Occupations in High Demand in South Africa

A Technical Report

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LABOUR MARKET
INTELLIGENCE PARTNERSHIP

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ABBREVIATIONS AND ACRONYMS

AASA	Airlines Association of Southern Africa
AF	Alkire-Foster
AGRISETA	Agriculture Sector Education and Training Authority
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ASGISA	Accelerated and Shared Growth Initiative – South Africa
BPESA	Business Process Enabling South Africa
BUSA	Business Unity South Africa
CATHSSETA	Culture, Art, Tourism, Hospitality, and Sport Sector Education and Training Authority
CFE	Call for Evidence
CJ	CareerJunction
CSP	concentrated solar power
CZ	Czechoslovakia
DA	Dental Assistant
DHA	Department of Home Affairs
DHET	Department of Higher Education and Training
DoL	Department of Labour
dti	Department of Trade and Industry
E&T	education and training
EPWP	Expanded Public Works Programme
ESD	Education and Skills Development
EWSETA	Energy and Water Sector Education and Training Authority
FET	further education and training
FoodBev SETA	Food and Beverage Manufacturing Sector Education and Training Authority
FP&MSETA	Fibre Processing and Manufacturing Sector Education and Training Authority
HD	high demand
HEMIS	Higher Education Management Information System
HPCSA	Health Professions Council of South Africa
HRD	human resource development
HRDCSA	Human Resource Development Council of South Africa
HRDS	Human Resource Development Strategy
HSRC	Human Sciences Research Council
HWSETA	Health and Welfare Sector Education and Training Authority
ICLT	Institute for Creative Leather Technologies
ICT	information and communications technology
ILO	International Labour Organization
ISCO	International Standard Classification of Occupations
IT	information technology
JIPSA	Joint Initiative on Priority Skills Acquisition
JOI	Job Opportunity Index
LFS	Labour Force Survey
LMDS	Labour Market Dynamics Study

LMIP	Labour Market Intelligence Partnership
MAC	Migration Advisory Committee
nec	not elsewhere classified
NFMA	Narrow Fabric Manufacturers Association
NILS	National Institute of Labour Studies
NQF	National Qualifications Framework
NSDS	National Skills Development Strategy
NSF	National Skills Fund
NTG	new teacher graduates
NTMA	National Textile Manufacturers Association
OECD	Organisation for Economic Co-operation and Development
OFO	Organising Framework for Occupations
OH	Oral Hygienist
OHASA	Oral Hygienists Association of South Africa
OIHD	Occupations in High Demand
OPSA	Association for Office Professionals of South Africa
OS	occupational shortage
PCASA	Plastics Convertors Association of South Africa
PISA	Programme for International Student Assessment
PIVOTAL	professional, vocational, technical and academic learning
PSET	post-school education and training
PTAs	Physiotherapy Technicians & Assistants
QCTO	Quality Council for Trades and Occupations
QLFS	Quarterly Labour Force Survey
SADA	South African Dental Association
SASCO	South African Standard Classification of Occupations
SASP	South African Society of Physiotherapy
SASSETA	Safety and Security Education and Training Authority
SDF	Skill Development Fund
SET	science, engineering and technology
SETA	sector education and training authority
SHE&Q	safety, health, environment & quality
SIP	Strategic Integrated Project
SMME	small, medium and micro-enterprise
SOC	Standard Occupational Classification
SSP	Sector Skills Plan
StatsSA	Statistics South Africa
STEM	science, technology, engineering and mathematics
TIMSS	Trends in International Mathematics and Science Study
TIPS	Trade and Industrial Policy Strategies
UK	United Kingdom
WCPO	Western Cape Premier's Office

GLOSSARY OF KEY TERMS

Imbalances

Skill shortages

Arise 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, 2016:29).

Skill surpluses

Are characterised by a relatively high supply and low demand for a given skill. They can be identified by high unemployment (OECD, 2016:29).

Mismatches

Either refers to the inadequacy of a worker's skill relative to the requirements of the job he/she is currently in (e.g. having a lower qualification than generally required for the job, or being trained in a field of study other than the one generally required for the job), or to the opposite phenomenon whereby a worker's skills exceed those required by the job (e.g. having a higher level of qualification than required for the job). A mismatch can be measured relative to qualification, field of study or skills (OECD, 2016:29).

Job

A set of tasks and duties carried out or meant to be carried out, by one person for a particular employer, including self-employment (DHET 2015:6).

Occupation

A set of jobs whose main tasks and duties are characterised by a high degree of similarity (skill specialisation). The occupations identified in the Organising Framework of Occupations (OFO) therefore represent a category that could encompass a number of jobs or specialisations, e.g. the occupation "General Accountant" would also cover the specialisation "Debt Manager" (DHET 2015:6).

Occupations in High Demand

Occupations in High Demand refer to those occupations that show relatively strong employment growth, or are experiencing shortages in the labour market. More specifically, occupations are said to be in high demand if they:

- have shown relatively strong employment growth over the past 5 years;
- are currently showing relatively strong employment growth (that is, relatively strong growth over the two years);
- are expected to show relatively strong employment growth in the future;

- have been identified as being in shortage in the labour market; or
- are new and expected to emerge in the near future as a result of innovation, technological advancements and the development of new industries (for example, the establishment of new occupations in "green" industries) (DHET, 2016).

Organising Framework of Occupations (OFO)

Is a coded occupational classification system. It is the Department of Higher Education and Training's key tool for identifying, reporting and monitoring skills demand and supply in the South African labour market.

The OFO is constructed from the bottom-up by:

- analysing jobs and identifying similarities in terms of a tasks and skills;
- categorising similar jobs into occupations; and
- classifying these occupations into occupational groups at increasing levels of generality (DHET, 2015).

Skill

The ability to carry out the tasks and duties of a given job. Two dimensions of skill are used to arrange occupations into groups. These are skill level and skill specialisation (DHET 2015:6).

Skill level

A function of the complexity and range of tasks and duties to be performed in an occupation. Skill level is measured operationally by considering one or more of:

- the nature of the work performed (i.e. the complexity and range of work) in an occupation in relation to the characteristic tasks and duties defined;
- the level of formal education defined in terms of the International Standard Classification of Education (ISCED-97) 2 required for competent performance of tasks and duties involved, and
- the amount of informal on-the-job training and /or previous experience in a related occupation required for competent performance of these tasks and duties (DHET, 2015:6).

Skill specialisation

Is considered in terms of four conceptual concepts:

- the field of knowledge required;
- the tools and machinery used;
- the materials worked on or with; and
- the kinds of goods and services produced (DHET, 2015:7).
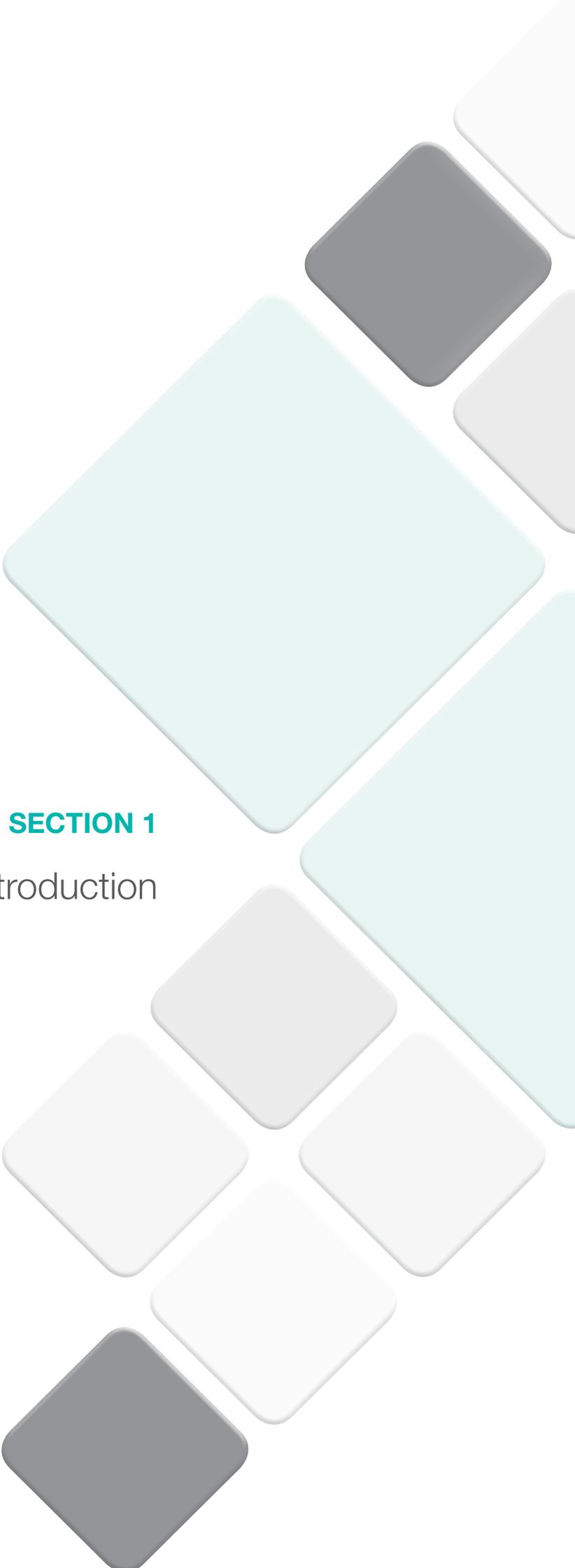
SECTION 1

Introduction

SECTION 1

INTRODUCTION

The purpose of this technical report is to present the background, the theoretical debates, the methodologies and the processes leading to the development of the 2018 list of Occupations in High Demand (OIHD) for South Africa. Numerous reports have cited the challenges of skills shortages in the country as bottlenecks in both the production of goods and the provisioning of services within both the public and private sectors. For the government, and, more specifically, the Post-School Education and Training (PSET) System, to respond effectively to the skills needs of the country, it is thus important, firstly, to understand the nature and extent of skills needs, and, secondly, to adopt specific interventions that will respond to the skills challenges facing the country.

The government of South Africa has embarked on a programme to establish a Credible Institutional Mechanism for Skills Planning*, as reflected in its Medium Term Strategic Framework (DHET, 2017). As part of the skills planning mechanism, government, and the PSET System, needs to identify, inter alia, which occupations are currently in demand, and which occupations will be needed in the future, particularly to support the implementation of government's strategic plans.

The Department of Higher Education and Training (DHET) has used a range of modalities to estimate the skills needed to inform the skills development and supply responses. Amongst these, two key instruments are: (1) the Annual Report on Skills Supply and Demand in South Africa, which provides insights into national and sectoral economic trends, as well as skills supply, skills demand and skills supply–skills demand mismatches in the country, and (2) the list of OIHD.

The DHET has already gazetted two lists of OIHD, in 2014 and 2016, respectively (DHET, 2014; DHET, 2016).Thus, building on this past work, the current report presents the 2018 list of OIHD in South Africa. The DHET acknowledges the importance of continuously reviewing and refining the methods and processes used in compiling the lists, considering not only the dynamism of supply and demand, but also availability of improved data sources.

In this specific round of identifying shortages of occupations for 2018, the focus was more on presenting the debates and strengthening methods using the most up-to-date and robust statistical and qualitative approaches to measuring the demand for occupations.

Countries carry out national skill assessments and anticipation studies using different methods and tools to inform various policy needs (OECD, 2016). Such exercises are mainly used to inform: (1) education policies, including updating occupational standards, designing and revisiting training programmes, and career advisory purposes; and (2) migration policies (e.g. those of the United Kingdom's (UK) Migration Advisory Committee). In the South African context, the *primary purpose* of the OIHD lists is to support the planning processes of the DHET with respect to PSET, particularly in relation to enrolment planning, resource allocation, career advice and qualifications development (DHET, 2017). The list is thus a useful resource for education and training institutions (universities, colleges, community colleges, education and training providers, employer and professional bodies, trade unions, and other related organisations) to inform their decision-making processes (DHET, 2015).

Other specific uses of the list include informing decisions regarding the allocation of funds from the fiscus, the discretionary fund managed by sector education and training authorities (SETAs), funds dispensed by the National Skills Fund (NSF), and funds used for skills development by other government departments and other funding agencies, the identification of special interventions needed to meet the skills required for national strategic priorities (such as those proposed by the Strategic Integrated Projects (SIPs), which are currently being piloted in the Centres of Specialisation Project), and the allocation of work visas by the Department of Home Affairs (DHA), which issues visas to those with critical skills. Clearly, the list is intended for wide use by a variety of stakeholders. For the purposes of this report, it should be noted from the outset that the focus on conceptualising and constructing the 2018 list was primarily on the objective of informing education and training system responses/interventions. Using the list for other purposes may require the user to adapt or refine it further, as necessary.

The report is structured as follows:

Section 2: provides the conceptualisation of OIHD in the South African context, reviews the empirical literature on occupational shortages or occupations in demand globally and in South Africa, and reflects on government growth plans/priority initiatives;

Section 3: reviews international approaches to measuring occupation demand;

Section 4: describes the methodology used to generate the 2018 list of OIHD;

Section 5: presents statistical results from the quantitative research undertaken for the project;

Section 6: considers stakeholder inputs collected through a call for evidence and through interviews;

Section 7: presents the final integrated list (integrated list of OIHD at Digit Levels 4 and 6); and

Section 8: contains the conclusion and recommendations.

This technical report details all the steps followed in arriving at the list. It should be read in conjunction with the final OIHD 2018 list gazetted by the DHET.

Conceptualising
occupations in high demand/
literature review
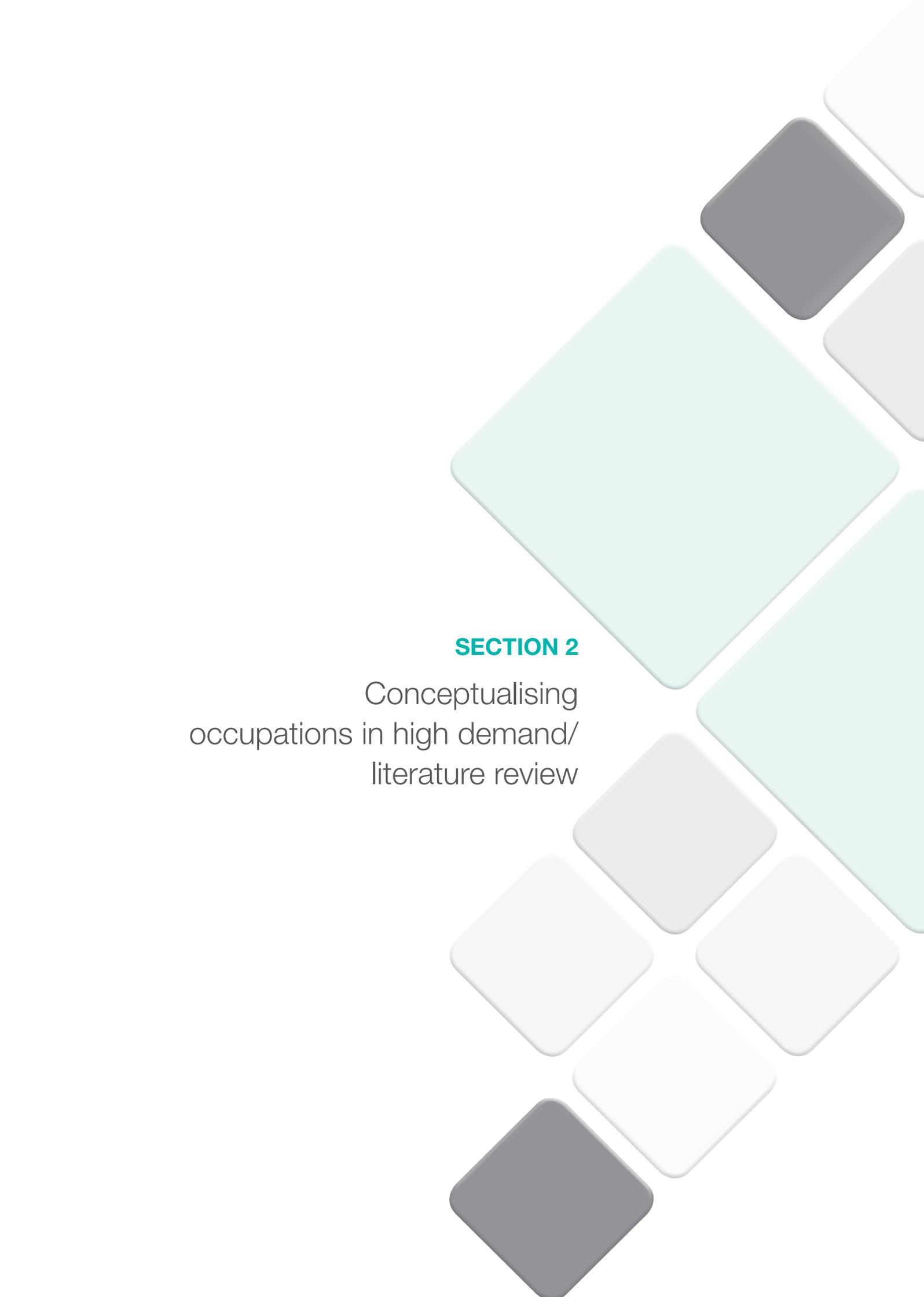
SECTION 2

CONCEPTUALISING OCCUPATIONS IN HIGH DEMAND/LITERATURE REVIEW

In this report, the term 'Occupations in High Demand' (OIHD) refers to occupations that show relatively strong employment growth or are experiencing shortages in the labour market. The 2016 *Gazette* of OIHD further states that occupations are said to be in high demand if they meet the following criteria:

- Have shown relatively strong employment growth in the recent past;
- Are expected to show relatively strong employment growth in the future;
- Have been identified as being in short supply in the labour market; or
- Are new and are expected to emerge in the near future as a result of innovation, technological advancements and the development of new industries (e.g. the establishment of new occupations in 'green' industries) (DHET, 2016b).

This definition captures the multidimensional nature of occupations in high demand and emphasises three key elements which need to be considered in order to identify such occupations, namely occupational growth (past and future), occupational shortages, and new or emerging occupations. The possibility of the three constituent elements occurring concurrently should be recognised. For instance, strong employment growth may (or may not) arise alongside shortages in an occupation.

Prior to the production of OIHD lists, and recognising the negative impact of skills shortages and mismatches in achieving growth targets, the government used several instruments to identify and measure existing skills needs. Notable examples included the

Department of Labour (DoL) list of scarce skills, which was intended to guide future investments in skills development.

More formalised attempts to investigate skills shortages included the country's first Human Resource Development Strategy (HRDS), the Accelerated and Shared Growth Initiative – South Africa (ASGISA) of 2007, and the Joint Initiative on Priority Skills Acquisition (JIPSA), which was established to identify the causes of scarce skills and remedy the situation. The first formal National Master Scarce Skills List for South Africa, produced by the DoL, comprised a list of skills that impact on economic growth and development.[1] The Department of Home Affairs (DHA) has also produced scarce-skills lists.

