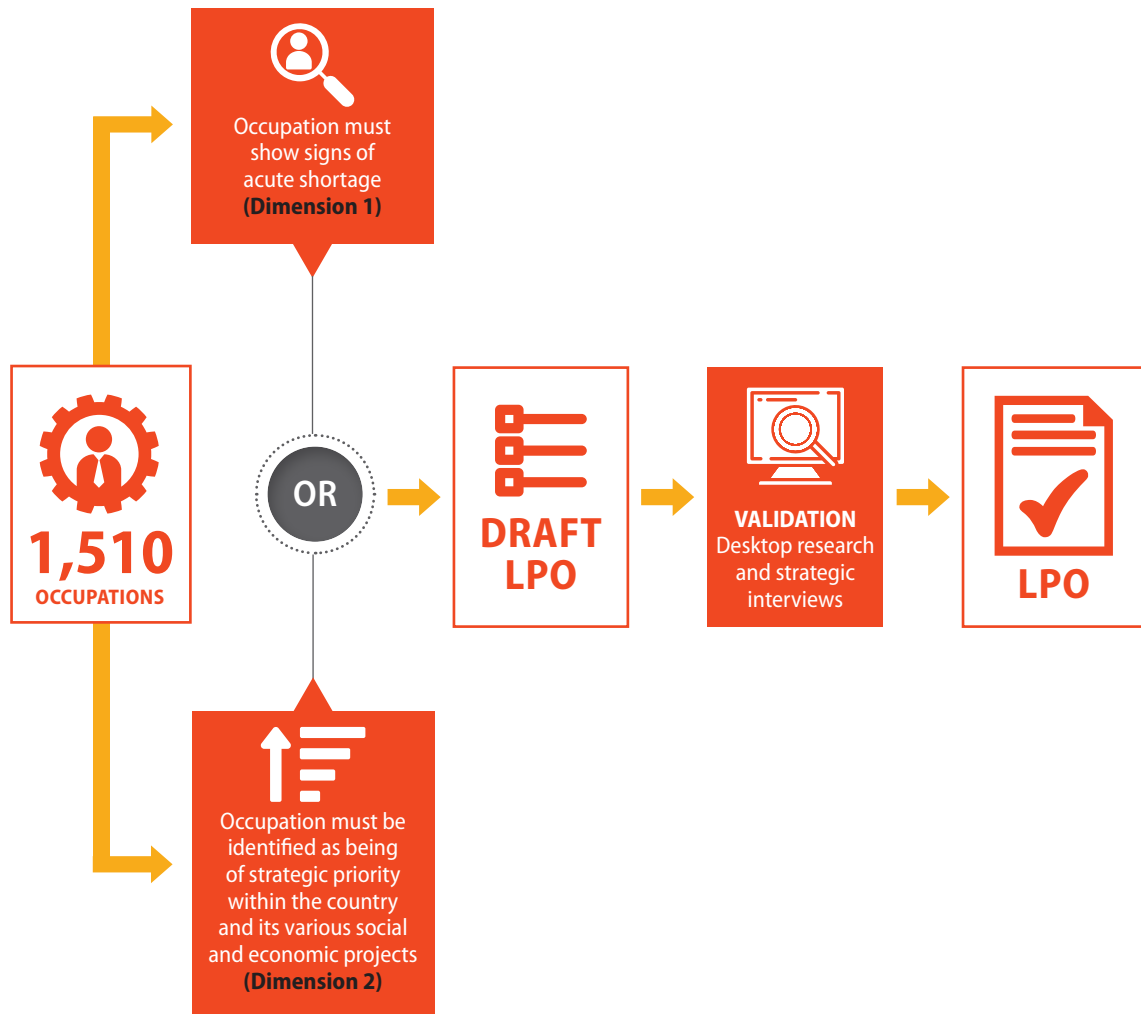
TABLE 4: LPO criteria dimensions

DIMENSION	DESCRIPTION
Dimension 1: Acute shortage	Convincing evidence for occupational shortage in South Africa
Dimension 2: Strategic priority	Important for strategic priorities for public and private sector investments

The OFO presents a way to discuss occupations in a very straightforward and descriptive manner (see Section 3). Considering this framework through the lens of the dimensions set out in Table 4 allows for a criteria-based filtering approach to identifying occupations for the LPO.

Figure 10 illustrates how this is done.

FIGURE 10: High-level methodology followed to obtain the LPO



Therefore, to be **included** in the LPO, an occupation:

- Must be in acute shortage (D1); **or**
- Must be considered important for strategic priorities going forward (D2).

Occupations are therefore **excluded** from the list if neither of these is confirmed.

To summarise, the following process informs the creation of the LPO:

TABLE 5: Steps to developing the LPO

STEP	DESCRIPTION
Step 1	Use indicators of occupational shortage to identify occupations in acute shortage (D1).
Step 2	Identify occupations in strategic documents (D2).
Step 3	Consolidate lists produced in Steps 1 and 2 to produce a list of occupations that are in acute shortage and/or important for South African strategic priorities.
Step 4	Sense-check and validate the occupations identified to finalise the LPO.

These steps and dimensions are discussed in detail in the next sub-sections.