However, inasmuch as the lists provided signals about occupation demand, such lists only measured occupational shortages, which constitute a subset of OIHD according to the definition given above. OIHD are thus hard to quantify and most of the previous attempts to measure skills needs commonly reverted to capturing skills shortages. But this was also due to lack of a coherent understanding pertaining to concepts such as skills shortages, scarce skills, critical skills or skills gaps, all of which are related to the concept of OIHD within the skills development terrain. Conflating these in estimating the shortages in order to inform policy can lead to a wrong diagnosis, resulting in the design of inappropriate policy interventions. Some of these concepts are therefore briefly reviewed below.

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1   See www.skillsportal.co.za/download.../NSDS-Scarce_ Skills_List_2007.doc.

Related concepts include:

1. Scarce skills: occur when the demand for a specific occupation outstrips the supply of the occupation at a specified price (or wage) (see Powell, Paterson & Reddy, 2014).

2. Skills shortages: occur when employers are unable to fill vacancies, or experience considerable difficulties in filling vacancies, due to the demand for workers in certain occupations being greater than the supply of workers who are available and willing to work under existing work and employment conditions (Richardson, 2007; Shah & Burke, 2005). Powell et al. thus relate the notion of scarce skills as used in the South African literature to the phenomenon of *skills shortages* (see Barnow, Trutko & Piatak, 2013; Haskel & Martin, 1993; Healy, Mavomaras & Sloane, 2012). A distinction is drawn between skills shortages in the internal labour market – which relate to workers possessing fewer skills than those required by a firm – and skills shortages in the external labour market, which are related to recruitment difficulties (Marchante, Ortega & Pagán, 2006; Bosworth & Warren, 1992; Holt, Szymon & Sloan, 2010).

3. Skills gaps (or skills deficiency) (see Green, Machin & Wilkson, 1998): exist when employers hire workers who do not possess the required qualifications, skills or experience to perform tasks at a particular occupational level (Shah & Burke, 2005) or when existing employees are perceived to be underqualified or underskilled. This maybe be due to workers not being adequately trained or qualified to perform tasks or because they may not have upskilled to match the emerging skill requirements.

4. Recruitment difficulties: occur when employers are unable to fill vacancies despite the existence of a sufficient supply of appropriately qualified and skilled workers in the labour market (Marchante, Ortega & Pagán, 2006; Bosworth & Warren, 1992;

Holt, Szymon & Sloan, 2010). This may be due to various factors, including the characteristics of the industry, occupation and employer, such as low remuneration, poor working conditions, a poor image of the industry, unsatisfactory working hours, location (hard to commute to), inadequate recruitment or firm-specific and highly specialised skills needs (Richardson, 2007).

The definitions above highlight the importance of differentiating between a situation where there are no available individuals with the necessary skills or credentials and that where such individuals are available in the labour market but are not pursuing available employment opportunities.[2] Importantly, Rasool (2015:3) draws a distinction between OIHD and skills shortages. Whilst skills shortages occur when there is mismatch between the jobs available and those seeking them (which jobs/occupations are experiencing a shortage), OIHD refers to occupations that are experiencing strong growth, or are expected to do so in the future.

Adding to the complexity of anticipating occupations in short supply – because there is no single direct measure to signal shortages in specific occupations – the analysis relies on proxies for skills (e.g. years of education, educational qualifications, and the occupational levels of jobs), despite major discontent regarding these measures (OECD, 2016; Richardson, 2007; OECD, 2017). Lack of consensus on the most credible proxy has led to suggestions that using multiple composite indicators which takes into account a myriad of signals, is most preferred.

Different factors provide varied but complementary information for models that attempt to estimate scarce occupations (OECD, 2017; MAC, 2013). As we refine our methods and approaches, it is important to be clear about the contributions and limitations of these proxies in measuring skills and ultimately identifying which occupations are in demand.

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2   See Richardson, 2007.

2.1 Measuring skills, and the use of proxies

The two concepts 'skill' and 'occupation' are especially important in this project. These concepts have a very complex relationship and are intertwined, so it is often not easy to separate them in practice. For instance, occupations are sometimes used as proxy for skills, or vice versa, that is, skills needs are often 'approximated by measuring which occupations are, or will be, in greater or lesser demand' (OECD, 2016:36).

The next section discusses how these underlying concepts of occupations, skills and, to some extent, qualifications share a common foundation, partly accounting for the confusion and slippages in their use, with negative implications for the understanding and estimation of skills demand.

The latest edition of the Organising Framework for Occupations (OFO) (2015) defines skill as 'the ability to carry out the tasks and duties of a given job'. Skills levels and skills specialisations are then used to cluster occupations into groups (see Section 2.2). Occupations, on the other hand, are defined as 'a set of jobs whose main tasks and duties are characterised by a high degree of similarity (skill specialisation) and are typically presented in an occupational classification where they are grouped on the basis of similarity in terms of tasks, responsibilities, education and skill level' (see Beblavý, Akgüc, Fabo & Lenaerts, 2016).

In the recent literature, much controversy continues to surround the notion of what skills are and how they should be measured. The term 'skill' can refer to generic cognitive and non-cognitive abilities or to generic or transferable skills, as well as to vocational or technical skills that are specific to a particular job/sector (OECD, 2016; Frogner, 2002).

Some scholars have described skills as elusive and a moving target because of the vast impact of technological change on the nature and structure of skills (Grugulis, Vincent & Hebson, 2003; Esposto, 2008; Toner, 2002; Elias & McKnight, 2001). Adding to the challenge of defining and quantifying relevant skills in order to enhance productivity in the workplace is the notion of the knowledge economy, which further inflates the importance of generic and non-cognitive skills (OECD, 2016; Campbell, Baldwin, Johnson, Chapman, Upton & Walton, 2001; Keep & Payne, 2004; Grugulis et al., 2003). This is evidenced by more employers employers placing emphasis on behavioural attributes aspect of skills (Felstead, Gallie & Green, 2002; Hayes, 2012).

The heightened importance of generic skills (i.e. problem solving, communication and the use of information technology (IT) equipment), which are difficult to measure, ultimately poses a challenge to the education and training institutions charged with teaching these skills in workforces, 'because there is also very little common agreement as to their scope and relative importance' (Toner, 2011; OECD, 2017).

Several approaches have been used to assess skills, and these can be summarised in terms of the following six key methods. The adequacy of all these measures continues to be questioned in the literature, as will be shown below; hence Grugulis et al. (2003) caution that there are always trade-offs, as proxies are never perfect substitutes for the skills they are meant to measure.

The two widely used measures of skill are the qualifications that individuals have acquired and the occupational classifications of jobs that people do. Other means of measuring the stock of skills include the use of skills assessment and job skill requirement tests. Examples of these are the Trends in International Mathematics and Science Study (TIMSS) and the Organisation for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA), which measures mathematics and science abilities. However, these skill tests are used only to assess a few sets of skills largely related to academic abilities. Consequently, some labour market outcomes could be difficult to measure using these methods. Therefore, testing and assessments are well suited for measuring skills in the cognitive domain but are of limited use in

the assessment of other workplace skills (Allen & Van der Velden, 2005). Moreover, even though these permit an international comparison, the role of culture in test performance has been questioned (Allen & Van der Velden, 2005). Direct measures of *job skill requirements* focus more on the job rather than on the characteristics, abilities or competencies of a person who occupies it (see Autor, Levy & Murnane, 2000; Howell & Wolff, 1991; Felstead et al., 2008; Allen & Van der Velden, 2005). In this instance, different tasks are analysed in relation to specific requirements.

Skills have also been proxied by earnings. High-wage jobs are assumed to be high-skilled jobs (Felstead et al., 2002; Haskel & Slaughter, 1998; Esposto, 2008), that is, higher earnings will be reflective of investment in education and training and will be associated with higher levels of skills. Furthermore, another intervention by employers to deal with skill scarcity and recruitment difficulties might be to increase salaries to attract candidates or to retain existing staff. Earnings might then be expected to increase in times of skills shortages (Frogner, 2002). The main shortcoming of this

Table 1: Different approaches to measuring skills

Approach	Description
Qualifications/ educational attainment	Qualifications have loose links with job skills and, thereby, economic performance.
	Not all skills are utilised in the labour market due to mismatch.
	Education may be a signal of ability rather than a source of skills supply.
	Acquisition and depreciation of skills continue after education is completed. Learning at work is important for acquisition of new skills and for updating existing skills.
Education length	Variable quality of education – one year in country A is not the same as one year in country B.
	Many of the criticisms of the use of q ualifications in measuring skills can be similarly applied to the length of education (i.e. there is only a loose link between education and job skills).
Occupation	Easily available from Labour Force Surveys and/or censuses.
	Internationally comparable (sometimes).
	Occupational classifications have a better link with job skills, but, even so, the hierarchy of occupations in the Standard Occupational Classification (SOC), for example, is contestable, uncertain and changing.
	Over time, skills change within occupations.
Tests	Formal assessments of skills through tests can only ever measure a limited range of skills (literacy and numeracy are typical) and are comparatively rare because of the costs of administering such testing. There has been criticism of the international comparability of universal testing.
Self-assessment	Wide range of skills, subjective, and used very rarely.
	A major problem is that skill self-assessment is associated with self-esteem.
Job requirements	Wide range of skills intimately connected with job. Job requirement measures are increasingly being used. Obviously, job skills can differ from person skill (mismatch). Measures are subjective and will only measure skills of those in employment. Existing commercial job analysis data, as well as bespoke surveys, can be used. Of course, mismatch and underutilisation still pose problems, but they have permitted a much richer description of individuals' skills – including soft/generic skills – simply not captured by other measures.

Source: Dickerson, Wilson, Kik & Dhillon (2012). Also see Borghans, Green & Mayhew (2001) and Allen & Van der Velden (2005).

assumption is the extent to which change in earnings genuinely represents changes in the skill composition.

Skills needs are also commonly measured in terms of *educational attainment* or *qualification*s (OECD, 2016; Grugulis, Keep & Warhust, 2004). Education is acknowledged for providing access to the attainment of technical skills required in the workplace (see Howell & Wolff, 1991; Esposto, 2008). Limitations of this approach include the following: variation in the quality of education over time and within and across education and training institutions, across geographic regions, and by individual characteristics; employers using credentials for screening devices; and potential mismatches in the labour market, particularly in respect of education (Howell & Wolff, 1991; Toner, 2001; Hanushek & Woessmann, 2008; Hanushek & Kimko, 2000; Esposto, 2008; Allen & Van der Velden, 2005; OECD, 2017; Frogner, 2002). Simply put, educational institutions offer courses at different levels and content and thus different skills levels are achieved by graduates. Therefore, years of schooling may not be a very good indication of the skills level of an individual (see Berg, 1970). Furthermore, most credentials are more likely to be accumulated prior to employment; hence Allen and Van der Velden (2005) caution that credentials are not the same as skills.

In recent years, there has been increasing interest in *skills and qualification mismatches*. Mismatch can be horizontal (level of schooling is appropriate; type of schooling is not) or vertical (overqualified or underqualified) (Desjardins & Rubenson, 2011). However, there is evidence that educational and qualification mismatches do not imply skill imbalances (Grapsa, 2017), even though qualifications have been used as a proxy for skills. This is because these measures do not consider skills acquired beyond formal qualifications, such as on-the-job learning, as well as variations in the quality of education (Desjardins & Rubenson, 2011). Nonetheless, all forms of mismatches and misallocation of labour have negative consequences for individual workers and the economy (see OECD, 2017; Beblavý et al., 2016; Allen & Van der Velden, 2001; Mavromaras, 2010).

Another alternative approach used as a proxy for skills is occupational classifications. *Occupations* have been found to provide a more comprehensive summary of the skills utilised by an individual in a job, 'especially where the occupational classification is hierarchical so that higher occupational levels can be associated with higher levels of skills' (see Machin & Van Reenen, 1998). This approach is commonly used in countries with well-developed occupational classification frameworks where there are clear descriptions of what skills are required in each occupation. The major advantage of this measure is thus that relevant national-level data is easily available through labour force surveys or census data.

The question posed in the literature (see Tijdens, 2014 & 2015; Green et al., 1998; Borghans et al., 2001) is to what extent similar job titles relate to the same work activities, and whether skill profiles in different jobs are the same. The main challenge with this measure is thus that skill can vary significantly between jobs that are part of the same occupation and that changes at the task level within occupations are not captured.

Occupational classifications are defined by the International Labour Organization (ILO) as 'a tool for organizing all jobs in an establishment, an industry, or a country into clearly defined set of groups according to the tasks and duties undertaken in the jobs'.[3] The commonly used classification of occupations is the International Standard Classification of Occupations (ISCO) which maps national classifications into internationally comparable clusters that allow for international comparison. Globalisation of the labour market has increased the need for internationally comparable data. For this reason, the ISCO framework facilitates international communication about occupations and allows for internationally comparable data that is useful to inform policy decisions regarding international migration and job placement (ILO, 2012).

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3   http://www.ilo.org/public/english/bureau/stat/isco/

Table 2: International and national occupational classification systems

Levels	International and national occupational classification systems							
	ISCO 2008	Germany KldB 2010	Poland KZis 2010	Italy 2006	CZ 2010	USA SOC 2010	SASCO	OFO
1 level	10	10	10	9	10	23	9	8
2 level	43	37	43	37	43	97	30	39
3 level	130	144	132	121	130	461	153	125
4 level	436	700	444	519	434	840	448	440
5 & 6 levels		1 286	2 360	811	1 362	1 110		1 448

Source: Adapted from Koucky, 2012; StatsSA, 2003; DHET, 2015.

Table 2 shows some examples of other national classifications with the number of groups of occupations and occupational units at different levels of the classification system.

2.2 The South African Organising Framework for Occupations (OFO)

The OFO is a skill-based, coded classification system of occupations which is used by the Department of Higher Education and Training (DHET) for 'identifying, reporting and monitoring skills demand and supply' in the labour market (DHET, 2015:4). It captures almost all occupations in the country and classifies them by skill level and skill specialisation. This information tool in respect of occupations is used by the DHET for skills planning purposes. The OFO is based on the Australian and New Zealand Standard Classification of Occupations (ANZSCO), which was adapted from the ILO's International Standard Classification of Occupations (ISCO 88). Although Statistics South Africa (StatsSA) adapted the ISCO framework to construct the South African Standard Classification of Occupations (SASCO), which it still uses to classify data on occupations for the national studies, this classification was rather limited and lacked some detailed information useful for skills planning; hence the OFO was developed. Sector education and training authorities (SETAs) and employers also use the OFO to collate information for workplace skills plans and sector skills plans.

The OFO is defined by occupational groups, National Qualifications Framework (NQF) levels and skills levels (see Figure 1).

Figure 1: OFO major groups and skill levels

NSDS	NQF-level	Skill level	OFS-major groups			
High	10 ↑ 7	4	2 Professionals			1 Managers
Intermediate	6	3	3 Technicians and associate Professionals			
	5	2	4 Clerical Support workers	5 Service and Sales workers	6 Skilled agricultural, forestry, fishery, craft and related trade workers	7 Plant & machine operator and assemblers
	4					
Entry	3					
	2	1	8 Elementary occupations			
	1					

Source: DHET, 2015.

The OFO is thus aligned to the ISCO, and, as can be seen in Figure 2, occupations are grouped into major (one-digit), sub-major (two-digit), minor (three-digit), and unit (four-digit) groupings. The major groups are largely based on four skill levels[4] which are related to education and training levels of the NQF (DHET, 2015).

Figure 2: OFO 2015 structure

Level 1
8 major groups

Level 2
39 sub major-groups of 8 major groups

Level 3
125 minor groups of 39 sub-major groups

Level 4
44 unit groups of 125 minor groups

Level 5 & 6
1 448 occupations cross 440 unit groups
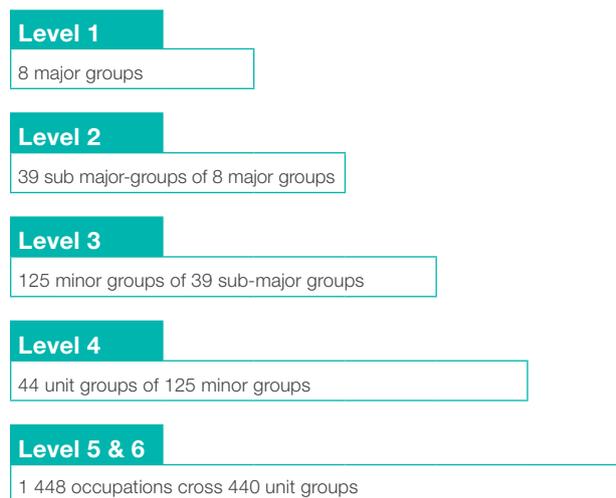
Source: DHET, 2015

2.3 Review of the empirical literature

Having discussed common approaches to, and measures of, skill, this section reflects on some key findings from local and international studies on occupational shortages at a global level, and specifically in South Africa.

South Africa already has a number of systems in place to estimate skills needs, and several national, sectoral and occupational studies having been undertaken in the recent past. In addition to more institutionalised exercises such as the DHET's 2014 and 2016 lists of occupations in demand, and the SETAs' scarce and pivotal skills lists, the output from a macro-education forecasting tool has been used to predict which occupations will be in a growth phase in the

future. Driven by different objectives, these studies adopt varied methodologies to measure current and future occupational imbalances.

2.3.1 Getting Skills Right: South Africa (OECD: 2017)

The recent OECD report, Getting Skills Right: South Africa (2017), is one in a series of country studies aimed at identifying skills imbalances. The study found significant imbalances between supply and demand where cognitive skills are in short supply while manual and physical skills are in surplus. This report also makes reference to the OECD's Skills for Jobs Database (published in 2017) and provides information on occupations and skills shortages or surpluses in Europe and South Africa. The skills need indicators are created using information on employment, unemployment, hours worked, hourly wages, and underqualification. Surpluses are mainly found in skills related to manual tasks, like those requiring physical strength, manufacturing and production knowledge, and technical skills. Shortages, on the other hand, are related to cognitive skills such as complex problem solving and to higher-skilled knowledge fields like education and health care. It is argued that this distribution indicates that the country has an oversupply of low-skilled workers and an undersupply of highly skilled workers. The report found the biggest skills shortages to be in management, health and teaching (OECD, 2017).

2.3.2 Getting Skills Right: Skills for Jobs Indicators (OECD: 2017)

In an OECD investigation of skills shortages and mismatches that focused on some European countries and South Africa, South Africa had the largest share of mismatched workers[5] (52%). This percentage was only 16% for the Czech Republic. In South Africa, 28% of workers were found to be underqualified. A further 24% were found to

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4   That is, where skills are associated with an occupation and are measured through formal education or training, work experience, and amount of training required to competently execute the task within the occupation – see http://awsassets.wwf.org.za/downloads/module_iii___a_guide_to_using_the_organising_framework_for_occupations.pdf.

5   This is generated by computing the mode (the most common) educational attainment level for each occupation in the country and point in time. This is then used as a benchmark to measure whether a worker's qualification matches the 'normal' education requirements of the occupation (OECD, 2016:44).

be overqualified. Additionally, the field of study mismatch was also pronounced, with about 33% having graduated from a field of study unrelated to where they were employed. The field-of-study mismatch was lower for Europe at 31%. The finding concerning high field-of-study mismatch is in line with the findings of Reddy, Bhorat, Powell, Visser and Arends (2016) registering a significant mismatch between type of qualification and sector of employment, especially amongst graduates with an engineering-related qualification. Furthermore, Grapsa (2017) also conducted an in-depth analysis of skills and qualification mismatches in South Africa. Consistent with the results above, the study found that the incidence of educational mismatch was high in South Africa, with half of the workers being mismatched. About 27% were found to be undereducated. whilst 27% were overeducated (also see Beukes, Fransman & Murozvi, 2016).

2.3.3 Global Talent Shortage Survey (ManpowerGroup: 2017)

This study is conducted annually by the ManpowerGroup. For the 2017 report, a total of 42 000 employers from 43 countries were surveyed for the Annual Talent Shortage Survey. About 40% of employers reported challenges in filling positions. When asked about the strategies they were employing to deal with shortages, more than half indicated plans to upskill existing staff.

In South Africa, this survey is conducted annually using a sample of about 750 businesses across the different sectors. The most recent survey showed that about 34% of employers were experiencing challenges in filling positions, with skilled-trade vacancies reportedly the hardest to fill. Difficulties were reported in the areas indicated in Table 3.

Table 3: Top ten jobs which employers are having difficulty in filling

Globally	In South Africa
Skilled Trades (including electricians, carpenters, welders, bricklayers, plasterers, plumbers, masons, and more)	Skilled Trades (including electricians, carpenters, welders, bricklayers, plasterers, plumbers, masons, and more)
IT Staff (developers, programmers, database administrators, and IT leaders and managers)	Management/Executive (senior- and board- level managers)
Sales Representatives (sales executives, sales advisors and retail salespeople)	Office Support Staff (secretaries, personal assistants, receptionists, and administrative assistants)
Engineers (managers, electrical and civil engineers)	Engineers (managers, electrical and civil engineers)
Technicians (production, operations or maintenance technicians)	Accounting & Finance Staff (bookkeepers, certified accountants and financial analysts)
Drivers (truck, lorry, heavy goods, delivery, heavy equipment, and construction)	Sales Representatives (sales executives, sales advisors and retail salespeople)
Accounting & Finance Staff	Technicians (production, operations or maintenance technicians)
Management/Executive (management/corporate)	Drivers (truck, lorry, heavy goods, delivery, heavy equipment, and construction)
Production Operators	Teachers
Secretaries, Personal Assistants, Receptionists, Administrative Assistants & Office Support Staff	IT Staff (developers, programmers, database administrators, and IT leaders and managers)

Source: http://www.manpowergroup.com/talent-shortage-explorer/#.WiEYW49OLIV.

Notably, teachers are reportedly in demand in the South African context but do not feature in the global list. When asked about reasons for experiencing difficulties, South African employers cited lack of experience (27%), lack of hard skills (26%), job seekers looking for more pay (14%), lack of available applicants (9%), or specific issues related to the organisation (8%). When asked what strategies they were adopting to address the skills shortage, 86% indicated training and developing existing employees to fill vacant positions. About 60% of employers had plans to recruit outside their organisations, and 44% said they were prepared to pay premium salaries to attract applicants (ManpowerGroup Report: 2017).

2.3.4 Skills Supply and Demand in South Africa: A 10-Year Forecast 2016–2025 (Adelzadeh: 2016)

This forecasting model provides employment projections for about 45 occupations and sectors and allows for assessing future imbalances by educational qualification. It combines a macro-economic model of South Africa with models of supply and demand in respect of occupations and educational qualifications (Adelzadeh, 2016b). The Linked Macro-Education Model for South Africa forecasts the occupational demand in order to capture the occupational composition of the new job opportunities and provide a projection of the total number of job openings in the economy by occupation (2016–2025) using three growth scenarios for the economy. Some of the evidence shows that, across the three scenarios (see Adelzadeh, 2016b, for information on scenario descriptions), the top three occupations with the highest growth over the next years are projected to be Craft and Related Trades Workers, followed by Plant and Machine Operators and Managers. With respect to occupations in high demand, under the low scenario, for the two occupations, Crafts and Related Trades Workers and Plant and Machine Operators, economic expansion is expected to account for 27 to 34% of job openings in these occupations. For Managers, economic growth generates more than half (52%) of job openings in this category. However, under moderate and high-growth scenarios, for the three fastest-growing occupations, most of the pressure is as a result of the growth of the economy, that is, expansion in demand.

2.3.5 Skills Supply and Demand in South Africa (Reddy et al.: 2016)

This report was a product of the Labour Market Intelligence Partnership (LMIP) and was compiled by the Human Sciences Research Council (HSRC) and its consortium partners. The report analysed the current supply of, and demand for, skills in South Africa, and the interaction thereof. This involved an exploration of the state of the economy by studying the characteristics of the labour force, as well as current and intermediate demand. The signals of demand were then analysed against the supply of skills from the formal school system, post-secondary education, and training systems and the workplace. Mapping the interaction of supply and demand thus provided a basis for interpreting signals on the nature and extent of skills shortages and mismatches in South Africa. Data used was largely from StatsSA Labour Force Surveys (LFSs) and the Higher Education Management Information System (HEMIS). Of particular interest with regard to studies on occupational demand, the study identified occupations in demand by the extent of demand,[6] for example severe demand, not as severe demand and less severe demand. Occupations that were identified as severe included the following:

- Skilled Occupations:
  – Production and Service Managers;
  – Administrative and Commercial Managers;
  – Teachers (early childhood development and mathematics);
  – STEM (science, technology, engineering and mathematics) Associates and Professionals;
  – Business and Administrative Professionals and Associates; and
  – Food & Beverage Technicians.

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6   See Reddy et al. (2016) at www.lmip.org.za for further details.

- Semi-Skilled Occupations:
  – Building and Trade-Related Workers;
  – Metal, Machinery and Related Trades; and
  – Electric and Electronic Trades Workers.

2.3.6 Adcorp Employment Index (Adcorp: 2015)

In line with the above, and according to the Adcorp Employment Index of 2015, which utilises Quarterly Labour Force Survey (QLFS) data, the highly skilled categories experiencing severe skills shortages are Senior Management, the Professionals (medicine, engineering, accounting and law), Technical Occupations (specialised technicians and artisans), and Agriculture. Notably, the analysis identified an oversupply of elementary workers in the country.[7]

2.3.7 An Investigation into the Supply of, and Demand for, Teachers (Adendorff, Mathebula & Green: 2015)

This study is an example of more in-depth studies on identifying skills shortages and imbalances at the occupational level, but focusing on a specific occupation, namely teachers. The study (see Adendorff et al., 2015), which focused on the state of teacher supply and demand projected to 2020 (from 2012) in South Africa, aimed to identify teacher education and teacher supply and demand challenges. The teacher supply and demand model considered the demand variables (job openings) and supply variables (job holders and qualified jobseekers). The study found that:

- It was less likely that South Africans would experience an absolute shortage of teachers by 2020. However, a relative shortage of educators teaching some phases and subjects was expected, and these included: African Language Foundation Phase teachers, and Life Orientation, English, Mathematics, Literacy, Life Sciences and Geography teachers in the Further Education

and Training (FET) Phase. This was attributed to a significantly higher production of Senior Phase and FET Phase teachers compared with teacher production for the Foundation and the Intermediate Phase.

- Policy responses to reported shortages of the supply of Mathematics and Physical Science teachers had been effective, as these teachers were currently not in short supply. The supply of teachers qualified to teach Business Studies, Economics, Accounting, Engineering Graphics and Design, and Computer Applications Technology was also adequate, but there was an oversupply of Computer Applications Technology graduates.
- There was clear underproduction of new teacher graduates (NTGs) to teach Agricultural Sciences, Tourism, Consumer Studies and the African languages relative to replacement demand.
- Teachers in excess, and underqualified or inappropriately qualified teachers (teaching out of their field), continued to hide real local shortages and prevented NTGs from getting posts in some provinces. These represented some form of hidden demand and were difficult to quantify. Another projected relative shortage was due to teachers' reluctance to teach in rural schools.

2.3.8 Skills Shortages in South Africa: Case Studies of Key Professions (Erasmus & Breier: 2009)

Additional examples of sector and occupationally focused studies include the Erasmus and Breier (2009) collection of case studies which investigated challenges related to the supply of key professions in South Africa.

2.3.9 HRDCSA Report on the Production of Professionals (HRDCSA: 2012)

The report was prepared by the Technical Task Team of the Human Resource Development Council of South Africa (HRDCSA) with the aim of investigating challenges related to the supply of professionals in South Africa. The study compared

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7   See http://www.cbn.co.za/services/short-course-mba-skills-development-training/skills-shortage-far-worse-than-admitted.

the numbers of skilled professionals in relation to population size and other countries. The report was a product of secondary data analysis using previous research, as well as interviews with stakeholders such as professional bodies. The report identified eight key professions that needed to be grown in South Africa and the challenges associated with the production of these. Such challenges were found in the following broad categories: Engineering and Built Environment; Health (nurses, doctors and pharmacists); Education (teachers); Agriculture (veterinary science, and bio-resource engineers); Finance (accountants, accounting technicians, chartered accountants and actuaries); and the Social Sector (social workers).

Some of the key blockages in relation to supply included: poor career guidance; a limited pool of school leavers that met the requirements of certain qualifications; negative perceptions of certain occupations; a lack of opportunities for on-the-job training; as well as emigration (HRDCSA, 2012).

2.4 Priority sectors and government priority initiatives

As part of the literature review, we studied 23 major government development strategy documents produced at the national, provincial and municipal level in order to get a sense of current and future occupational needs as identified in the growth plans.[8] The objective of the policy scan was to generate a broad estimate of the skills demand implications of implementing these specialised development strategies, including programmes specifically designed as job-creating projects. Secondary objectives of the policy scan included the following:

- Providing an indication of current and future skills needs emanating from the strategies;
- Estimating demand according to the three broad skills categories: high-skill, medium-skill and low-skill occupations;Where strategy documents estimated the expected size

8   This was a follow-up study to the 2016 HSRC Working Paper, *Estimating the current and future skills demand of government's national growth and development policies.*

Table 4: Key findings of Erasmus and Breier (2009)

Occupation	Key results
Social Worker	- While there was an absolute scarcity of social workers, the reasons for this were varied and included the refocusing of welfare services on previously disadvantaged groups as well as on the impact of HIV/Aids. - Absolute scarcity intersected with relative scarcity, with qualified social workers moving to Gauteng and the Western Cape.
Educator	- There was an absolute shortage in the supply of educators.
Lawyer	- There was no absolute scarcity of law professionals, but African attorneys and advocates were relatively scarce. - Relative scarcity was also evident in rural areas.
Engineer and Engineering Technician	- The evidence was not clear as to whether there was a decline in the supply, or a lack of supply, of engineering professionals. - There was an oversupply of engineering technicians in mining and metallurgy, and an oversupply of electricians, and chemical and industrial engineers.
Doctor and Nurse	- There were clear, absolute shortages of doctors, but the evidence was not clear whether there were absolute shortages of nurses. - The shortage was due to unfavourable working conditions. - The shortage would continue to exist due to possibilities of emigration (also see OECD, 2016).

of skills demand that would be created, analysing the implications of the strategy for skills development;Where strategy documents estimated the expected size of skills demand that would be created, examining the methodology used to generate these estimations; andSuggesting a methodology for calculating skills demand that might be applied to new government programmes or policies as they occur.

The review identified the green economy-related skills as being in greater demand, particularly with regard to the national Department of Environmental Affairs' green economy initiatives such as the Green Economy Inventory and the Green Fund. Furthermore, there were references to skills in construction (such as plumbing and water management) and engineering, possibly to support infrastructure development plans. Although the magnitude of the demand has not been quantified, tourism-related skills will be critical for the Western Cape national and municipal plans. A need for skills in agriculture, agroprocessing, and information and communications technology (ICT) was outlined across a number of growth policies at national and provincial level. Other more sector-specific skills which will be in greater demand in order to support the growth plans included aquaculture, astronomy and medical-related skills. Important to mention is the observation that, in contrast to the national and provincial plans, growth plans at the municipal level were likely to specify occupation needs requirements or estimate the skills demand. Similarly, it is evident that occupational needs relating to construction were articulated in detail and provided an estimate of the anticipated skills demand. The pattern of current and future occupational needs emerging from this

exploratory analysis (see Table 5) suggests specific areas where skills development initiatives should be focused.

In general, arriving at a precise estimation of current and future skills needs at the national level based on the analysis of the growth plans, proved to be challenging. Very few of the strategies from the analysis provided skill assessments to match their needs. Where some indication of skills requirements was provided, skills gaps were largely recorded for low-skill occupations, like those demanded in the productive industries, and for high-skill applications, like those demanded by science, engineering and technology (SET) industries or within the knowledge-based economy.

In addition to a lack of skills indicators, the analysis revealed a disconnect between job creation goals, available skills, and government efforts to address skills shortages. This disconnect was more pronounced in the specialised development interventions requiring specialised skills. For instance, the eThekwini Medium-Term Revenue and Expenditure Framework described the creation of a seven billion rand film precinct, but there was no mention of the anticipated skills demand or the current availability of relevant skills within the municipality. This may have far reaching implications for the actual implementation of these specialised projects in the future, as they largely require high-level skills that may be difficult to source locally and might require longer periods to develop.

In evaluating the skills assessment methodologies of the strategies, none of the documents contained any methodological guidelines demonstrating how their estimates might have been arrived at.

Table 5: An analysis of the current and future occupational needs of government's new growth initiatives

Policy document	Type of skills required	Skills category	Skills requirements
Cape Winelands District Integrated Development Plan Review	Tourism-related	Low, Medium	Unspecified
City of Johannesburg Integrated Development Plan Review	Unspecified	Unspecified	Unspecified
Cooperative Governance and Traditional Affairs Integrated Urban Development Framework	Unspecified	Unspecified	Unspecified
Department of Agriculture, Forestry and Fisheries Strategic Plan	Aquaculture	Unspecified	15 000 direct jobs in aquaculture
Department of Environmental Affairs Green Economy Inventory for South Africa	Green economy-related	Unspecified	Unspecified
Department of Environmental Affairs South Africa's Green Fund	Renewable energy and green technologies	High	Unspecified
Department of Health Service Delivery Improvement Plan	Management, medical	Unspecified	Unspecified
Department of Science and Technology National Research Foundation Strategy 2020	Astronomy, research	High	Unspecified
Department of Transport Green Transport Strategy	Unspecified	Low	Unspecified
Department of Telecommunications and Postal Services Information and Communication Technology Small and Medium Enterprises Support Strategy	Information communications technology	Low, Medium, High	Unspecified
Department of Telecommunications and Postal Services National e-Strategy	Information communications technology	Unspecified	Unspecified
Department of Telecommunications and Postal Services National Integrated Information and Communication Technology Policy	Information communications technology	Unspecified	Unspecified
Economic Development Department Revised Strategic Plan	Unspecified	Unspecified	Unspecified

Policy document	Type of skills required	Skills category	Skills requirements
eThekwini Medium-Term Revenue and Expenditure Framework	Construction, plumbing, water management, engineering	Low, Medium, High	Unspecified
Gauteng Township Economy Revitalisation Strategy	Entrepreneurship	Low, Medium	500 000 SMME jobs to be created
Operation Phakisa Key Messages	Agriculture	Unspecified	1 million new agricultural jobs by 2030
Port St Johns Municipality Nodal Development Strategy	Tourism	Low	Unspecified
Ratlou Local Municipality Integrated Development Plan	Construction	Low	1 100 new jobs in construction and the EPWP
Rustenburg Local Municipality Integrated Development Plan Review 2016–2017	EPWP, agriculture, agroprocessing	Low	Unspecified in the EPWP; 3 570 direct jobs and 1 815 indirect jobs in the agriculture and agroprocessing industries
Rustenburg Local Municipality Integrated Development Plan 2017–2020	Manufacturing, service	Unspecified	130 000 jobs in manufacturing and 170 000 service-related jobs
Sport and Recreation South Africa Annual Performance Plan 2016/2017	Sports science, sports management, sports education	Medium	Unspecified
Sport and Recreation South Africa Annual Performance Plan 2017/2018	Unspecified	Unspecified	Unspecified
Western Cape Medium-Term Budget Policy Statement	Tourism, agroprocessing	Low, Medium	Unspecified

2.4.1 Concluding comments

The discussion of the literature reflected on the complex relationship between the concepts of skill and occupation. It is evident that the distinction between the two is not always clear, but that they cannot be discussed in isolation from each other, as they are intimately linked. The review revealed many challenges regarding the measurement of skills and showed that indirect measures or proxies are often utilised, of which occupation (categories) is one. Other proxies include educational qualification, education length, self-assessments or assessment tests. All these

methods have their strengths and shortcomings. However, they supplement one another and, in most countries, are used in combination in order to provide various signals of shortages.

Looking more closely at the global and local evidence regarding occupational shortages, we outlined different studies aimed at measuring skills imbalances currently and in the future. These had varied study objectives and relied on various data sources, but there were a few common, key threads running across the study findings. Firstly, the OECD study recorded the highest levels of qualification mismatch and study mismatch

amongst South Africans, with over 30% of employees working in a field of study unrelated to that in which they had studied.

Secondly, there was an oversupply of low-skilled workers and an undersupply of highly skilled workers, with the shortage being particularly evident in the management, health and teaching fields. This finding was echoed by the analysis flowing from the Adcorp Employment Index (2015), which recorded an oversupply of elementary workers in the country. The shortage of teachers in the country was also captured in the 2017 Manpower Global Talent Shortage Report. Notably, teaching was the only occupation that was uniquely in shortage in South Africa, for it did not feature in the global list of occupations that were difficult to fill. However, Adendorff et al. (2015) projected that teachers would not be in shortage in the near future but also noted relative shortages across certain phases and subjects.

Thirdly, the analysis of the current and future occupational needs of the government's new growth initiatives found that the green economy-related skills would be in greater demand in order to support green economy initiatives across various government departments. Additionally, the analysis anticipated that skills related to construction, agriculture and ICT would also be required to implement these development plans.

To sum up, this section approached the review of the literature from three vantage points. Firstly, it was important to conceptually delineate and clarify the key and related concepts so that the reader can differentiate between the focus of this report and possibly that of another. This report defines OIHD as comprising occupations that show relatively strong employment growth or are experiencing shortages in the labour market. We also decided to adopt this particular definition because it captures the multidimensional nature of occupations in demand and emphasises three key dimensions which need to be considered in order to identify OIHD, occupational growth (past and future), occupational shortages, and new or emerging occupations. More importantly, this definition indicates that occupational shortages are a subset of OIHD. Secondly, the review focused on outlining the proxies used to measure skills so as to support our selection of specific proxies in line with our project objectives and the availability of data. Lastly, we reviewed studies on occupational shortages in order to have an empirical base from which to interrogate the findings of this project. In the next section, we thus build on the insights established through the discussion in this section so as to inform the conceptualisation of our methodology and design. The next section now provides an overview of the key approaches, internationally, to measuring these occupational shortages and considers which lessons might be relevant to the South African 2018 OIHD list.