5.2.1 Step 1: Use indicators of occupational shortage to identify occupations in acute shortage (D1)

According to the OECD, a skills shortage:

arises when employers are unable to recruit staff with the required skills in the accessible labour market, and at the going rate for pay and working conditions due to a lack of an adequately skilled workforce. (OECD, 2016, p. 29)

A direct measure of shortage would compare **the number of applicants (the supply of labour) to the number of vacancies advertised (the demand for labour)**. If the supply is less than the demand, it can be said that there is a shortage. However, relying too heavily on this direct estimate of shortage comes with challenges:

1. Occupations for which applications and openings are captured through online portals tend to be focused on professional skills and occupations rather than on artisanal skills and occupations.
2. Only a handful of applicants/job postings would likely appear on any single career portal, making it difficult to collate all career portal information within a country.
3. The number of qualified applicants for a position is likely to be over-estimated, as not all applications will come from individuals with the requisite skills.⁴
4. Data for job applications not advertised on the internet are not available.

A multi-dimensional index is therefore also used – similar to what is suggested by the MAC and the OECD, and also to what is done to identify occupations for the list of OIHD. The difference between the approach used for the list of OIHD and the LPO lies in the indicators constituting the respective indices. While the list of OIHD index consists of indicators relating to the needs of the economy, the LPO index of shortage is specifically focused on those indicators that signal a gap between what employees can provide and what the economy requires. Although there is overlap between the two sets of indicators, each of them has unique attributes that specifically evidence the phenomena they aim to signal. Table 6 presents the indicators used for the LPO index and explains how each one relates to shortage.

⁴ This over-estimation might also come about due to duplication – one individual might apply for the same occupation on many different websites, duplicating both the number of occupations available and the number of applicants.

TABLE 6: Indicators of acute shortage

SUB-DIMENSION	REASON FOR INCLUSION	INDICATOR	SOURCE	STATISTICAL THRESHOLD
Hard-to-fill vacancies	An employer, instead of employing a potential candidate with insufficient skill, will wait to employ the correct candidate who has a matching skills profile to what the employer has expected or needs. Vacancies that are not filled within six months can be considered to point to a skills shortage.	The growth rate of the number of vacancies that take longer than six months to fill.	CJ	Change in the number of vacancies above the median between 2010 and 2017.
		The proportion of vacancies that take longer than six months to fill.		Change in the proportion of vacancies that take longer than six months to fill above the median between 2010 and 2017.
		The proportion of vacancies re-advertised within the year.		Change in the proportion of vacancies re-advertised within a year above the median between 2010 and 2017.
Vacancy pressure	An increase in the number of vacancies for a particular occupation could signal that employers are not obtaining the skills needed to fill positions adequately.	Change in vacancy growth.	CJ	Change in vacancy growth above the median in the JOI or CJ listings.
Supply-Demand	Most direct indicator of shortage within the contexts of its inherent challenges set out previously.	Demand (active candidates per OFO code) exceed supply (employer adverts) over the past 12 months.	CJ	Demand exceeds supply.
Wage pressure	Increasing wages signal that demand for a particular skill could be increasing more than the supply of those skills, and employers will thus pay a premium for an adequately skilled employee to fill a position.	Hourly mean wage growth.	QLFS/LMDS	Change in mean hourly earnings above the median between 2010 and 2017.
		Hourly median wage growth.		Change in median hourly earnings above the median between 2010 and 2017.
		Conditional hourly mean wage growth.		Change in the conditional mean hourly wage above the median between 2010 and 2017.

SUB-DIMENSION	REASON FOR INCLUSION	INDICATOR	SOURCE	STATISTICAL THRESHOLD
Employment pressure	An increase in the number of hours worked by an individual signals that the individual could be in a role that is difficult to fill. An employer might – instead of recruiting more workers who might not be well-matched to their needs – increase the workload of a sufficiently skilled individual.	Employment intensity growth.	QLFS	Change in employment intensity above the median between 2010 and 2017 (hours worked by full-time workers).

Because the indicators' relative importance is not apparent, the choice was made to use PCA as the primary technique to calculate the respective weights. The other two approaches (equal weighting and subjective weighting) are then used to compare results and test their robustness.

Occupations are seen to be in "acute shortage" if this index score ranked an occupation above **the 90th percentile of shortage**. They would, thereby, be considered to have passed the criteria of Dimension 1.

Referring back to Figure 10, the quantitative analysis of Dimension 1 occurs in parallel to (or independently of) the qualitative analysis of Dimension 2.

5.2.2 Step 2: Identify priority occupations in strategic inputs (D2)

Strategic occupations are identified by reviewing a plethora of strategic inputs from both the public and private sector. **A strategic occupation can be defined as an occupation important for the current and future strategic aims of the South African economy.**

For the public sector, a host of available strategic documents are included as inputs. For the private sector, a CFE is used. This CFE provides an opportunity for the sector to nominate strategically important occupations. Although the government's strategic documents would also include the perspective of the private sector, the degree of this would differ between sectors. The list of inputs reviewed is presented in Table 7.

An occupation would have to be mentioned in at least four of the sources set out in the table to pass the criteria of Dimension 2.