SECTION 3

Review of
international approaches

SECTION 3
REVIEW OF INTERNATIONAL APPROACHES

While there are number of approaches,[9] internationally, to identifying, measuring and interpreting skills and occupational needs, three stand out in the recent literature. These include the shortage occupation lists produced by the United Kingdom's (UK) Migration Advisory Committee (MAC), the Organisation for Economic Co-operation and Development's (OECD) Skills for Jobs Indicators, and the Australian National Institute of Labour Studies' (NILS) system for monitoring shortages and surpluses in the market for skills. Of these three approaches, the MAC and OECD approaches have a particular focus on developing a *multidimensional index* of skills and/or occupational shortage, that is, combining relevant indicators into a single framework (NILS, 2013).[10] Naturally, there are conceptual and methodological overlaps as well as key differences between these two approaches, but, together, they offer the most up-to-date, transparent and robust approach to the measurement of occupational demand and imbalance in the labour market.[11] Accordingly, the design of the 2018 Occupations in High Demand (OIHD) methodology is based on some of the lessons learnt from these two approaches. Before describing the key features of, and rationale behind, the 2018 South African OIHD methodology, the OECD and MAC methodologies will be reviewed.

3.1   OECD methodology

Perhaps the key similarity between the objectives of the OECD skills indicator project and the South African 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, 2016:3). In other words, while the approaches are somewhat different and the key concepts being measured (skills vs 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 (see Table 6) for hourly wage growth, employment growth, the unemployment rate, hours worked, and underqualification are combined to measure 'labour market pressure' at the occupational level[12] (OECD, 2017:30). 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 indicators to reflect the greater ambiguity of employment growth as a signal of occupational shortage (OECD, 2017).

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9   For a concise overview of the lessons learnt from the literature, see NILS (2013:31–32).

10 The NILS approach is conceptually and methodologically appealing in a number of ways but is based on a qualitative approach which is best developed over a longer period of time and updated continually.

11 But see, also, the Hays Global Skills Index (http://www.hays-index.com/the-index/introduction/) which is constructed from seven indicators measuring: education flexibility, labour market participation, labour market flexibility, talent mismatch, overall wage pressure, wage pressure in high-skill industries, and wage pressure in high-skill occupations.

12 For the South African indicators, only data from the Quarterly Labour Force Surveys (QLFSs) were used. Indicators for other (OECD) countries were derived from Labour Force Surveys (LFSs) and Employer Surveys.

One important innovation of the OECD methodology is the consideration of larger macroeconomic effects which 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 is 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, 2016:8). 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.[13]The second step in the OECD approach is less relevant to the design of the South African 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 OIHD (both the 2014/2016 methodologies as well as the current 2018 OIHD), since it is concerned with identifying occupations for which there is evidence of strong demand or shortage.

- 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, 2016:25).
- Therefore, over and above the methodological and conceptual appeal of a composite index, the aggregation and decomposition of indicators of demand can contribute meaningfully to *policy debates*.

- In terms of the identification of occupations which 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: 35). This is a particular concern with the South African data given the relatively small sample sizes of the QLFSs 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, etc.) may be sending signals which are more strongly related to cyclical changes in the economy or broader macro-changes which are unrelated to sustained demand for a particular occupation.

3.2 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[14] of this list are quite distinct from those of the South African OIHD list, there are some important methodological lessons to be learnt 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, 2013:36). In terms of the methodology itself, the MAC framework for identifying occupational shortages has been described as a 'hybrid approach' which 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

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13 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 macroeconomic trends.

14 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 in respect of which there is a shortage in the UK and in respect of which immigration is a more desirable solution than longer-term education and training initiatives.

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 OIHD, since it consists of the transparent, robust and regularly reviewed construction of a composite indicator of occupational shortage. The MAC's key indicators (see Table 6) for the top-down approach include (2008:13): 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[15]); and other indicators of imbalance based on administrative data (e.g. vacancies or vacancy/unemployment ratios). There is, therefore, a clear overlap with the indicators used in the OECD methodology, even though the purposes of these two approaches differ considerably.[16] 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 (2008:105) methodology is quite clear that the choice of indicators is based on the 'concept of shortage as an imbalance or mismatch between demand and supply'. The MAC's (2008:250) 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 which suggested the following additional considerations in selecting and measuring indicators (MAC 2010:43):

- More attention should be paid to the distribution of observations when assigning indicator thresholds. There are a number of reasons why the median might be more appropriate than the mean, particularly in the case of 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, for example are not advertised through Jobcentre Plus in the UK.

The MAC methodology therefore introduces a useful discussion on both the conceptual (see, also, Campbell, 2016; Keating, 2008) and practical elements of identifying and measuring (sub-)indicators of labour market demand and shortage which 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% 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. those in 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 per cent or more of the

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15 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. because of high levels of long-term or chronic unemployment).

16 This is an important point to debate in constructing the 2018 OIHD List 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.

indicators' for which there is data[17] (MAC, 2008:132). In the first version of the MAC list in 2008, there were 20 occupations out of a 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% 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 Organising Framework for Occupations (OFO) in the statistical data sets (MAC, 2013:31). Such a situation introduces an obvious tension into the methodology which can often only be resolved through a 'judgement call'. Another 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).

17 The percentage of indicators is used instead of the number of indicators because some occupations do not have complete data for all 12 indicators.

Table 6: 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 NQF3, and 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 for less than one year
		Administrative data-based	Absolute change in median vacancy duration
			Stock of vacancies/claimant count by sought occupation

Sources: OECD (2017:31) and MAC (2008:116).

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% of indicators introduces a 'knife-edge' outcome to the index.
- More thinking around the *application of weights* is also needed.
- The estimation of *conditional wage pressure should be re-evaluated* to take into consideration a wider range of covariates.

3.3 The 2016 South African OIHD list

The 2014 and 2016 OIHD lists (see Rasool, 2014; Rasool, 2015) represented an important start to the process of identifying OIHD in South Africa and aligning the methodology underpinning this process with international approaches. Both these lists included indicators of:

- Employment growth;
- Vacancy growth;
- Government strategic priorities;

- Scarce-skills lists from Sector Skills Plans (SSPs) (2014); and
- Strategic Integrated Projects (SIPs) occupations (2014).

Moreover, the 2016 OIHD list added indicators to capture qualitative evidence obtained from stakeholders and occupational forecast data (for 2015 to 2025).

However, the various indicators and signals of occupational demand were not combined or aggregated into a single, composite indicator, and the weighting of each indicator was not explicitly addressed. It is, therefore, not possible to identify the demand for occupations relative to one another or to identify which indicators explain why occupations are in high demand (i.e. whether the occupations on the list were determined largely by employment growth, government priorities, occupational shortages, stakeholder input or forecasted needs). There are also some gaps in terms of the data and indicators used to compile the previous lists. These include: gaps in vacancy data (the 2014/2016 lists used vacancy data from the Department of Labour (DoL) only); the fact that there was no analysis of wage or price pressure; and the fact that measures of employment pressure were limited to 'employment growth'.
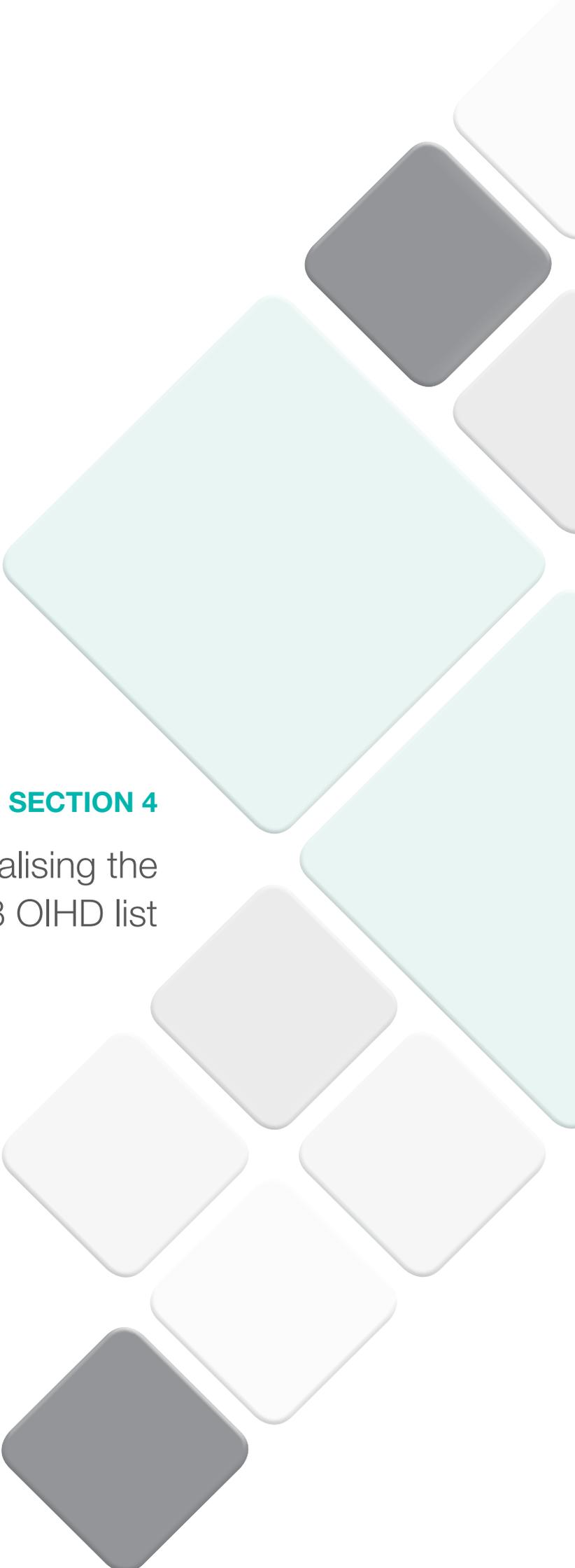
SECTION 4

Operationalising the
2018 OIHD list

SECTION 4

OPERATIONALISING THE 2018 OIHD LIST

Based on the review of international approaches to identifying occupations in high demand (OIHD) in the previous section, the focus now shifts to the statistical ('top-down') and qualitative ('bottom-up') methodologies used in the construction of the 2018 OIHD list. As described in the various MAC reports, combining quantitative and qualitative evidence in respect of occupational demand should be the key objective. This section begins by describing the overall framework for the statistical component of the project and then provides detail on the sources of data and on domains, indicators and thresholds relevant to the methodology. Next, the section identifies the way in which the 'bottom-up' evidence was collected, analysed and used to supplement the statistical approach to identifying OIHD.

4.1 Statistical framework

4.1.1 Domains, indicators and thresholds

The first step in constructing the statistical framework for the 2018 OIHD list was to identify the domains and indicators which capture the main features of OIHD (see Table 7). Based on both the past OIHD lists, recent methodological innovations (MAC, 2010; OECD, 2017), as well as the broader international and South African literature (Campbell, 2016; Daniels, 2007; Kraak, 2005; Powell, Paterson & Reddy, 2014; Reddy, Bhorat, Powell, Visser & Arends, 2016; Reddy & Powell, 2015), the following four dimensions of occupational demand were used:

- **Wage pressure.** Upward wage pressure over time is one characteristic of occupations for which demand is high (and currently outstrips, or is likely in the future to outstrip, supply).

- **Vacancy pressure.** The persistence and/ or duration of vacancies over time is often interpreted as a signal of occupational shortage.

- **Employment pressure.** On its own, employment growth is a sign of demand being met, but, combined with employment intensity and turnover, employment pressure can be a signal of occupational demand.

- **Priority/strategic demand.** It is increasingly being acknowledged (see NILS, 2013) that sectoral and governmental priorities and strategic plans should be included in measuring occupational demand.[18] Including these strategic priorities also gives the approach something of a 'forward-looking' element to occupational demand.

In terms of the measurement of each of the dimensions described above, the experiences and best practices from other contexts strongly suggest that measurement should be based on changes over a selected period of time (see, also, Rasool, 2015). Wage pressure, vacancy pressure and employment pressure are therefore measured as occupational changes relative to median changes over a period (e.g. 2010–2015) for which there is data for a large number of indicators. The dimension of priority/strategic demand, however, is based on the most recent data only, since the government's Strategic Integrated Projects (SIPs) list and the sector education and training authority (SETA) Pivotal List both contain an element of forward planning for occupations. This last dimension should be

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18 Moreover, the *Skills through SIPs* report specifically notes that its objective is to 'inform education and training planners of the occupations in demand for the SIPs' – see https://sip-skills.onlinecf.net/SKILLSforandthroughSIPs/_layouts/15/start.aspx#/SitePages/Skills%20for%20and%20through%20SIPs%E2%80%99%20Report%202014.aspx.

Table 7: Framework for the 2018 list of Occupations in High Demand (OIHD)

Dimension	Data source	Indicator	Threshold	Weight
Wage pressure	QLFS/LMDS	Hourly mean wage growth	Change in mean hourly earnings above the median[18] between 2010 and 2015	1/12
	QLFS/LMDS	Hourly median wage growth	Change in median hourly earnings above the median between 2010 and 2015	1/12
	QLFS/LMDS	Conditional[19] hourly mean wage growth	Change in the conditional mean hourly wage above the median between 2010 and 2015	1/12
Vacancy pressure	JOI/CJ	Vacancy growth	Change in vacancy growth above the median in the JOI *or* Career Junction (CJ) listings	1/8
	CJ	Vacancy duration	Change in vacancy renewals ('hard-to-fill') above the median in the CJ listings	1/8
Employment pressure	QLFS	Employment growth	Change in employment growth above the median between 2010 and 2015	1/12
	QLFS	Employment intensity growth	Change in employment intensity above the median between 2010 and 2015 (hours worked by full-time workers)	1/12
	QLFS	Employment tenure	Change in proportion of employees with tenure of less than one year above the median between 2010 and 2015	1/12
Priority/strategic demand	SETA Pivotal List	Strategic sectoral priority	Occupations for which a quantity over the median is needed	1/8
	SIPs List	National priority	Occupation appears on the SIPs List	1/8

Note: See MAC (2008:116, 255 & 259) for a list of the 12 indicators. See, also, MAC (2010:54) and MAC (2013:241).

reviewed on a regular basis, since government and sector needs and strategic plans do change regularly (but not necessarily annually).

The second step was to identify the indicators which can be used to measure each of the four dimensions described above. Again, the literature and, in particular, the MAC, NILS and OECD approaches all provide evidence as to how various indicators can be used to identify different aspects of occupational demand. As identified in the previous section, however, there is both a conceptual and practical element to selecting indicators, and data constraints play a role in this process. While six different sources of data were used for the 2018 OIHD index, the research team considered a wider number of sources that were ultimately not selected due to issues of data quality, compatibility or representivity. Occupations are available at the Organising Framework for Occupations (OFO) four-digit level for all the data sources listed in Table 7, so the statistical list (see Section 5) of occupations is given at this level.

19 As will be outlined in the following section, the median was used as a benchmark in identifying the threshold, and, to the extent possible, the MAC's suggested threshold of the median value + 50% was used where permitted by the distribution – see also Appendix .

20 $\hat{y} = \alpha + \beta_1 \ln(A_i) + \beta_2 P_i + \varepsilon_i$ where hourly earnings are predicted by the log of age (A_i), province (P_i) and an error term (ε_i).

Greater levels of disaggregation are not available for most of the data sources.

Finally, and as discussed in the previous section, the selection of indicator thresholds was informed largely by the MAC framework, which aimed to identify 'shortages' as occurring when occupational changes were observed above the median plus 50%. While this was the preferred threshold or 'rule of thumb', a final decision on the threshold for each indicator was made once the distribution of all indicators was compared. The details of the distribution and final threshold of each indicator are included in Appendix 3. Since the OIHD is concerned with identifying occupations for which a qualification or training is required, only occupations associated with a National Qualifications Framework (NQF) Level 3 (see DHET, 2015:10) and above were considered for the analysis.

4.1.2 Aggregation

The broad framework and aggregation method for the 2018 OIHD have been adapted from the Alkire-Foster (AF) methodology[21] (Alkire & Foster, 2011). The AF methodology is an intuitive and axiomatic counting approach in which a vector of observations is identified. Based on the number of indicators (see Table 7) in which an occupation

(i) exceeds the threshold, an occupation is considered to be in high demand when the total proportion of weighted indicators is k – where i is each occupation and k is the selected cut-off point (see next subsection) based on the aggregate distribution. In other words, an occupation is identified as being in high demand (HD) when it exceeds k weighted indicator thresholds:

$$HDi = \sum (w_j) g_{ij} 0$$

Where $g_{ij}0$ is a matrix whose ijth entry is 1 when occupation i exceeds the threshold in the jth indicator, and 0 when the occupation does not.

The index is the sum of the final weighted (w_j) scores of the ten indicators. The composite index score for each occupation therefore falls anywhere between 0 and 1.

4.1.3 Ranking and disaggregation

While it would be possible to rank all occupations based on their scores on the composite index, such an approach would likely be placing too much emphasis on the relative weighting of the index and would result in a fairly rigid ordering of occupational demand based on a number of proxy indicators.[22] Statistical significance

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21 This methodology has been used primarily in the multidimensional poverty literature, but, due to its simplicity and transparency, it has also been extended to other applications (e.g. the Women in Agriculture Empowerment Index).

22 In Appendix 2, however, we provide the full statistical list (including occupations below the 0.25 threshold for inclusion in the list), with occupations ranked by their OIHD index scores.

Figure 3: Distribution of OIHD index scores for all four-digit occupations with scores above zero (normal and kernel density curves plotted)
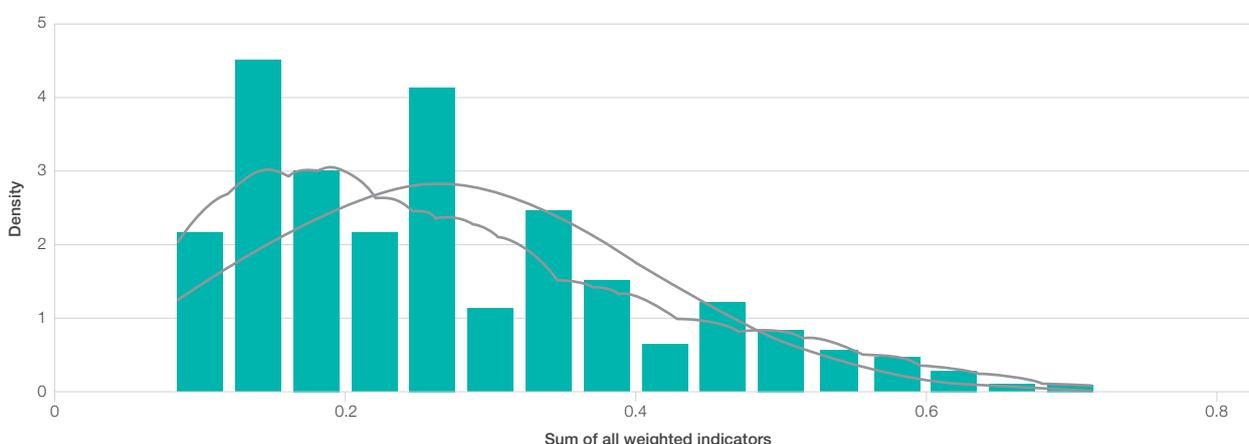
Source: South African OIHD Statistical Index (2018).

is also an issue when combining such a large number of data sources at a high level of disaggregation[23] (i.e. the OFO four-digit level). As the final identification step, we used the top half (i.e. above the median) of the OIHD index's distribution (see Figure 3)[24] for all occupations with a score above zero. The median value for the non-zero distribution of index scores was 0.25. This consisted of 143 occupations with an index score greater than 0.25 (k) (or occupations which reflected demand in more than 25% of the weighted indicators). These 143 occupations were then grouped into three mutually exclusive categories denoting high, higher and highest demand (based on their individual index scores) using a mean clustering analysis.[25]

4.1.4 Statistical robustness

One part of the robustness testing of the final list of occupations is the decomposition of the key indicators driving the ordering of occupations. A key feature of the AF methodology is that it is easily decomposable by its constituent parts. Section 5 identifies which of the indicators are driving the results in the different parts of the list (i.e. high, higher and highest). This also has a strong conceptual appeal, since it is possible to identify the main priority (highest-demand)

occupations and explain why and how they were identified as such (e.g. whether they experienced significant wage pressure vs employment pressure). Such a decomposition exercise is also valuable when reconciling the statistical approach to constructing the final integrated list with the qualitative component.