TABLE 7: List of strategic priority documents reviewed

STRATEGIC GROUPING	DOCUMENT NAME	PUBLICATION YEAR
Priority sectors of government	The South African Poultry Master Plan	2019
	The South African Retail, Clothing, Textiles, Footwear, and Leather Value Chain Master Plan 2030	2019
	Digital Skills Strategy South Africa	
	Geared for Growth: South Africa's Automotive Industry Master Plan to 2035	2018
Special Economic Zone (SEZ) projects	Coega: Development Corporation: Sustainable Growth Strategy 2015–2020	2015
	Dube Tradeport Corporation: Strategic Plan 2015/16–2019/20	2015
	Richards Bay Industrial Development Zone Strategic Plan 2017/18–2021/22	2017
	Ntinga O.R. Tambo Development Agency SOC Strategic Business Plan 2018/19–2021	2018
	Proposed SEZ Occupation for Tubatse	2020
	Saldanha Bay IDZ submission for OIHD Call for Evidence 2020	2020
Phakhisa projects	Operation Phakhisa Skills Development Roadmap for the Offshore Oil and Gas Industry in South Africa	2015
	List of Skills Development Initiatives in Operation Phakhisa Labs	
	Phakhisa Aquaculture	
Reports on provincial and local strategies	Free State Master Skill Plan 2017–2020	2017
	Gauteng Province Master Skills Plan 2	2017
	KZN Provincial Growth and Development Strategy and Plan	2018
	KZN Master Skills Plan 2017–2020	2017
	National Skills Authority: Presentation to the Limpopo Premier's Employment and Growth Advisory Council (PEGAG)'s Industrial and Enterprise Development Technical Working Group (TWG)	2018
	Mpumalanga Provincial Skills Plan 2019–2030	2019
	Northern Cape HRD and Skills Development Strategy 2016/17–2029/30	2016
	North West Provincial Skills Plan 2019–2020	2019
Stakeholder inputs from CFE	Western Cape Provincial Government Strategic Plan 2014–2019	2014
	Record of comments received from members of the public regarding whether occupations are critical for the development of the country	2020

STRATEGIC GROUPING	DOCUMENT NAME	PUBLICATION YEAR
Research	LMIP National Paper on Skills Agro-processing 2012 National Policy Framework on the development of small and medium agro-processing enterprises in South Africa 2015 Agriculture Policy Action Plan	2020
SETA PIVOTAL lists	AgriSETA PIVOTAL list BANKSETA PIVOTAL list MQA PIVOTAL list SASSETA PIVOTAL list Services SETA PIVOTAL list W&R SETA PIVOTAL list TETA SETA PIVOTAL list PSETA PIVOTAL list CATHSETA PIVOTAL list CETA PIVOTAL list CHIETA PIVOTAL list EW SETA PIVOTAL list ETDP SETA PIVOTAL list Fasset PIVOTAL list FoodBev SETA PIVOTAL list FP&M SETA PIVOTAL list INSETA PIVOTAL list LGSETA PIVOTAL list HWSETA PIVOTAL list merSETA PIVOTAL list MICT SETA PIVOTAL list	2018/19– 2019/20

The occupations passing the criteria of D1 are then consolidated with the occupations passing D2 to produce one aggregated list in Step 3.

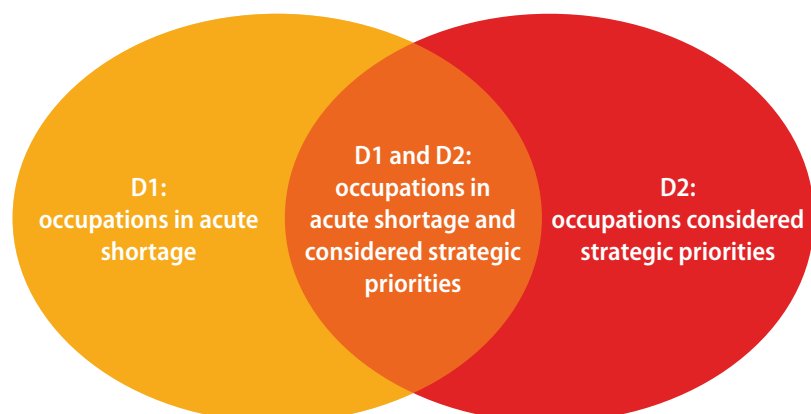
5.2.3 Step 3: Consolidate lists produced in Steps 1 and 2

D1 looks at the past and projects future shortages. D2 looks to the present (current strategic decision making) and predicts future shortages. While D1 looks to the future assuming a replication of the past, D2 appreciates the potential impact that current decisions can have on the future trajectory. These perspectives are equally important. The consolidated list produced by Step 3, therefore, consists of the following occupations:

1. Occupations that only passed the criterion of D1 (acute shortage);
2. Occupations that only passed the criterion of D2 (strategic priority); and
3. Occupations that have passed the criteria for both D1 and D2.

These categories are best illustrated with the assistance of a Venn diagram.

FIGURE 11: Combining D1 and D2



Once consolidated, the draft LPO is ready for the validation process (see Section 6).

5.3 The Critical Skills List

The CSL consists of occupations critical for improvement in economic growth and **without which certain projects and work could not be undertaken**. These occupations require a **high-level of skill** that will enhance the skills pool in the economy, which in turn will **encourage and potentially accelerate growth in the economy** (Rogan & Chabane, 2020).

It is the main tool used to inform the recruitment of critically skilled foreign nationals where the South African labour market is unable to produce such skills in the short-term.

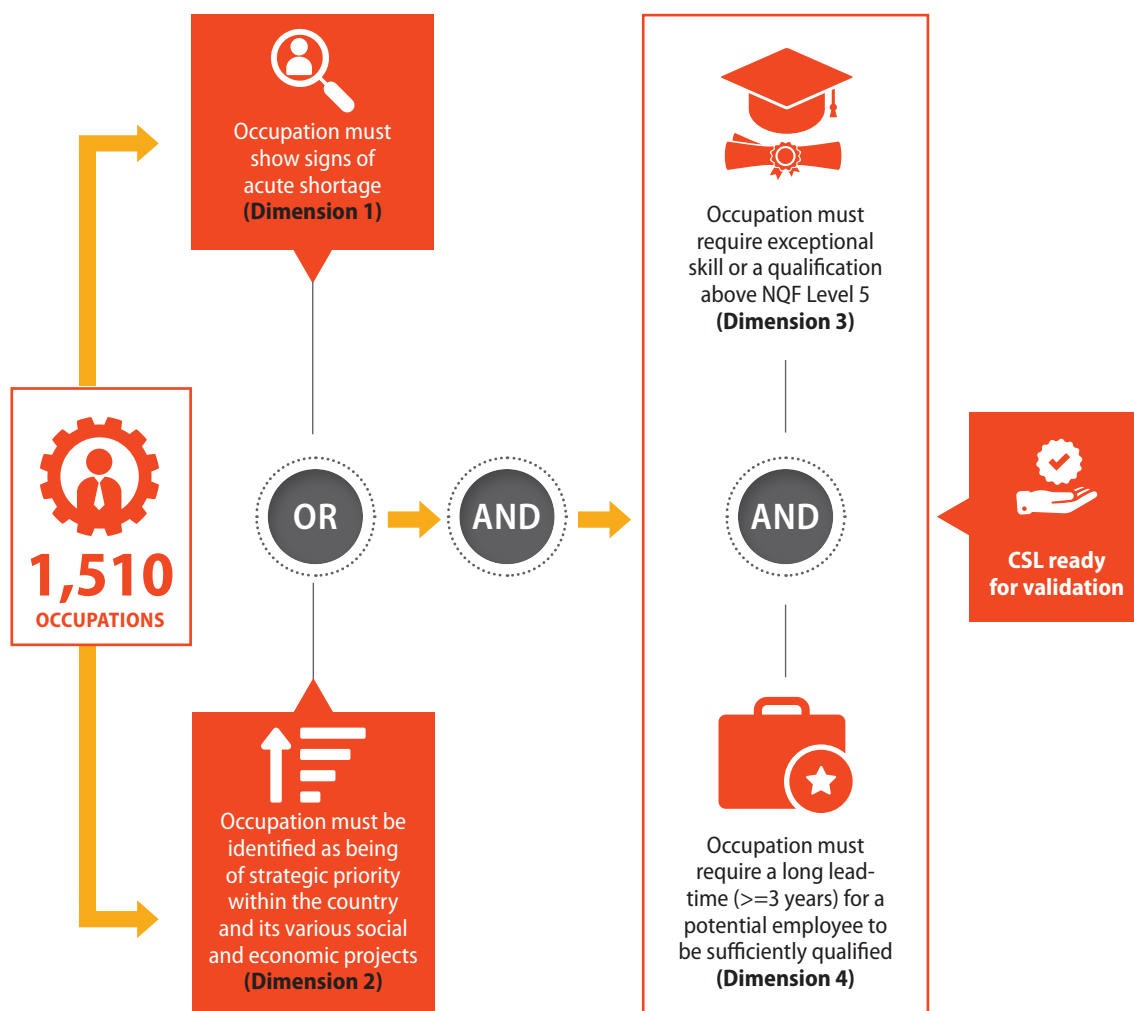
Based on this definition and purpose, four dimensions of criteria have been put forward as the basis for identifying occupations for the CSL. As can be seen in Table 8, in addition to the first two dimensions that overlap with the LPO, for the CSL, there are two other dimensions.

TABLE 8: CSL criteria dimensions

DIMENSION	DESCRIPTION
Dimension 1: Acute shortage	Convincing evidence for occupational shortage in South Africa
Dimension 2: Strategic priority	Important for strategic priorities for public and private sector investments
Dimension 3: Highly qualified or exceptionally skilled	Occupations for which workers are highly qualified or exceptionally skilled
Dimension 4: Long lead time	Occupations that have a long lead time to develop a supply pipeline

The CSL also uses the OFO as the basis for discussing occupations. Figure 12 illustrates how the dimensions from Table 8 are used to filter the 1,510 occupations of the OFO to those appropriate for the CSL.

FIGURE 12: CSL methodology outline



The first half of the CSL methodology is, therefore, the same as the LPO methodology by which occupations are identified that are either in acute shortage, strategically important, or both. However, the CSL methodology then imposes additional criteria that are specifically related to the potential for developing a supply pipeline of the skills required for the South African economy in the short-term.

Essentially, to be included in the CSL, an occupation:

- must be identified as a strategic priority (D2), **or** be in acute shortage (D1); **and**
- require workers that are highly qualified/skilled (D3); **and**
- have a long lead time to develop a supply pipeline (D4).

Occupations are therefore **excluded** from the list if any of the following are true:

- The occupation requires less than an NQF Level 5 qualification;
- The occupation is not identified as an artisanal occupation and requires less than three years' post-secondary school education and training; **and/or**
- The occupation is not listed as a strategic priority or is not an occupation in acute shortage.