Since a number of decisions regarding dimensions, indicators, thresholds and weights have been made on a largely conceptual basis, it is important to test the sensitivity of the results to different assumptions. Key among these is testing the final list of occupations against differing assumptions about weights. Re-estimating the demand levels of occupations based on different combinations of weights (using both conceptual and statistical judgements) in the index identifies how robust the composition of the index is to the equal-weights approach. This final part of the statistical analysis investigates, in particular, how sensitive the statistical index is to: (1) an alternative specification for the weights assigned to the employment pressure dimension;[26] (2) the exclusion of the priority/strategic demand dimension; and (3) a lower weighting assigned to this dimension.

4.1.5 Government strategic projects and growth initiatives

While the *Skills through SIPs* report is an important source of information on occupations that will be needed for key government infrastructure projects, there is also a need to consider additional and emerging occupational needs (including green jobs) associated with government growth initiatives. To this end, the project team undertook a scan of relevant policy documents in order to update the SIPs based on new government growth initiatives. In particular, the policy (as discussed in Section 2.4) scan updated earlier work by the Labour Market

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23 Caution should be exercised in interpreting the four-digit occupation codes in the Quarterly Labour Force Surveys (QLFSs). Small sample sizes mean that, even with sample weights, estimates at this level are not representative. In order to minimise the risk of drawing conclusions based on small sample sizes, the analysis for the OIHD index only included occupations for which there were at least ten (unweighted) observations in both 2010 and 2015 (for the indicators based on QLFS data). This is still a relatively small number, however, and the authors suggest that caution be used in interpreting the data from the QLFSs at the four-digit level.

24 Appendix 1 contains a similar graphic distribution for all 369 four-digit occupations that appear in at least one of the data sets which were used to construct the index. As shown in the graph, the modal category is 0, which simply indicates that these are occupations (100 in total) that appear in one of the data sources but do not exceed the threshold for high demand in any of the ten indicators. When the full distribution of OIHD scores is included, the median drops to 0.16 (weighted index score).

25 Given the skewed distribution of OIHD scores, k-means clustering was used to partition observations (in this case, four-digit OFO occupations) into three clusters in which each occupation is assigned to the cluster with the nearest mean score on the index.

26 This step is of interest, since employment pressure, relative to the other indicators, may be a particularly weak signal of occupational demand and because of the low level of statistical power when analysing occupations at the four-digit levels in the QLFSs (see, also, OECD, 2017, as well as input from the OIHD project advisors).

Intelligence Partnership (LMIP) research team (see Kalina & Rogan, 2017) by focusing on more recent government projects.

4.2 Qualitative or 'bottom-up' evidence

The aim of the qualitative component of the project is to add context and texture to the quantitative list of 143 OFO four-digit occupations identified in the next section (see Table 10), and to extend the list from the four-digit Unit Group Level to the six-digit Occupational Level. Given that the primary purpose of the list is to inform planning and decision-making, it is critical to identify drivers of demand and scarcity. In particular, a distinction has to be made between drivers that can be addressed through education and training, and those that cannot. For purposes of this analysis, the drivers are considered only to the extent that they assist in curating the list. The details are not documented in this report.

Therefore, in addition to providing a more detailed (OFO six-digit) identification of OIHD, the approach taken for the qualitative analysis also triangulates the signals for demand by comparing quantitative and qualitative evidence. In particular, the 'bottom-up' approach seeks to:

- Justify the *inclusion* of occupations; and
- Justify the *exclusion* of occupations.

The primary sources of information for the identification or verification of the six-digit OFO codes were:

- The 2017 Scarce-Skills Lists in the Sector Skills Plans (SSPs) developed by 21 SETAs;
- The responses to the Call for Evidence (CFE) from 20 stakeholders (the full list is attached as Appendix 4) (The CFE was issued by the Department of Higher Education and Training (DHET) to 367 stakeholders, requesting recommendations for occupations to be included in the OIHD list, and the substantiations for such inclusion.);
- The Talent Survey from the ManpowerGroup Report 2016/2017;

- The SIPs List 2014;[27]
- The literature review, including the policy scan of government's new growth initiatives, where specific occupational shortages were identified; and
- Interviews held with industry representatives (the full list appears in Appendix 5).

The steps followed to arrive at the final list of occupations in this report are set out in Table 8.

Table 8: Steps followed to arrive at the final list

Step 1	Consolidate all the scarce skills from the SETA SSPs and the other stakeholder inputs at the six-digit level.
Step 2	Match the four-digit OIHD, which had been compiled based on the quantitative methodology referred to above, with the six-digit occupations from the qualitative inputs.
Step 3	Segregate transversal occupations that are in high demand across multiple sectors.
Step 4	Segregate sector-specific occupations, i.e. occupations reported by fewer than five sources.
Step 5	Review supporting evidence to assess the reason for inclusion of occupations where fewer than three sources reported.
Step 6	Interviews were held with industry or professional bodies regarding occupations where no documented evidence was available from the secondary sources listed above. The six-digit occupations for each Unit Group were tested with respondents to verify if demand is high or supply is limited.
Step 7	Where no other supporting evidence was available, the researchers used their discretion-based expert understanding of the labour market to include or exclude the Unit Group.
Step 8	Consolidate the final list.

27 The details of SIPs are available online at https://sip-skills. onlinecf.net/SKILLSforandthroughSIPs/_layouts/15/start. aspx#/SitePages/Home.aspx.

4.2.1 Criteria for inclusion and exclusion

The criteria for inclusion and exclusion are inherently subjective and are subject to further refinement. For this assessment, the criteria applied were as set out in Table 9.

Table 9: Criteria for inclusion and exclusion

	Criteria	Basis
Inclusion:	More than five sources reported the occupation, reflecting a need within the broader labour market.	Automatic inclusion
	Interviews with industry representatives provide strong substantiation for inclusion.	Automatic inclusion
	Two to four sources reported the occupation, but the occupation has narrowly specified demand in the labour market. In this case, the sources must be sector specialists and have credibility for reporting the shortage or demand.	Conditional inclusion based on review of supporting evidence
	One to two sources reported the occupation, and the underlying qualitative evidence is robust (evidence drawn from SSPs and CFEs).	Conditional inclusion based on review of supporting evidence
	Literature review provides evidence of high demand.	Conditional inclusion based on literature review
Exclusion	One to two sources that are not the principal users or custodians of the occupation and are thus not reflective of the broad labour market for that occupation; further, if the reasons cited for the shortage are not labour market-related and could not be corrected through education and training.	Conditional exclusion based on review of supporting evidence
	Interviews with industry representatives provide strong substantiation for exclusion.	Automatic exclusion
	Application of the 3S methodology points to exclusion.	Automatic exclusion

OIHD list
(four-digit ofo – statistical)
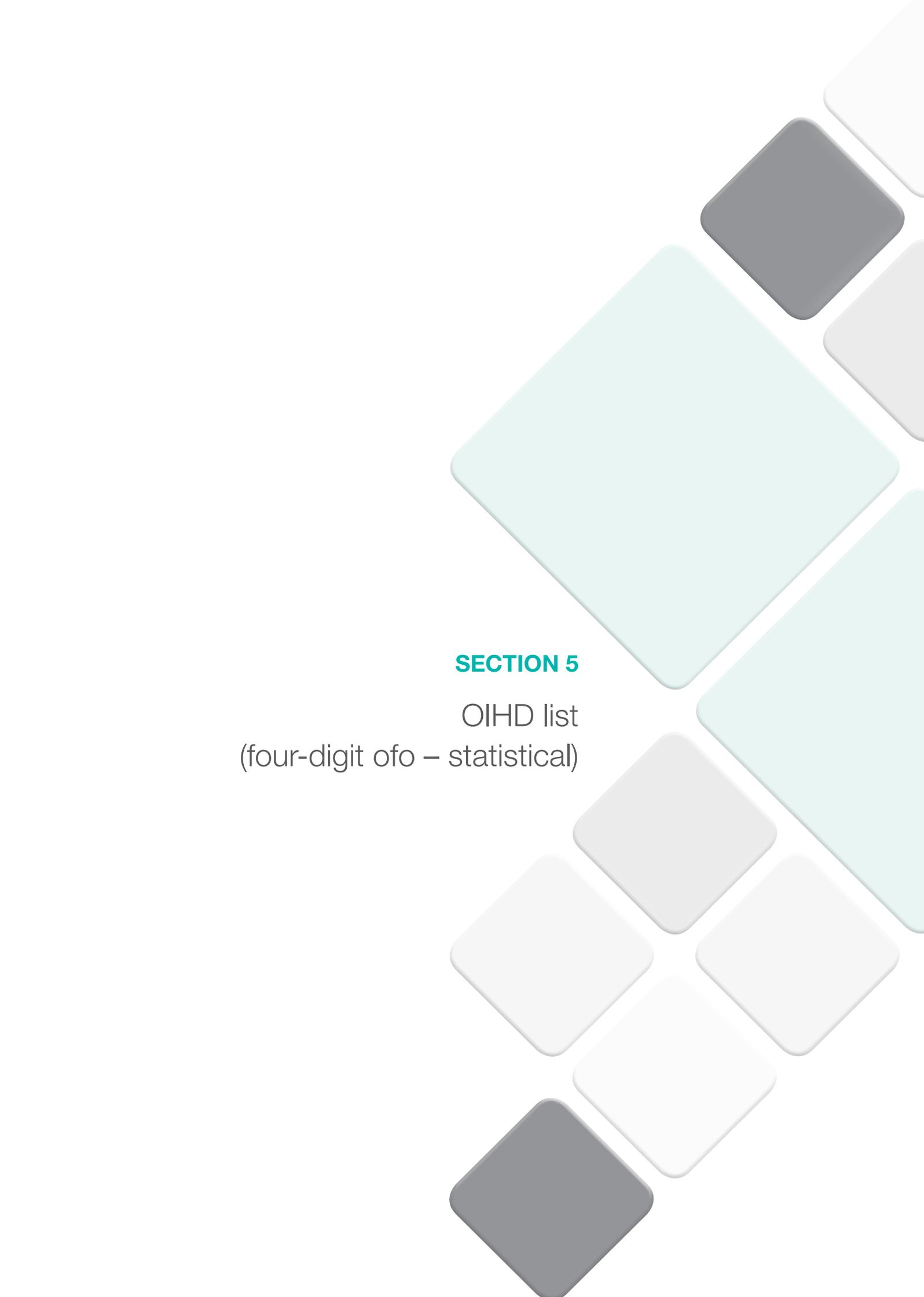
SECTION 5

OIHD LIST (FOUR-DIGIT OFO – STATISTICAL)

Table 10 presents the list of 143 occupations in high demand (OIHD) at the four-digit level as generated through the statistical analysis.

Table 10: Four-digit OFO generated by the statistical index

HIGHEST	
1112. Senior Government Officials	2519. Software & Applications Developers
1211. Finance Managers	2611. Lawyers
1219. Business Services & Administration	2619. Legal Professionals nec
1221. Sales & Marketing Managers	3112. Civil Engineering Technicians
1311. Agricultural & Forestry Production	3113. Electrical Engineering Technicians
1321. Manufacturing Managers	3115. Mechanical Engineering Technicians
1323. Construction Managers	3118. Draughtspersons
1324. Supply, Distribution & Related Managers	3123. Construction Supervisors
1331. ICT Service Managers	3132. Incinerator & Water Treatment Plant Operators
1349. Professional Services Managers nec	3212. Medical & Pathology Laboratory Technicians
2114. Geologists & Geophysicists	3434. Chefs
2132. Farming, Forestry & Fisheries Advisors	3512. Information & Communications Technicians
2141. Industrial & Production Engineers	3521. Broadcasting & Audiovisual Technicians
2142. Civil Engineers	4221. Travel Consultants & Clerks
2146. Mining Engineers, Metallurgists & Related Professionals	4413. Coding, Proofreading & Related Clerks
2149. Engineering Professionals nec	5311. Childcare Workers
2331. Secondary or Intermediate & Senior Education Teachers	5321. Health Care Assistants
2341. Primary School or Foundational Phase Teachers	6711. Building & Related Electricians
2412. Financial & Investment Advisors	6712. Electrical Mechanics & Fitters

HIGHER	
1113. Traditional Chiefs & Heads of Villages	3432. Interior Designers & Decorators
1411. Hotel Managers	3439. Artistic & Cultural Associate Professionals
1421. Retail & Wholesale Trade Managers	3513. Computer Network & Systems Technicians
2144. Mechanical Engineers	4111. General Office Clerks

2161. Building Architects	4131. Typists & Word-Processing Operators
2211. Generalist Medical Practitioners	4132. Data Entry Clerks
2262. Pharmacists	4212. Bookmakers, Croupiers & Related Gaming Workers
2311. University & Higher Education Teachers	4313. Payroll Clerks
2342. Early Childhood Educators	4323. Transport Clerks
2413. Financial Analysts	5111. Travel Attendants & Travel Stewards
2423. Personnel & Careers Professionals	6415. Carpenters & Joiners
2511. Systems Analysts	6426. Plumbers & Pipe Fitters
2512. Software Developers	6512. Welders & Flame Cutters
2514. Applications Programmers	6513. Sheet Metal Workers
2635. Social Work & Counselling Professionals	6523. Metalworking Machine Tool Setters
3114. Electronics Engineering Technicians	6533. Agricultural & Industrial Machinery Mechanics & Repairers
3117. Mining & Metallurgical Technicians	6613. Jewellery & Precious Metal Workers
3131. Power Production Plant Operators	6614. Potters & Related Workers
3142. Agricultural Technicians	6713. Electrical Line Installers & Repairers
3251. Dental Assistants & Therapists	6834. Upholsterers & Related Workers
3314. Statistical, Mathematical & Related Associate Professionals	6842. Shotfirers & Blasters
3321. Insurance Representatives	7154. Bleaching, Dyeing & Fabric Cleaning Machine Operators
3324. Trade Brokers	7156. Shoemaking & Related Machine Operators
3332. Conference & Event Planners	7332. Heavy Truck & Lorry Drivers
3421. Athletes & Sports Players	

HIGH

1212. Human Resource Managers	4321. Stock Clerks
1439. Services Managers nec	5131. Waiters
2121. Mathematicians, Actuaries & Statisticians	5141. Hairdressers
2131. Biologists, Botanists & Zoologists	5153. Building Caretakers
2143. Environmental Engineers	5244. Contact Centre Salespersons
2145. Chemical Engineers	5322. Home-Based Personal Care Workers
2166. Graphic & Multimedia Designers	5329. Personal Care Workers in Health Services nec
2221. Nursing Professionals	5411. Firefighters
2251. Veterinarians	5414. Security Guards
2263. Environmental & Occupational Health & Hygiene Professionals	6111. Field Crop & Vegetable Growers
2353. Other Language Teachers	6113. Gardeners, Ornamental Horticulturalists & Nursery Growers
2513. Web & Multimedia Developers	6211. Forestry & Related Workers

2521. Database Designers & Administrators	6413. Stonemasons, Stone Cutters, Splitters & Carvers
2523. Computer Network Professionals	6419. Building Frame & Related Trades Workers nec
2529. Database & Network Professionals nec	6421. Roofers
2631. Economists	6524. Metal Polishers, Wheel Grinders & Tool Sharpeners
2634. Psychologists	6615. Glass Makers, Cutters, Grinders & Finishers
2651. Visual Artists	6722. ICT Installers & Servicers & Related Occupations
3119. Physical & Engineering Science Technicians	6832. Garment & Related Pattern Makers & Cutters
3141. Life Science Technicians (Excluding Medical)	7114. Cement, Stone & Other Mineral Products Machine Operators
3252. Medical Records & Health Information Technicians	7142. Plastic Products Machine Operators
3255. Physiotherapy Technicians & Assistants	7152. Weaving & Knitting Machine Operators
3257. Environmental & Occupational Health Inspectors & Associates	7159. Textile, Fur & Leather Products Machine Operators nec
3323. Buyers	7161. Food & Related Products Machine Operators
3339. Business Services Agents nec	7219. Assemblers nec
4121. Secretaries (General)	7341. Mobile Farm & Forestry Plant Operators
4213. Pawnbrokers & Moneylenders	7343. Crane, Hoist & Related Plant Operators
4223. Telephone Switchboard Operators	7344. Lifting Truck Operators

Source: South African OIHD Statistical Index (2018).

5.1 Decomposing the index

As outlined in the previous section, one of the advantages of the Alkire-Foster (AF) counting methodology is that it is easily decomposable. In other words, the method allows for an intuitive way of identifying which constituent parts of the index are driving the overall index scores. A preliminary decomposition of the four-digit occupations (from Table 10 above) for which there is not supporting qualitative data (see the following section), suggests that signals of employment and wage pressure from the Quarterly Labour Force Surveys (QLFSs) do not necessarily match with qualitative signals of demand. As such, it is important to investigate further this discordance between qualitative and quantitative signals of occupational demand. The decomposition analysis in this section therefore begins by identifying the main statistical indicators of demand for each of the three groups of occupations (high, higher and highest). Next, further disaggregation and triangulation with the qualitative work is undertaken

to identify which indicators of demand from the statistical index are not matched with supporting qualitative or contextual information.

The results of the decomposition analysis in Figure 4 show that, for the group of occupations in the highest demand grouping on the statistical index, the single-largest signal comes from mean wage pressure. Nearly 90% of four-digit occupations in this group recorded average wage growth above the median plus 50% and were, therefore, identified as experiencing demand in this indicator. Decomposing the sources of demand further, the next two indicators with the highest prevalence for the occupations in highest demand are employment growth and employment tenure. Roughly 74% of the occupations in this group experienced demand according to each of these two indicators. To a lesser extent, these occupations at the top of the statistical index also experienced signals of demand in the form of median wage pressure (63%) and vacancy

Figure 4: Sources of occupational demand for occupations in the highest group
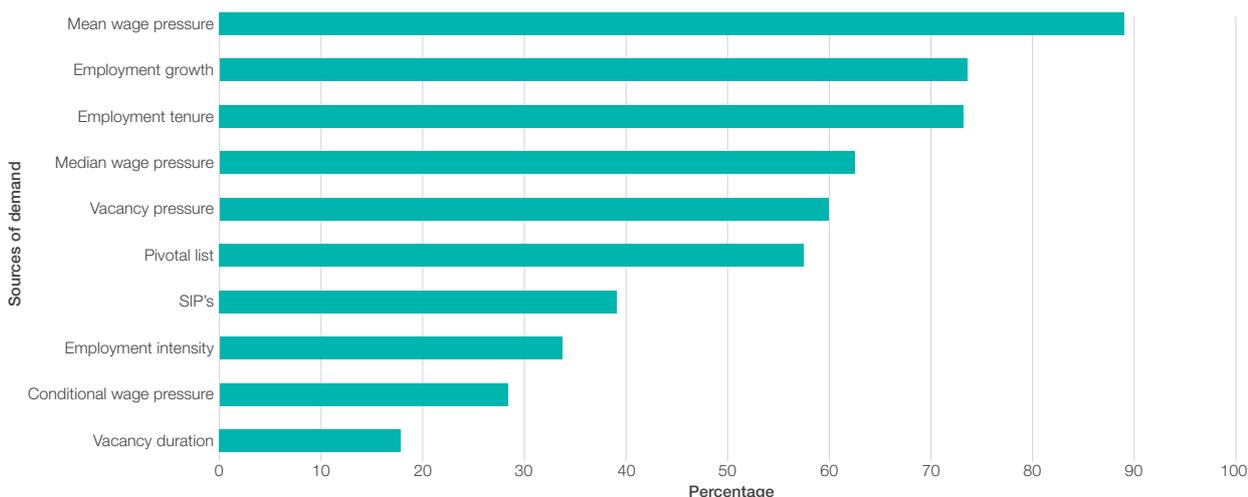
Source: South African OIHD Statistical Index (2018).

pressure (61%). The occupations with the very highest levels of demand (according to the OIHD statistical index) were therefore driven by demand signalled through wage pressure, employment growth, turnover, and vacancy pressure. Significantly, these occupations were also identified by signals of strategic priority through the sector education and training authority (SETA) Pivotal List. About 58% of the top occupations identified through the statistical index were included in the Pivotal List as occupations for which a large number of trained employees were needed.

It is also important to identify how signals of demand differ across the three groups

of occupations which were derived from the statistical index. Figure 5 presents the results from a decomposition of all ten demand indicators across the three groups of occupations (high, higher and highest).

The results of the decomposition highlight some interesting differences in the sources of demand between the three groups of occupations. The second group of occupations ('higher') is fairly similar to the first group ('highest'). The main indicators of demand for this group are employment growth and tenure (59% and 49%, respectively). One difference is that fewer occupations experienced signals of demand

Figure 5: Sources of demand for occupations in high, higher and highest demand
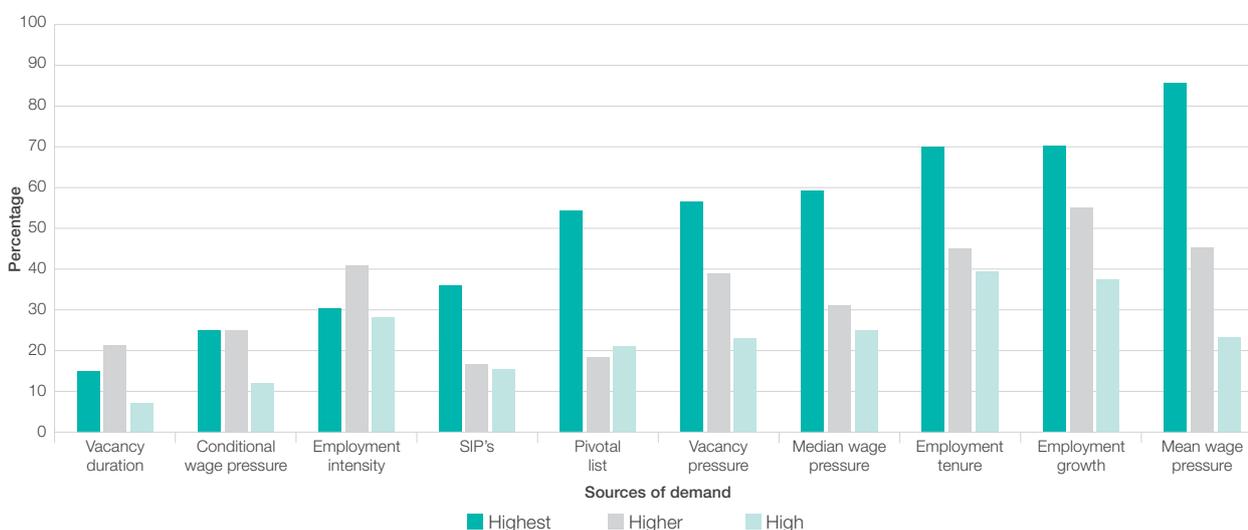
Source: South African OIHD Statistical Index (2018).

in wage pressure. Strategic demand was also quite low compared both with other indicators and with the occupations in the highest group. Occupations in the higher group had signals of strategic demand which are far more comparable with the group below (high). Only 20% and 23% of higher-demand occupations experienced signals in respect of Strategic Integrated Projects (SIPs) or Pivotal List demand, respectively.

The third group of occupations ('high') is somewhat different from the first two groups. The single-largest indicator of demand is employment tenure (i.e. turnover), with 43% of occupations in this group scoring on this particular indicator. As with the other two groups, the indicator for employment growth is relatively high-scoring (41%). This third group, however, does not feature strong signals of demand for mean wage pressure (27%) or vacancy pressure (27%) relative to the higher and highest groups of occupations.

Finally, a potentially useful approach to the triangulation of data between the statistical analysis and the qualitative work is to decompose the sources of demand for occupations for which there is no qualitative evidence. Section 6 of this report identifies 36 four-digit occupations for which no qualitative evidence was obtained. Figure 6 identifies

the sources of demand signals from these occupations. Not surprisingly, given the emphasis on the SETA skills plans as well as the relatively small number of responses to the call for evidence (CFE) in the qualitative component of the study, none of these 36 occupations featured signals of demand from the strategic/priority demand dimension. In part, this suggests that the analysis of the CFE, the SETA skills plans, and the stakeholder interviews with government has been exhaustive (i.e. the statistical analysis has not identified any occupations with strategic demand which have not been corroborated by the qualitative component of the study). Rather, the occupations for which there is no corroborating, qualitative evidence all exhibit demand signals from the indicators denoting employment pressure, wage pressure, and, to a lesser extent, vacancy pressure. Taken together, this provides a further motivation to check the sensitivity/robustness of the index to a reweighting of the employment pressure dimension.

Overall, the decomposition of the OIHD index has suggested that the occupations with the highest levels of demand demonstrate signals of demand in wage growth, employment growth and vacancy pressure. It is, therefore, somewhat reassuring that these signals reinforce one another within the context of the occupations

Figure 6: Sources of demand for occupations without qualitative support
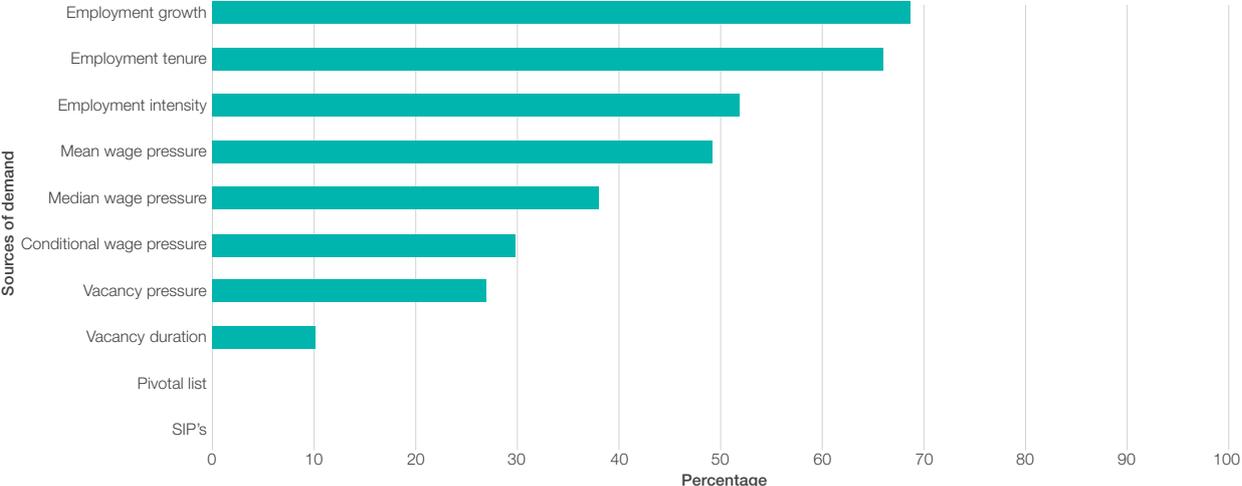
Source: South African OIHD Statistical Index (2018).

with the very highest levels of demand. It is difficult to imagine, for example, a situation in which employment growth, wage growth and vacancy growth do not send fairly similar signals for occupations which are in scarce supply or high demand in the economy. The one possible exception, of course, is the indicator for employment growth, which may also be a signal of demand being met. In recognition of this possibility, and in line with other approaches (e.g. the Organisation for Economic Co-operation and Development [OECD]) to measuring occupations in high demand, the next section considers several different approaches to weighting the index and, inter alia, re-estimates the OIHD index with a lower weight assigned to the indicators for employment pressure.

5.2 Statistical robustness

As indicated above, this section investigates the robustness of the statistical component of the OIHD methodology by re-estimating the index in three ways. The three sensitivity tests are as follows:

1. The reweighting of the index in which the employment pressure domain is assigned a 10% weighting (and each of the other domains a 30% weighting);

2. An index in which the priority/strategic demand is assigned a lower weight (10%, and, again, the other three domains and sub-indicators are reweighted accordingly); and

3. A respecification of the index in which the domain of priority/strategic demand is excluded and the remaining domains and sub-indicators are reweighted accordingly (i.e. 1/3 each).

5.2.1 Reweighting the employment pressure domain

Table 11 begins by re-estimating the index with a lower weight assigned to the indicators measuring employment pressure. Since the analysis has suggested that the employment pressure domain

has identified occupations for which there is limited qualitative evidence, it is important to consider this particular domain carefully. Project advisors have also suggested that caution be exercised when interpreting the employment pressure indicators, as they may not be capturing occupational demand or shortage as well as other indicators (i.e. they may be capturing demand being met in the labour market).

On the whole, there is substantial overlapping between occupations included on the original index (Table 10) and the reweighted index in Table 11. Of the original 143 occupations on the index, 124 (or 86.7%) are also on the reweighted index of high demand. As expected, however, some occupations have shifted groups and are not necessarily in the same category of demand (i.e. high, higher, highest) in both indices. For example, of the 38 four-digit occupations in the highest group in the original index, 24 (or 63.2%) are also in the highest group on the reweighted index. Some of the occupations which are no longer in the highest group (i.e. in Table 11) include: Sales and Marketing Managers (1221), Geologists and Geophysicists (2114), Lawyers (2611), and Chefs (3434). All 14 of the occupations which are no longer in the highest group moved to the next group ('higher').

Overall, the original index is fairly robust to the reweighting of the employment pressure domain, and the vast majority of occupations (87%) would still be included in the list even if less consideration was given to employment growth, intensity and tenure (turnover). Perhaps even more importantly, the broad ordering of occupations is similar. It is particularly encouraging, from a methodological standpoint, that all of the occupations which fell out of the highest grouping moved to the next-highest grouping and not off the list altogether. The main conclusion from this first robustness check is, therefore, that reweighting the main signals of occupational demand has only a marginal impact on the identification of occupations on the OIHD list.[28]

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28 The overall index scores (not shown in the tables) are, of course, somewhat lower, but this is the expected result of giving the main signals of demand a lower weighting.

Table 11: Reweighted four-digit OFO (with employment pressure weighted at 10%)

HIGHEST

1112. Senior Government Officials	2511. Systems Analysts
1211. Finance Managers	2512. Software Developers
1219. Business Services & Administration	2514. Applications Programmers
1311. Agricultural & Forestry Production	2519. Software & Applications Developers
1321. Manufacturing Managers	3112. Civil Engineering Technicians
1323. Construction Managers	3113. Electrical Engineering Technicians
1331. ICT Service Managers	3115. Mechanical Engineering Technicians
1349. Professional Services Managers nec	3118. Draughtspersons
2141. Industrial & Production Engineers	3123. Construction Supervisors
2142. Civil Engineers	3212. Medical & Pathology Laboratory Technicians
2144. Mechanical Engineers	3421. Athletes & Sports Players
2149. Engineering Professionals nec	3513. Computer Network & Systems Technicians
2331. Secondary or Intermediate & Senior Education Teachers	4221. Travel Consultants & Clerks
2341. Primary School or Foundational Phase Teachers	5111. Travel Attendants & Travel Stewards
2412. Financial & Investment Advisors	6711. Building & Related Electricians
2413. Financial Analysts	6712. Electrical Mechanics & Fitters

HIGHER

1212. Human Resource Managers	3131. Power Production Plant Operators
1221. Sales & Marketing Managers	3132. Incinerator & Water Treatment Plant Operators
1324. Supply, Distribution & Related Managers	3321. Insurance Representatives
1421. Retail & Wholesale Trade Managers	3323. Buyers
2114. Geologists & Geophysicists	3339. Business Services Agents nec
2121. Mathematicians, Actuaries & Statisticians	3434. Chefs
2132. Farming, Forestry & Fisheries Advisors	3439. Artistic & Cultural Associate Professionals
2143. Environmental Engineers	3512. Information & Communications Technicians
2145. Chemical Engineers	3521. Broadcasting & Audiovisual Technicians
2146. Mining Engineers, Metallurgists & Related Professionals	4111. General Office Clerks
2161. Building Architects	4121. Secretaries (General)
2166. Graphic & Multimedia Designers	4131. Typists & Word-Processing Operators
2211. Generalist Medical Practitioners	4132. Data Entry Clerks
2221. Nursing Professionals	4321. Stock Clerks
2251. Veterinarians	4323. Transport Clerks
2262. Pharmacists	4413. Coding, Proofreading & Related Clerks
2263. Environmental & Occupational Health & Hygiene Professionals	5244. Contact Centre Salespersons

2311. University & Higher Education Teachers	5311. Childcare Workers
2342. Early Childhood Educators	5321. Health Care Assistants
2423. Personnel & Careers Professionals	6113. Gardeners, Ornamental Horticulturalists & Nursery Growers
2513. Web & Multimedia Developers	6415. Carpenters & Joiners
2521. Database Designers & Administrators	6512. Welders & Flame Cutters
2523. Computer Network Professionals	6513. Sheet Metal Workers
2529. Database & Network Professionals nec	6523. Metalworking Machine Tool Setters
2611. Lawyers	6613. Jewellery & Precious Metal Workers
2619. Legal Professionals nec	6615. Glass Makers, Cutters, Grinders & Finishers
2651. Visual Artists	6834. Upholsterers & Related Workers
3114. Electronics Engineering Technicians	7114. Cement, Stone & Other Mineral Products Machine Operators
3117. Mining & Metallurgical Technicians	7332. Heavy Truck & Lorry Drivers
3119. Physical & Engineering Science Technicians	

HIGH

1113. Traditional Chiefs & Heads of Villages	5223. Shop Sales Assistants
1411. Hotel Managers	5411. Firefighters
1412. Restaurant Managers	5414. Security Guards
1439. Services Managers nec	5415. Intelligence Operators
2131. Biologists, Botanists & Zoologists	6412. Bricklayers & Related Workers
2151. Electrical Engineers	6413. Stonemasons, Stone Cutters, Splitters & Carvers
2165. Cartographers & Surveyors	6419. Building Frame & Related Trades Workers nec
2411. Accountants	6422. Floor Layers & Tile Setters
2622. Librarians & Related Information Professionals	6426. Plumbers & Pipe Fitters
2631. Economists	6533. Agricultural & Industrial Machinery Operators
2635. Social Work & Counselling Professionals	6614. Potters & Related Workers
3141. Life Science Technicians (Excluding Medical)	6619. Handicraft Workers nec
3142. Agricultural Technicians	6621. Pre-Press Technicians
3241. Veterinary Technicians & Assistants	6622. Printers
3251. Dental Assistants & Therapists	6713. Electrical Line Installers & Repairers
3255. Physiotherapy Technicians & Assistants	6831. Tailors, Dressmakers, Furriers & Hatters
3257. Environmental & Occupational Health & Hygiene Professionals	6832. Garment & Related Patternmakers
3314. Statistical, Mathematical & Related Associate Professionals	6842. Shotfirers & Blasters
3324. Trade Brokers	7152. Weaving & Knitting Machine Operators
3332. Conference & Event Planners	7154. Bleaching, Dyeing & Fabric Cleaning Machine Operators
3334. Real Estate Agents & Property Managers	7156. Shoemaking & Related Machine Operators

3432. Interior Designers & Decorators	7219. Assemblers nec
4212. Bookmakers, Croupiers & Related Gaming Workers	7322. Car, Taxi & Van Drivers
4313. Payroll Clerks	7341. Mobile Farm & Forestry Plant Operators
5132. Bartenders	7343. Crane, Hoist & Related Plant Operators

Source: South African OIHD Statistical Index (2018).

5.2.2 Reweighting the priority/strategic demand domain

Table 12 presents the list of occupations as generated from an index in which the two indicators of priority/strategic demand are assigned only a combined 10% weighting. Once again, this reweighted version of the list corresponds closely with the original. Of the original 143 occupations which appeared on the OIHD, 125 (or 87.4%) also appear on the list. Put slightly differently, the reweighted index identified 138 OIHD, and 90% of these were also identified on the original list. There is therefore a strong correlation between the two different weightings in terms of which occupations they identify.

As in the earlier iteration, there is also a strong similarity in the ordering or grouping of occupations. There were 12 occupations, for example, which were initially identified in the highest group but were not included in the highest group on the reweighted list. Several

of these include: Civil Engineers (2142), Mining Engineers (2146), Engineering Professionals not elsewhere classified (2149), and several types of Engineering Technicians (3112, 3113, 3115). This is a particularly interesting finding for two reasons. Firstly, all 12 of these occupations appear in the higher grouping on the reweighted list (i.e. they moved only one group down). Secondly, there is a strong theme of Engineering and Building Professionals among these 12 occupations and this seems intuitive, since the domain of priority/strategic demand is concerned largely with infrastructure (e.g. SIPs) and other large projects as well as technical occupations (from the SETA Pivotal List).