The development of the CSL, therefore, happens in six steps:

TABLE 9: Steps to developing the CSL

STEP	DESCRIPTION
Step 1	Use indicators of occupational shortage (listed below) to identify occupations in acute shortage (D1).
Step 2	Identify occupations in strategic documents.
Step 3	Consolidate lists produced in Steps 1 and 2 to develop a list of occupations that are in acute shortage and/or important for South African strategic priorities.
Step 4	Extract occupations from the list produced in Step 3 that require highly skilled/qualified workers (D3).
Step 5	Extract occupations from the list produced in Step 5 that require a long lead time to produce a pipeline of qualified individuals (except for artisans).
Step 6	Sense-check and validate occupations identified in Step 6 to finalise CSL.

Because the first two dimensions of the CSL and LPO are the same, the first three steps are also the same. The only difference is that the criteria used for D2 (“strategic priority”) in this context mean that an occupation would have to either:

1. Appear on PIVOTAL lists across various SETAs. These occupations are identified, per economic sector, as being able to assist the country in meeting its industry skills needs; or
2. Appear on SEZ documents, provincial priority documents, government master plans, the DHET’s CFE, and other grey literature sources at least three times individually. These occupations and skills are identified as a strategic priority, given the government’s mandate to create employment and develop infrastructure in specially designated areas within the country.

Because Steps 1–3 have already been described under the methodology of the LPO, it is unnecessary to repeat that description here. Once these steps have been completed, the CSL methodology proceeds to Steps 4 and 5.

An occupation included in the list produced by Step 3 is analysed by answering the following two questions:

D3 “Does an occupation require a high level of professional/technical competence?”

AND

D4 “Does an occupation require a long lead time (three years or more) to cultivate the relevant education/experience before a candidate employee can apply for the occupation?”

For an occupation to have “passed” D3, the occupation would either:

1. Require an NQF Level 5 qualification or above; or
2. Be included in the Government Gazette (DHET, 2012) listing artisanal trades.

Instead of running through each occupation, a sieve method is applied to occupations passing D1 or D2, which consists of the following logical tests:

TABLE 10: Logical filter for passing D3

Most occupations within OFO major groups 1, 2, or 3 require an NQF Level 6 qualification or above. This was the case for all occupations save for the following occupational groups:

- 1 113 Traditional chiefs and heads of villages
- 3 421 Athletes and sports players
- 3 439 Artistic and cultural associate professionals
- 333 402 Real estate agent
- 334 301 Secretary bargaining council
- 334 302 Personal assistant

The qualifications of all employees within the QLFS were assessed for OFO major groups 4, 5, 6, and 7. The NQF level of the majority of employees per specific occupation was taken as the qualification required for that occupation.

- If an occupation was found in the government list of artisans, it was seen to require exceptional practical skill.

All occupations within the OFO major group 8 require NQF Level 2 or below.

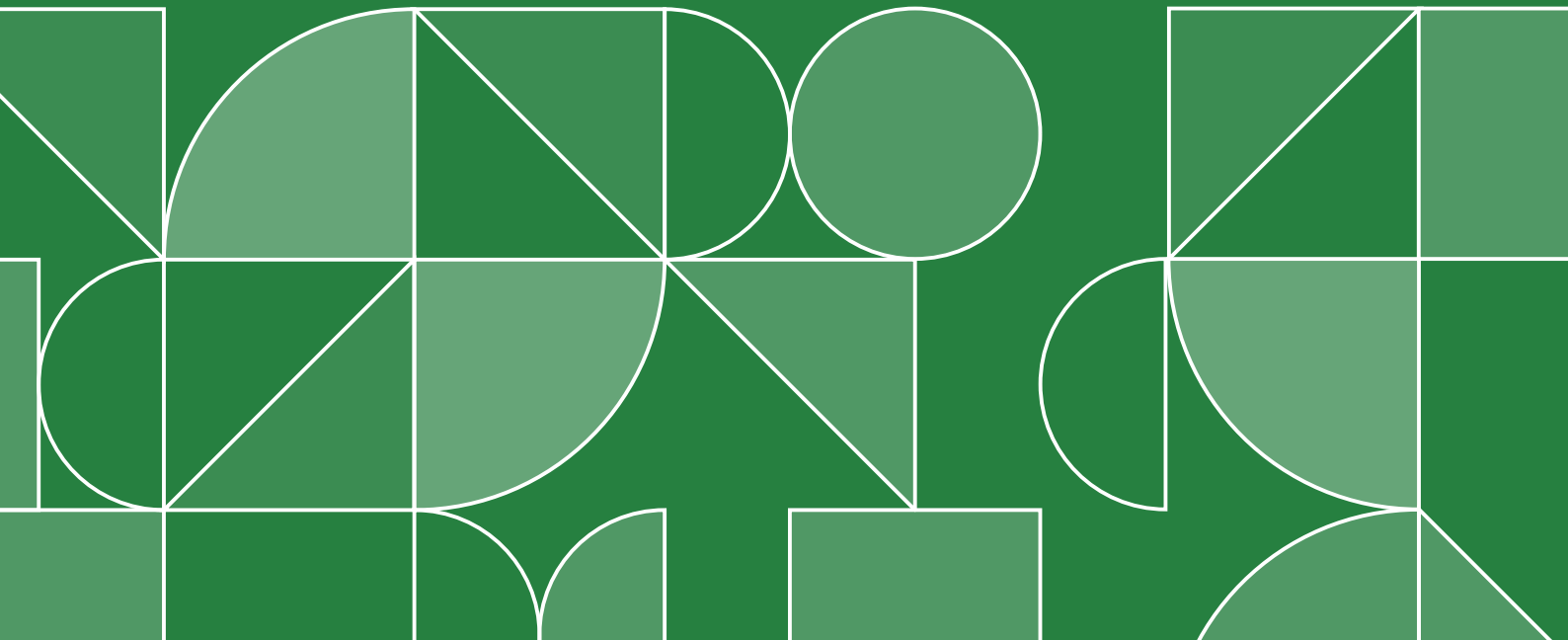
Once occupations pass through the D3 criterion, a desktop review is done to assess the length of time it takes to qualify/be trained for each particular occupation.⁵ All occupations that take three or more years to prepare for are, according to D4, seen to have a long lead-time.