Overall, the key finding from this version of the reweighted index is that there is a strong correlation with the original list, but with slightly less emphasis on Engineering and Engineering and Building Technicians in particular. These occupations remain on the list, however, and are included in the 'higher' grouping rather than the highest.

Table 12: Reweighted four-digit OFO (with priority/strategic demand weighted at 10%)

HIGHEST	
1112. Senior Government Officials	2611. Lawyers
1211. Finance Managers	2619. Legal Professionals nec
1311. Agricultural & Forestry Production	3118. Draughtspersons
1321. Manufacturing Managers	3123. Construction Supervisors
1323. Construction Managers	3212. Medical & Pathology Laboratory Technicians
1324. Supply, Distribution & Related Managers	3512. Information & Communications Technicians
1331. ICT Service Managers	3521. Broadcasting & Audiovisual Technicians
1349. Professional Services Managers nec	4111. General Office Clerks
2114. Geologists & Geophysicists	4221. Travel Consultants & Clerks
2141. Industrial & Production Engineers	4323. Transport Clerks
2161. Building Architects	4413. Coding, Proofreading & Related Clerks
2331. Secondary or Intermediate & Senior Education Teachers	5311. Childcare Workers
2341. Primary School or Foundational Phase Teachers	5321. Health Care Assistants
2412. Financial & Investment Advisors	6712. Electrical Mechanics & Fitters
2511. Systems Analysts	6834. Upholsterers & Related Workers
2519. Software & Applications Developers	

HIGHER	
1113. Traditional Chiefs & Heads of Villages	3141. Life Science Technicians (Excluding Medical)
1212. Human Resource Managers	3142. Agricultural Technicians
1219. Business Services & Administration	3251. Dental Assistants & Therapists
1221. Sales & Marketing Managers	3314. Statistical, Mathematical & Related Associate Professionals
1411. Hotel Managers	3321. Insurance Representatives
1421. Retail & Wholesale Trade Managers	3324. Trade Brokers
2132. Farming, Forestry & Fisheries Advisors	3332. Conference & Event Planners
2142. Civil Engineers	3421. Athletes & Sports Players
2144. Mechanical Engineers	3432. Interior Designers & Decorators
2146. Mining Engineers, Metallurgists & Related Professionals	3434. Chefs
2149. Engineering Professionals nec	3439. Artistic & Cultural Associate Professionals
2211. Generalist Medical Practitioners	4131. Typists & Word-Processing Operators
2221. Nursing Professionals	4132. Data Entry Clerks
2262. Pharmacists	4212. Bookmakers, Croupiers & Related Gaming Workers
2311. University & Higher Education Teachers	4313. Payroll Clerks
2413. Financial Analysts	5111. Travel Attendants & Travel Stewards
2423. Personnel & Careers Professionals	5411. Firefighters

2512.	Software Developers	6426.	Plumbers & Pipe Fitters
2514.	Applications Programmers	6533.	Agricultural & Industrial Machinery Operators
2631.	Economists	6613.	Jewellery & Precious Metal Workers
2635.	Social Work & Counselling Professionals	6614.	Potters & Related Workers
3112.	Civil Engineering Technicians	6711.	Building & Related Electricians
3113.	Electrical Engineering Technicians	6713.	Electrical Line Installers & Repairers
3115.	Mechanical Engineering Technicians	6842.	Shotfirers & Blasters
3117.	Mining & Metallurgical Technicians	7154.	Bleaching, Dyeing & Fabric Cleaning Machine Operators
3131.	Power Production Plant Operators	7156.	Shoemaking & Related Machine Operators
3132.	Incinerator & Water Treatment Plant Operators	7219.	Assemblers nec

HIGH

1111.	Legislators	5131.	Waiters
1342.	Health Service Managers	5141.	Hairdressers
1412.	Restaurant Managers	5153.	Building Caretakers
1439.	Services Managers nec	5223.	Shop Sales Assistants
2131.	Biologists, Botanists & Zoologists	5322.	Home-Based Personal Care Workers
2342.	Early Childhood Educators	5329.	Personal Care Workers in Health Services nec
2353.	Other Language Teachers	5414.	Security Guards
2513.	Web & Multimedia Developers	6111.	Field Crop & Vegetable Growers
2634.	Psychologists	6211.	Forestry & Related Workers
2651.	Visual Artists	6413.	Stonemasons, Stone Cutters, Splitters & Carvers
3111.	Chemical & Physical Science Technicians	6419.	Building Frame & Related Trades Workers
3114.	Electronics Engineering Technicians	6421.	Roofers
3241.	Veterinary Technicians & Assistants	6523.	Metalworking Machine Tool Setters
3252.	Medical Records & Health Information	6524.	Metal Polishers, Wheel Grinders & Tool Sharpeners
3255.	Physiotherapy Technicians & Assistants	6615.	Glass Makers, Cutters, Grinders & Finishers
3257.	Environmental & Occupational Health Professionals	6722.	ICT Installers & Servicers & Related Occupations
3334.	Real Estate Agents & Property Managers	6832.	Garment & Related Patternmakers
3339.	Business Services Agents nec	7121.	Metal Processing Plant Operators
3343.	Administrative & Executive Secretaries	7142.	Plastic Products Machine Operators
3411.	Legal & Related Associate Professionals	7152.	Weaving & Knitting Machine Operators
3513.	Computer Network & Systems Technicians	7159.	Textile, Fur & Leather Products Makers
4121.	Secretaries (General)	7161.	Food & Related Products Machine Operators
4213.	Pawnbrokers & Moneylenders	7311.	Locomotive Engine Drivers
4223.	Telephone Switchboard Operators	7341.	Mobile Farm & Forestry Plant Operators
4312.	Statistical, Finance & Insurance Clerks	7343.	Crane, Hoist & Related Plant Operators
4321.	Stock Clerks	7344.	Lifting Truck Operators
4412.	Mail Carriers & Sorting Clerks		

Source: South African OIHD Statistical Index (2018).

5.2.3 Re-estimating the statistical index without the priority/strategic demand domain

Table 13 presents the third sensitivity check, which lists OIHD as generated from an index in which the domain of priority/strategic demand is excluded and the remaining domains (employment pressure, wage pressure and vacancy pressure) are assigned equal weighting (i.e. 1/3 each). The differences from the original list are more noticeable in this iteration of the index, but, nonetheless, the methodology appears relatively robust to changes in both weighting and specification.

Overall, of the 143 occupations from the original list, 114 (or 80%) are still included, even without the domain of strategic and priority occupations. This is a slightly lower correlation than exhibited by the two reweighted indices (87% each) but

is, nonetheless, reflective of a strong overlap between the difference versions of the OIHD index. The ordering of the occupations into the three groups is somewhat different, however, when the priority occupations are excluded. For example, only about 44% of the highest occupations from the original list are also highest in this version (i.e. Table 13) of the list. In absolute terms, there are 21 occupations from the original highest group that are no longer in the highest grouping. These 21 occupations are, however, all still on the list and have shifted into other categories. Most (18) have moved to the 'higher' category, while only three now appear in the 'high' group. As with the other iterations of the index, the transitions across categories have therefore been fairly modest (i.e. the shifts have been across only one grouping). Not surprisingly, the vast majority of the 21 occupations which moved down to the higher category are related to the Engineering, Building and Construction Industries.

Table 13: Re-estimated four-digit OFO (excluding the priority/strategic demand domain)

HIGHEST	
1321. Manufacturing Managers	3212. Medical & Pathology Laboratory Technicians
1324. Supply, Distribution & Related Managers	3512. Information & Communications Technicians
1331. ICT Service Managers	3521. Broadcasting & Audiovisual Technicians
2114. Geologists & Geophysicists	4111. General Office Clerks
2141. Industrial & Production Engineers	4221. Travel Consultants & Clerks
2161. Building Architects	4323. Transport Clerks
2331. Secondary or Intermediate & Senior Education Teachers	4413. Coding, Proofreading & Related Clerks
2511. Systems Analysts	5311. Childcare Workers
2519. Software & Applications Developers	5321. Health Care Assistants
2611. Lawyers	6712. Electrical Mechanics & Fitters
2619. Legal Professionals nec	6834. Upholsterers & Related Workers
3118. Draughtspersons	

HIGHER	
1112. Senior Government Officials	3132. Incinerator & Water Treatment Plant Operators
1113. Traditional Chiefs & Heads of Villages	3141. Life Science Technicians (Excluding Medical)
1211. Finance Managers	3142. Agricultural Technicians
1212. Human Resource Managers	3251. Dental Assistants & Therapists

1221. Sales & Marketing Managers	3314. Statistical, Mathematical & Related Associate Professionals
1311. Agricultural & Forestry Production	3321. Insurance Representatives
1323. Construction Managers	3324. Trade Brokers
1349. Professional Services Managers nec	3332. Conference & Event Planners
1411. Hotel Managers	3421. Athletes & Sports Players
1421. Retail & Wholesale Trade Managers	3432. Interior Designers & Decorators
2132. Farming, Forestry & Fisheries Advisors	3434. Chefs
2142. Civil Engineers	3439. Artistic & Cultural Associate Professionals
2146. Mining Engineers, Metallurgists & Related Professionals	4131. Typists & Word-Processing Operators
2211. Generalist Medical Practitioners	4132. Data Entry Clerks
2221. Nursing Professionals	4212. Bookmakers, Croupiers & Related Gaming Workers
2262. Pharmacists	4313. Payroll Clerks
2311. University & Higher Education Teachers	5111. Travel Attendants & Travel Stewards
2341. Primary School or Foundational Phase Teachers	5411. Firefighters
2412. Financial & Investment Advisors	6613. Jewellery & Precious Metal Workers
2423. Personnel & Careers Professionals	6614. Potters & Related Workers
2514. Applications Programmers	6711. Building & Related Electricians
2631. Economists	6713. Electrical Line Installers & Repairers
2635. Social Work & Counselling Professionals	6842. Shotfirers & Blasters
3112. Civil Engineering Technicians	7154. Bleaching, Dyeing & Fabric Cleaning Machine Operators
3115. Mechanical Engineering Technicians	7156. Shoemaking & Related Machine Operators
3123. Construction Supervisors	7219. Assemblers nec
3131. Power Production Plant Operators	

HIGH

1111. Legislators	4312. Statistical, Finance & Insurance Clerks
1219. Business Services & Administration	4321. Stock Clerks
1342. Health Service Managers	4412. Mail Carriers & Sorting Clerks
1412. Restaurant Managers	5131. Waiters
2131. Biologists, Botanists & Zoologists	5141. Hairdressers
2144. Mechanical Engineers	5153. Building Caretakers
2149. Engineering Professionals nec	5223. Shop Sales Assistants
2342. Early Childhood Educators	5322. Home-Based Personal Care Workers
2353. Other Language Teachers	5329. Personal Care Workers in Health Services
2413. Financial Analysts	6111. Field Crop & Vegetable Growers
2512. Software Developers	6211. Forestry & Related Workers
2513. Web & Multimedia Developers	6413. Stonemasons, Stone Cutters, Splitters & Carvers
2634. Psychologists	6421. Roofers

2651. Visual Artists	6426. Plumbers & Pipe Fitters
3111. Chemical & Physical Science Technicians	6523. Metalworking Machine Tool Setters
3113. Electrical Engineering Technicians	6524. Metal Polishers, Wheel Grinders & Tool Sharpeners
3114. Electronics Engineering Technicians	6533. Agricultural & Industrial Machinery Operators
3117. Mining & Metallurgical Technicians	6615. Glass Makers, Cutters, Grinders & Finishers
3241. Veterinary Technicians & Assistants	6722. ICT Installers & Servicers & Related Occupations
3252. Medical Records & Health Information	6832. Garment & Related Patternmakers
3255. Physiotherapy Technicians & Assistants	7121. Metal Processing Plant Operators
3334. Real Estate Agents & Property Managers	7142. Plastic Products Machine Operators
3339. Business Services Agents nec	7152. Weaving & Knitting Machine Operators
3343. Administrative & Executive Secretaries	7159. Textile, Fur & Leather Products Machine Operators
3411. Legal & Related Associate Professionals	7161. Food & Related Products Machine Operators
4121. Secretaries (General)	7311. Locomotive Engine Drivers
4213. Pawnbrokers & Moneylenders	7344. Lifting Truck Operators
4223. Telephone Switchboard Operators	

Source: South African OIHD Statistical Index (2018).

On the whole, the robustness checks presented in this section have been encouraging in terms of providing some confidence in the methodology for the 2018 OIHD list. While reweighting the statistical index and changing the specification (i.e. excluding one of the domains) have resulted in some changes to the occupations included in the list, these changes have been relatively subtle. The vast majority of occupations are still identified as being in demand, irrespective of the weights assigned to each domain. Some of the more interesting changes have occurred in the ordering of the occupations across the three groups, but this has largely conformed to prior expectations in terms of whether government strategic priorities should be included in the statistical analysis (or how much weight should be assigned to this domain). Moreover, the decomposition analysis from the previous section, together with the robustness tests in this section, should provide important input into revisions to the statistical component of the methodology for the next version of the OIHD list (i.e. in 2019 or 2020).

SECTION 6

Stakeholder Inputs
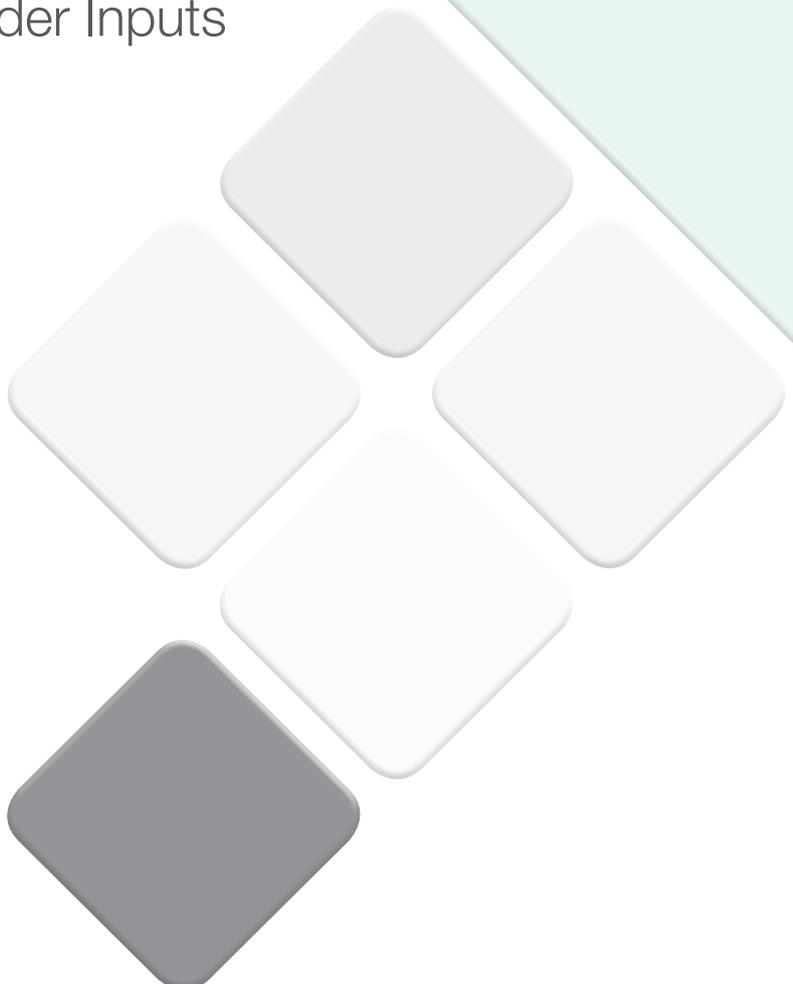
SECTION 6
STAKEHOLDER INPUTS

A set of more detailed lists as an outcome of the analysis of the 'bottom-up'/qualitative evidence is now presented. We then move on to a process of verification/triangulation where we compare the outcome of the identification of occupations in high demand (OIHD) at the four-digit level (from the statistical analysis) and six-digit level (from the qualitative interviews). This results in a list of occupations identified as in high demand transversally (across sectors), as well as a list of occupations that might have been identified as in demand from the statistical analysis, but this was not supported by the qualitative data. This is followed by a review of evidence in order to consolidate the final draft list.

6.1 Transversal occupations in high demand (OIHD)

Occupations falling in this category were identified by multiple sectors and stakeholders as being either in high demand or short supply. This suggests that there is an acute shortage or high level of demand for skills across the labour market generally. For that reason, these occupations are all included in the final list.

Table 14: Transversal occupations in high demand (OIHD)

HIGHEST		
1211.	Finance Managers	7 sources, 4 occupations
1219.	Business Services & Administration	11 sources, 8 occupations
1221.	Sales & Marketing Managers	10 sources, 5 occupations
1321.	Manufacturing Managers	5 sources, 5 occupations
1323.	Construction Managers	6 sources, 2 occupations
1324.	Supply, Distribution & Related Managers	6 sources, 5 occupations
1331.	ICT Service Managers	9 sources, 6 occupations
1349.	Professional Services Managers nec	8 sources, 8 occupations
2132.	Farming, Forestry & Fisheries Advisors	5 sources, 5 occupations
2142.	Civil Engineers	6 sources, 2 occupations
2149.	Engineering Professionals nec	5 sources, 5 occupations
3113.	Electrical Engineering Technicians	6 sources, 3 occupations
6711.	Building & Related Electricians	12 sources, 2 occupations (all but 2 are Electrician)
6712.	Electrical Mechanics & Fitters	9 sources, 6 occupations

HIGHER	
2144. Mechanical Engineers	5 sources, 3 occupations (mainly Mechanical Engineering)
2511. Systems Analysts	6 sources, 1 occupation (with specialisations)
2512. Software Developers	8 sources, 3 occupations
3513. Computer Network & Systems Technicians	7 sources, 2 occupations
6415. Carpenters & Joiners	6 sources, 3 occupations
6533. Agricultural & Industrial Machinery Mechanics & Repairers	11 sources, 10 occupations

HIGH	
1212. Human Resource Managers	8 sources, 5 occupations
2121. Mathematicians, Actuaries & Statisticians	5 sources, 2 occupations
2166. Graphic & Multimedia Designers	5 sources, 4 occupations
2521. Database Designers & Administrators	6 sources, 1 occupation (various specialisations)
2523. Computer Network Professionals	5 sources, 2 occupations

6.2 Moderate demand across the labour market

The occupations in this category were reported by a limited number of sources. However, the nature of the occupations is such that they are not universally applicable across the labour market. Thus they are included on the basis that the reporting sources included the primary 'custodian' of the occupation. In some cases, such as Social Workers and Psychologists, other sources (the Safety and Security Education and Training Authority [SASSETA] and the Mining Qualifications Authority [MQA]) reported scarcity. However, the factors driving scarcity in those sectors were not well defined in their submissions. The occupations are, nevertheless, included on the strength of the submission by the Health and Welfare Sector Education and Training Authority (HWSETA).