The final result is then a list of occupations that require workers who are highly qualified (D3), have a long lead time to develop a supply pipeline (D4), and are either in acute shortage (D1) or essential for South Africa’s strategic priorities (D2). The only remaining step is validation. As mentioned before, this is a process required for each list. The next section explains why this is necessary, as well as how it is done.

⁵ The criteria for D4 are not applied to occupations in the government gazette of artisans. It is also assumed that all occupations that require NQF Level 6 or above qualifications would immediately pass the criterion for D4, given that these qualifications require at least three years of post-school education.

PART 6

Final step: Validation



6.1 The necessity of validation

The methodologies set out above follow best-practice protocols. This is true because they:

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

An important sixth way in which the methodologies endeavour to adhere to best practice, and thereby produce accurate lists, 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. To be more specific, the following shortcomings exist:

TABLE 11: Limitation–impact–mitigation (LIM) summary

LIMITATION	POTENTIAL IMPACT
Quality of quantitative data	
Data for D1 are at the four-digit OFO level. For the CSL and LPO, the occupational shortage index is therefore assumed to be the same for all matching six-digit occupations, which fall under the relevant four-digit unit group.	Occupations might be considered to be in an acute shortage that are not, and vice versa.
Some data sources (CJ specifically) tend to be biased towards the inclusion of professional- and management-level positions, given the nature of the data source.	Occupations that pass D1 of the CSL, the LPO, or the quantitative analysis of the list of OIHD might not sufficiently represent all OFO major categories.
Some data within the QLFS specifically have a two-year lag, given the availability of updated data.	Some signals that occur in 2018 might not translate to 2020, biasing the result of the quantitative analysis.
Quality of qualitative data	
Documents reviewed in the literature analysis do not always specify occupations, but sometimes mention skills.	The match between priority documents and occupations might contain some overlap (many skills may match to one occupation, or many occupations might match to one occupation). This increases the size of the draft lists.
There are industries and sectors that have not published strategic plans.	It is likely that important occupations for these sectors and industries will not be included in the draft lists.

LIMITATION	POTENTIAL IMPACT
D3 and D4 (only applicable to the CSL)	
NQF levels and relevant lead times are not always straightforward to confirm. Different employers sometimes require different qualifications/levels of proficiency to appoint a candidate to a particular occupation.	Some occupations that might not require technical or professional competence might be included in the draft CSL unnecessarily.
Overall	
Uncertainty regarding the impacts of the current COVID-19 pandemic at sub-sector level.	Occupations could be included that are primarily within sub-sectors whose future economic trajectory will be substantially negatively impacted by the pandemic. The opposite is also possible – occupations being excluded even though the pandemic is likely to impact their future demand positively.

Given these challenges, the validation process is paramount to the finalisation of lists that truly reflect reality within the contexts of their respective purposes.

6.2 Validation processes

The validation process can technically be considered part of the qualitative analysis. The goal is to review evidence for the purpose of including or excluding an occupation.

Although all channels are not utilised for each list, eight channels of validation are employed across all three. Table 12 sets out the channels and specifies to which list each channel is applied.

TABLE 12: Validation processes

VALIDATION CHANNEL	APPLICATION
“Sensibility” filter	List of OIHD, CSL, and LPO
JOI and ESSA database	List of OIHD, CSL, and LPO
Social partners of the Jobs Summit	List of OIHD, CSL, and LPO
Public comment	List of OIHD
Follow up with industry representatives	List of OIHD, CSL, and LPO
“Highest priority” sectors	LPO
DHA validation	CSL
Analysing index score cut-offs	LPO

1 “Sensibility” filter

Some occupations identified by the methodologies may not be sensible to include given the respective purposes of the lists. For this reason, the lists are reviewed and tested against specific sensibility criteria. Exclusion was enacted on the following grounds:

1. Government management positions;
2. Special talent occupations (for example, musicians and artists);
3. Non-developmental-related occupations (for example, athletes); and
4. Occupations not requiring any specific type of formal training (for example, restaurant managers).

This “sensibility” filter was guided by the methodology outlined by the MAC (2013), which conducts a similar form of filtering.

2 Job Opportunities Index (JOI) and Employment Services (ESSA) databases

The Department of Employment and Labour (DEL) maintains two databases of the number of South African citizens who are unemployed by occupation. Although the databases aim to measure the same thing, they use different data to achieve it. The ESSA database is based on the registration of unemployed graduates on the ESSA website, while the JOI uses information from the Department of Public Service and Administration and INFODEX.

These databases show the number of theoretically qualified but unemployed individuals for each occupation. Therefore, if the lists include an occupation for which these databases show many unemployed yet qualified individuals, it is likely that this occupation should be excluded.

3 Social partners of the Jobs Summit

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

4 Public comment

The list of OIHD, along with a description of its methodology, was gazetted for public comment on 11 August 2020. The public was given three weeks to respond. The request was the same as the one made to the social partners of the Jobs Summit. The strength of the argument or evidence provided by any particular entity or individual is evaluated according to the same criteria as the initial qualitative analysis. The number of times it is mentioned and the position of the individual or entity relative to the occupation’s primary industry are also considered. Because the list of OIHD encapsulates nearly all the occupations of the CSL and the LPO, any relevant information collected during this process is also applied to these lists.

5 Follow-up with industry representatives

The researchers' understanding of the South African economy and labour market 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 occupation is deserving of inclusion, and, finally, requesting a justification for whatever answer the interviewee provided. E-mails were also sent out that offered engagement with industry representatives in the form of virtual presentations with opportunities for questions, answers, and comments.

6 "Highest priority" sectors

While the filtering methodology explicitly considered strategic priorities, this analysis was broad and drew from many sources. Therefore, if an occupation was included in the draft lists, but the validation process provided no substantiating evidence, it would only be included if it was considered essential for South Africa's priority sectors.⁶

7 DHA validation

Given that the DHA is the custodian of the CSL, this short-list was sent to the DHA for comment and validation.

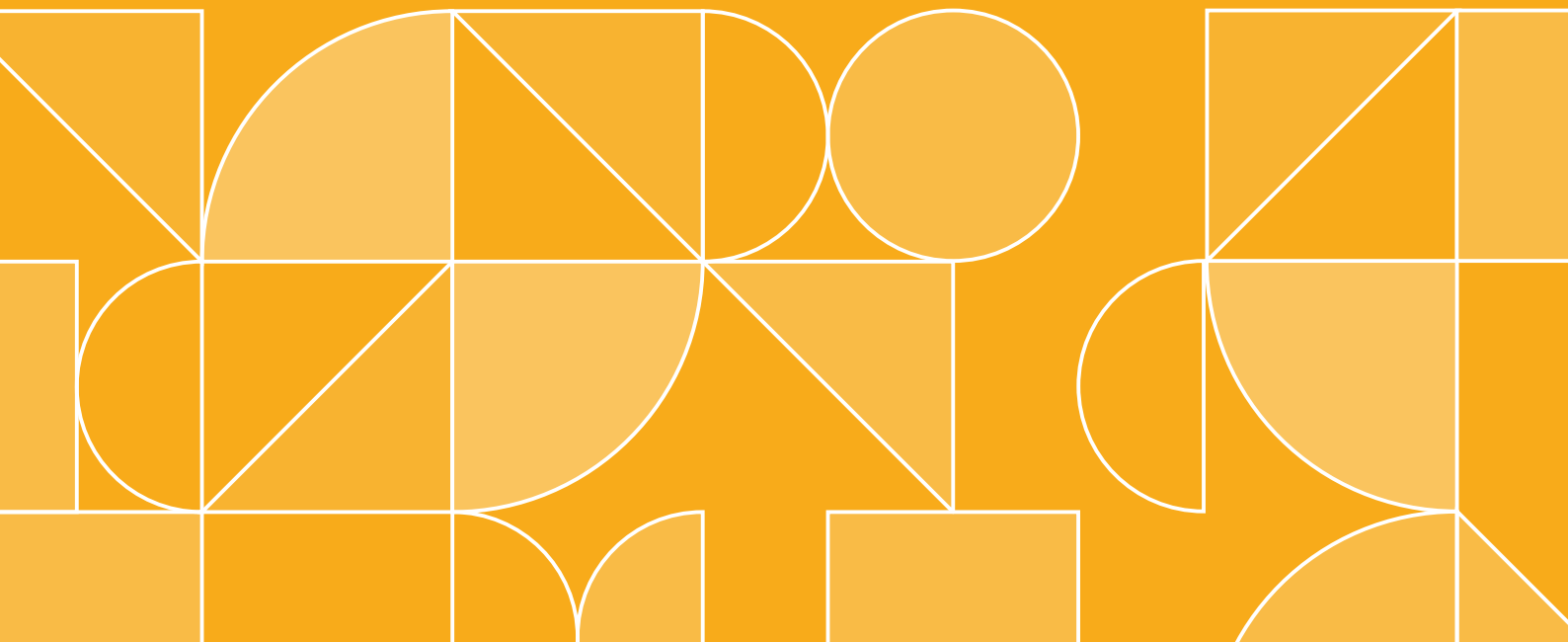
8 Analysing index score cut-offs

The index score calculated for the LPO ranked occupations according to occupational shortage. Index scores are relative scores meaning that the score of one occupation should only be interpreted in relation to the score of another. It is the difference in the scores that is important rather than the score of a single occupation by itself. Large drops between consecutively ranked occupations can therefore split occupation into categories of occupational shortage.

6 As per the MTSF, the Economic Recovery Plan, and the IPAP.

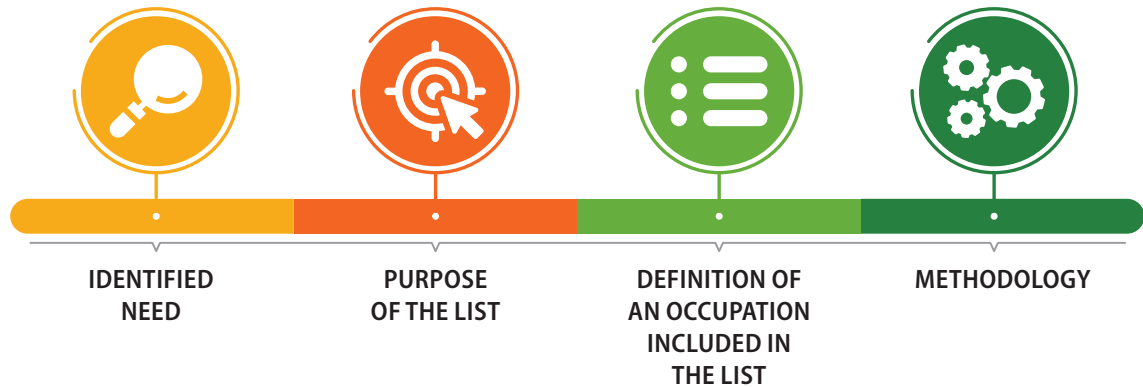
PART 7

Conclusion



This report has described the methodologies employed for the development of the list of OIHD, the LPO, and the CSL. The methodologies were specifically developed to ensure that each list fulfils its specific function.

FIGURE 13: Methodological aim



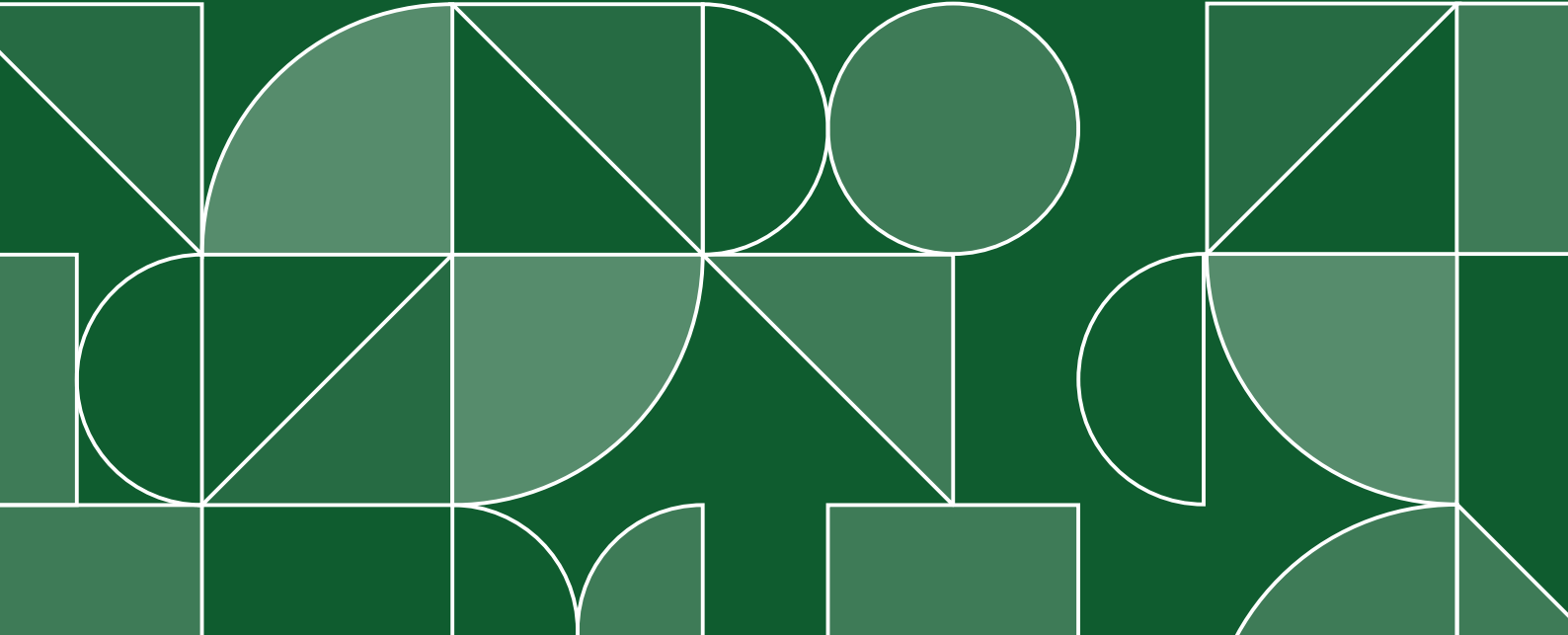
Consequently, if the eventual lists do not contribute to the solution of the initial problem, the methodology has failed. This report has aimed to show that this is not the case and that the line connecting the purpose to the methodology is clear and explicit.

Furthermore, this report provides a platform for critique. The evolution of the methodology employed for the list of OIHD was described in Section 4. For the list of OIHD, such an evolution should continue, and for the CSL and LPO, such an evolution should begin. Methodological consistency over time is *not* the final goal. Although the purpose of each list should remain the same, the methodologies should be open to critique. Critique can bring about changes that result in further alignment between purpose and methodology.

Finally, the description of the methodologies will also help users of the lists understand why they might see some occupations in a certain list (or lists) and not in others. This context is particularly important to ensure that the lists are used appropriately.

PART 8

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