Table 15: Moderate demand across the labour market

HIGHEST		
1311.	Agricultural & Forestry Production	4 sources, 3 occupations
2141.	Industrial & Production Engineers	3 sources, 4 occupations
2331.	Secondary or Intermediate & Senior Education Teachers	2 sources, 2 occupations
2341.	Primary School or Foundational Phase Teachers	2 sources, 2 occupations
2412.	Financial & Investment Advisors	2 sources, 4 occupations
2611.	Lawyers	2 sources, 2 occupations
3112.	Civil Engineering Technicians	4 sources, 3 occupations
3115.	Mechanical Engineering Technicians	4 sources, 3 occupations
3118.	Draughtspersons	3 sources, 1 occupation
3123.	Construction Supervisors	2 sources, 2 occupations
3132.	Incinerator & Water Treatment Plant Operators	3 sources, 3 occupations
3434.	Chefs	3 sources, 1 occupation
3512.	Information & Communications Technicians	2 sources, 1 occupation
3521.	Broadcasting & Audiovisual Technicians	3 sources, 6 occupations
4221.	Travel Consultants & Clerks	2 sources, 2 occupations

HIGHER		
1421.	Retail & Wholesale Trade Managers	3 sources, 2 occupations
2161.	Building Architects	3 sources, 1 occupation
2211.	Generalist Medical Practitioners	2 sources, 1 occupation
2262.	Pharmacists	3 sources, 3 occupations
2342.	Early Childhood Educators	2 sources, 1 occupation
2413.	Financial Analysts	3 sources, 1 occupation
2423.	Personnel & Careers Professionals	4 sources, 2 occupations (mainly SDF)
2635.	Social Work & Counselling Professionals	3 sources, 1 occupation
3114.	Electronics Engineering Technicians	2 sources, 1 occupation
3117.	Mining & Metallurgical Technicians*	2 sources, 4 occupations
3131.	Power Production Plant Operators*	3 sources, 8 occupations (principally WCPO)

3142.	Agricultural Technicians	3 sources, 1 occupation
4111.	General Office Clerks	3 sources, 1 occupation
4323.	Transport Clerks	2 sources, 1 occupation
6426.	Plumbers & Pipe Fitters	4 sources, 7 occupations (mainly WCPO)
6512.	Welders & Flame Cutters	3 sources, 3 occupations (mainly WCPO)
6513.	Sheet Metal Workers	2 sources, 2 occupations
6523.	Metalworking Machine Tool Setters	2 sources, 2 occupations
7332.	Heavy Truck & Lorry Drivers	2 sources, 1 occupation

HIGH

1439.	Services Managers nec	3 sources, 2 occupations
2131.	Biologists, Botanists & Zoologists	3 sources, 7 occupations
2143.	Environmental Engineers	3 sources, 2 occupations
2145.	Chemical Engineers	2 sources, 2 occupations
2221.	Nursing Professionals	3 sources, 12 occupations (mainly HWSETA)
2251.	Veterinarians	2 sources, 1 occupation (various veterinary specialisations)
2263.	Environmental & Occupational Health & Hygiene Professionals	4 sources, 2 occupations
2513.	Web & Multimedia Developers	4 sources, 2 occupations
2529.	Database & Network Professionals nec	4 sources, 1 occupation
2631.	Economists	2 sources, 1 occupation
2634.	Psychologists	3 sources, 2 occupations
3119.	Physical & Engineering Science Technicians	4 sources, 3 occupations (mainly WCPO)
3257.	Environmental & Occupational Health Inspectors & Associates	4 sources, 5 occupations
3323.	Buyers	2 sources, 2 occupations
3339.	Business Services Agents nec	4 sources, 4 occupations
4321.	Stock Clerks	2 sources, 2 occupations
5244.	Contact Centre Salespersons	3 sources, 1 occupation
5414.	Security Guards	2 sources, 2 occupations
7161.	Food & Related Products Machine Operators	2 sources, 1 occupation
7343.	Crane, Hoist & Related Plant Operators	4 sources, 3 occupations

6.3 Sector-specific

Unless otherwise specified, only one occupation has been reported under each Unit Group. The occupations are included because they were reported by the primary user or 'custodian' of that occupation, and no other source could reasonably be expected to have reported on them. For example, Hotel Manager is an occupation that is associated only with the Hospitality Industry and was reported by the Culture, Art, Tourism, Hospitality, and Sport Sector Education and Training Authority (CATHSSETA) alone.

Entries marked with a (*) relate to the Western Cape Premier's Office, which means the need is specific to that initiative in that province. This is a province-specific need that has not been identified by any other source. Others are from the Strategic Integrated Projects (SIPs) List, but have no supporting substantiation within the report. Therefore, these occupations are *excluded* from the final list.

Entries marked with a (#) are from the Talent Survey; thus, although the entry is from a single source, the research cut across the whole labour market. These occupations are *included* in the list.

Table 16: Sector-specific occupations

HIGHEST		
1112.	Senior Government Officials	1 source, 3 occupations
2114.	Geologists & Geophysicists	
2146.	Mining Engineers, Metallurgists & Related Professionals	1 source, 2 occupations
2519.	Software & Applications Developers*	
3123.	Construction Supervisors	
3212.	Medical & Pathology Laboratory Technicians	
5311.	Childcare Workers	

HIGHER		
1411.	Hotel Managers	
2311.	University & Higher Education Teachers	
2514.	Applications Programmers	
3114.	Electronics Engineering Technicians	
3117.	Mining & Metallurgical Technicians*	1 source, 3 occupations
3321.	Insurance Representatives	1 source, 2 occupations
3324.	Trade Brokers	
3432.	Interior Designers & Decorators	
3439.	Artistic & Cultural Associate Professionals	

4212.	Bookmakers, Croupiers & Related Gaming Workers	1 source, 2 occupations
4313.	Payroll Clerks	
6613.	Jewellery & Precious Metal Workers	1 source, 2 occupations
6834.	Upholsterers & Related Workers	

HIGH		
5131.	Waiters*	1 source, 2 occupations
5141.	Hairdressers	
5329.	Personal Care Workers in Health Services nec	
6113.	Gardeners, Ornamental Horticultural and Nursery Growers*	
6413.	Stonemasons, Stone Cutters, Splitters and Carvers#	
6419.	Building Frame & Related Trades Workers nec	
6722.	ICT Installers & Servicers & Related Occupations	
7114.	Cement, Stone & Other Mineral Products Machine Operators	
7341.	Mobile Farm & Forestry Plant Operators	
7344.	Lifting Truck Operators	

6.4 The outliers

Some occupational groups that emerged from the quantitative findings did not have supporting evidence from the submissions made by sector education and training authorities (SETAs) and stakeholders through the Call for Evidence (CFE), or the other documented sources reviewed above. These were followed up through interviews with industry stakeholders drawn from employer associations and professional bodies. The respondents were selected on the basis of their ability to comment on the selected occupational groups and on the availability of such respondents. Thus, the final decision on which occupations to include or exclude was based on the following rationale:

- Those Unit Groups (four-digit level) for which only one or two occupations are listed on the

Organising Framework for Occupations (OFO) have been included automatically on the basis that they are the ones reflected in the findings from the data.

- For the Unit Group findings for which there are multiple occupations listed on the OFO, the relevant industry or professional body was contacted to establish which specific occupations are in high demand, the underlying causes or drivers of demand, and if education and training (E&T) interventions could contribute to addressing the shortage. It was not possible to interview all relevant bodies, as respondents were not always available.

- For the remainder of the findings, the Migration Advisory Committee (MAC)[29] approach was

29 The approach is adapted from the MAC Report (2010) methodology.

adapted, based on the researchers' knowledge of the South African labour market, to include or exclude the Unit Groups. The MAC approach tests the following:

– Is this a *skilled* occupation?
– Is there a *shortage* of appropriately skilled workers in the labour market?
– Is the inclusion of the occupation *sensible* given the purpose of the list?

6.5 Feedback from stakeholders

The following is the feedback from stakeholders on the drivers of demand for specific occupations, and the recommendations on the inclusion or exclusion of the occupations on the OIHD list.

6.5.1 Clerical Support Workers

Clerical Support occupations include Secretaries, Typists and Word-Processing Operators, Telephone Switchboard Operators, and Coding, Proofreading and Related Clerks. These occupations are in high demand in general, especially within the call centre environment, due to increased demand for the services. Significantly, the level of skill required has been raised. Within the call centres, demand is shifting from voice-based support to written online chat. This means operators need to be multiskilled in both telephony and word-processing skills. The nature of the occupations is evolving and, to some extent, they are merging.

A similar change is occurring in the type of secretary demanded in workplaces. According to the Association for Office Professionals of South Africa (OPSA), employers are increasingly seeking assistants who are able to act as strategic partners in the conduct of their business. Secretaries are no longer managing calendars and correspondence but are increasingly taking on the more complex responsibilities such as event management and corporate social responsibility, and even holding meetings on behalf of their employer. Entry-level requirements are also rising, with some employers expecting their secretaries to hold tertiary qualifications.

Technology is a big driver of these developments. Workplaces are changing, and thus the role of support functions is evolving apace.

6.5.2 Health and Personal Care Workers

In the past, Dental Assistants (DAs) were not required to be fully qualified in order to work in dentists' rooms. They learnt on the job and were able to register with the Health Professions Council of South Africa (HPCSA), irrespective of their qualification status. However, owing to a change in the relevant regulations, DAs are now required to be qualified both to work in the industry and to register with the HPCSA. Those DAs who were previously registered but unqualified had until October 2017 to remedy their status. This has been the main driver of demand in this occupation, which has also led to wage pressure as Dentists compete for the few qualified DAs available in the labour market.

The other occupation within this category that is on the rise is that of Oral Hygienists (OHs). According to the Oral Hygienists Association of South Africa (OHASA), demand is mainly coming from increased demand for cosmetic surgery. More dentists are going into this field, and offering oral hygiene as a service is very lucrative for dental practices. Although OHs are now allowed to open independent practices, few have taken up the option due to unequal pay by medical schemes. Thus the potential exists for this occupation to grow more substantially, especially in respect of the promotion of oral health education in schools and in the broader population.

Finally, Physiotherapy Technicians and Assistants are currently only allowed to work in the public sector. According to the South African Society of Physiotherapy (SASP), the existing cohort of technicians and assistants i close to retirement age. There has not been a stable pipeline of new entrants to the profession due to a lack of providers offering the requisite qualifications. The University of the Witwatersrand offered a two-year programme until 2002, when the Minister of Education ruled that diploma courses bearing

240 credits or less could not be offered at tertiary institutions. Since then, no other providers have taken up the gap, thus leading to a shortage of skills in this field.

6.5.3 Services Workers

Occupations in the Services Industries that required follow-up included: Conference and Event Planners, Travel Attendants, Pawnbrokers and Moneylenders, Building Caretakers, and Firefighters. Respondents were not available for all of these occupations. However, the feedback from the travel industry gave rise to interesting observations about Travel Attendants. The nature of the occupation is that it attracts younger workers who generally remain in the occupation for a limited time. There is thus a relatively high turnover, which may be reflected as high demand within the quantitative model. This provides a cautionary message and highlights the value of expert validation in the interpretation of the findings. The same phenomenon may apply to the other service occupations that have relatively low barriers to entry and relatively high turnover. This is an area that would warrant further research.

6.5.4 Machine Operators

Two broad industries were represented in the findings – Plastics, and Textiles and Footwear. The findings in respect of the two were very distinctive owing to the evolution of the industries.

Within the Plastics Sector, production processes have become highly mechanised and automated. Machine Operators, as traditionally understood, are becoming increasingly redundant. In their place, more-skilled technicians and professionals able to set up and troubleshoot complex equipment are in demand. The recommendation from the Plastics Convertors Association of South Africa (PCASA) was thus *not* to include these occupations on the OIHD list, as the current stock of graduates is becoming increasingly unemployable. Given this feedback, the factors that led to this finding in the quantitative model are unclear. One possible explanation is that those operators who do remain are highly

experienced, and this is reflected in higher wages, longer tenure, and increased job intensity.

The Textiles and Footwear Industry is more complex. The industry experienced a significant shock at the turn of the century, when cheaper imports were allowed into the country tariff-free. This led to a huge shrinkage in the sector, leaving a very small segment of the industry still able to compete. Those companies that remained moved into niche markets. In relation to Textiles Machine Operators, respondents indicated that there are nine distinct subsectors, each with its own specific needs. Overall, there is a critical need for warp and weft machine operators, weaving machine operators, non-woven textiles machine operators, dry finishing machine operators, wet process machine operators, and braiding machine operators. Knitting machine operators are in short supply within the narrow weaving industries, but less so in the others that responded.

The main constraint facing the industry, according to respondents, is that the training infrastructure which previously existed effectively collapsed with the industry around the year 2000. Currently, all training occurs in the workplace, and very few relevant qualifications still remain. A process is currently under way together with the Quality Council for Trades and Occupations (QCTO) to develop new training and assessment methodologies to support employers with the implementation of learnerships. The Fibre Processing and Manufacturing Sector Education and Training Authority (FP&MSETA) has been a strong partner in this process, but more capacity and support are needed to meet the needs of this industry. The absorption rate of graduates is relatively high, not just for machine operators but for trades workers too.

Although it was not possible to get direct input from the Footwear Industry, a recent feasibility study by the Department of Trade and Industry (dti) points to similar needs. The feasibility study looked into the need for a Leather Research Institute in South Africa. Amongst the findings was that there was a strong need, expressed by 70% of employers, for trained machined operators, thus strongly substantiating the inclusion of such occupation in the list (ICLT, 2016).

6.6 Skilled, shortage, sensible

The outcome of the inputs and further analysis yielded the list in Table 17, with Table 18 providing an explanation for those occupations that were excluded.

Table 17: Further analysis of occupations that had no documented qualitative evidence

HIGHEST		Verification
2619.	Legal Professionals nec	Literature review
4413.	Coding, Proofreading & Related Clerks	Interview with BPESA, OPSA
5321.	Health Care Assistants	No OFO codes, no verification

HIGHER		Verification
1113.	Traditional Chiefs & Heads of Villages	Excluded
3251.	Dental Assistants & Therapists	Interview with SADA, OHASA
3314.	Statistical, Mathematical & Related Associate Professionals	3S
3332.	Conference & Event Planners	3S
3421.	Athletes & Sports Players	Excluded
4131.	Typists & Word-Processing Operators	Interview with BPESA, OPSA
4132.	Data Entry Clerks	Interview with BPESA, OPSA
5111.	Travel Attendants & Travel Stewards	Input from AASA, 3S
6614.	Potters & Related Workers	Excluded
6713.	Electrical Line Installers & Repairers	2 occupations
6842.	Shotfirers & Blasters	2 occupations
7154.	Bleaching, Dyeing & Fabric Cleaning Machine Operators	Interviews with NTMA, NFMA, F Barnard (industry expert)
7156.	Shoemaking & Related Machine Operators	Literature review

HIGH		Verification
2353.	Other Language Teachers	Literature review
2651.	Visual Artists	Excluded
3141.	Life Science Technicians (Excluding Medical)	3S
3252.	Medical Records & Health Information Technicians	1 occupation
3255.	Physiotherapy Technicians & Assistants	Interview with SASP
4121.	Secretaries (General)	Interview with BPESA, OPSA
4213.	Pawnbrokers & Moneylenders	3S
4223.	Telephone Switchboard Operators	Interview with BPESA, OPSA
5153.	Building Caretakers	3S
5322.	Home-Based Personal Care Workers	3S
5411.	Firefighters	2 occupations

6211.	Forestry & Related Workers	2 occupations
6421.	Roofers	2 occupations
6524.	Metal Polishers, Wheel Grinders & Tool Sharpeners	3S
6615.	Glass Makers, Cutters, Grinders & Finishers	2 occupations
6832.	Garment & Related Patternmakers & Cutters	Interview with NTMA, NFMA, F Barnard
7142.	Plastic Products Machine Operators	Interview with PCASA
7152.	Weaving & Knitting Machine Operators	Interview with NTMA, NFMA, F Barnard
7159.	Textile, Fur & Leather Products Machine Operators nec	1 occupation
7219.	Assemblers nec	1 occupation

Some of the occupations listed in the CFE were occupations for which no OFO code has yet been registered. It was thus not possible to identify a match with any of the Unit Groups listed here. A theme that emerged in some of the submissions was the need for 'green' occupations, either as new occupations or as specialisations within existing occupations.

Table 18 summarises all the occupations that were excluded from the consolidated list, citing reasons for their exclusion. In all, 14 Unit Groups were excluded from the original list of 143.

Table 18: Excluded occupations

Unit Group	Summary	Substantiation
1113. Traditional Chiefs & Heads of Villages	3S	Custom/niche occupation for which no labour market interventions can be planned.
2651. Visual Artists	3S	Custom/niche occupation for which no labour market interventions can be planned.
3117. Mining & Metallurgical Technicians	2 sources, 4 occupations	Exclude – only reported by WPCO and SIPs. SIPs Report does not provide any substantive reason for inclusion of these occupations. No evidence of any initiatives requiring the skills concerned. WPCO is provincially focused. Sector is in decline globally.
3131. Power Production Plant Operators	3 sources, 8 occupations (principally WCPO)	Exclude – of the 8 occupations, the majority are listed by the WCPO, with EWSETA listing only 1. TIPS's primary reason for all its proposed occupations is the greening of existing occupations.
3255. Physiotherapy Technicians & Assistants	Interview with SA Society of Physiotherapy (SASP)	The OFO listed occupations do not match the activities recognised by the industry body. OFO needs to be reviewed and updated to include PTAs. Large proportion of current stock of PTAs are nearing retirement, with very little output from E&T institutions due to lack of appropriate training facilities. There is a strong need to invest in infrastructure. Only public sector employs PTAs.
3421. Athletes & Sports Players	3S	Custom/niche occupation for which no labour market interventions can be planned.
4213. Pawnbrokers & Money-lenders	3S	No evidence of shortage, do not meet the 'sensible' criterion.
5111. Travel Attendants & Travel Stewards	Input from AASA, 3S	High turnover leads to constant demand. Travel Attendants do not remain in these occupations for long; hence the need for them to be replaced constantly. No shortage or increased demand.
5153. Building Caretakers	3S	Out of 6 occupations/specialisations, Maintenance Officer provisionally fits the skilled criterion. Otherwise: occupations not skilled; no evidence of shortage; relatively easy to find suitable workers in the labour market.
5321. Health Care Assistants		No OFO codes; not clear which occupations are referred to.
6523. Metalworking Machine Tool Setters	2 sources, 2 occupations	Exclude – FoodBev SETA cites the need based on WSP vacancy and HTF data, but there is no real indication that this is an occupation in high demand anywhere else in the labour market. The other source is WCPO, which is province-specific.
6524. Metal Polishers, Wheel Grinders & Tool Sharpeners	3S	No evidence of shortage. The six-digit occupations are mostly in the Mining Industry, which is a sector in decline.
6614. Potters & Related Workers	3S	Custom/niche occupation for which no labour market interventions can be planned.
7142. Plastic Products Machine Operators	Interview with PCASA	Occupations are becoming redundant due to increased automation on production lines. No need for increased supply.

Final integrated OIHD list
(integrated qualitative list,
four- and six-digit level)
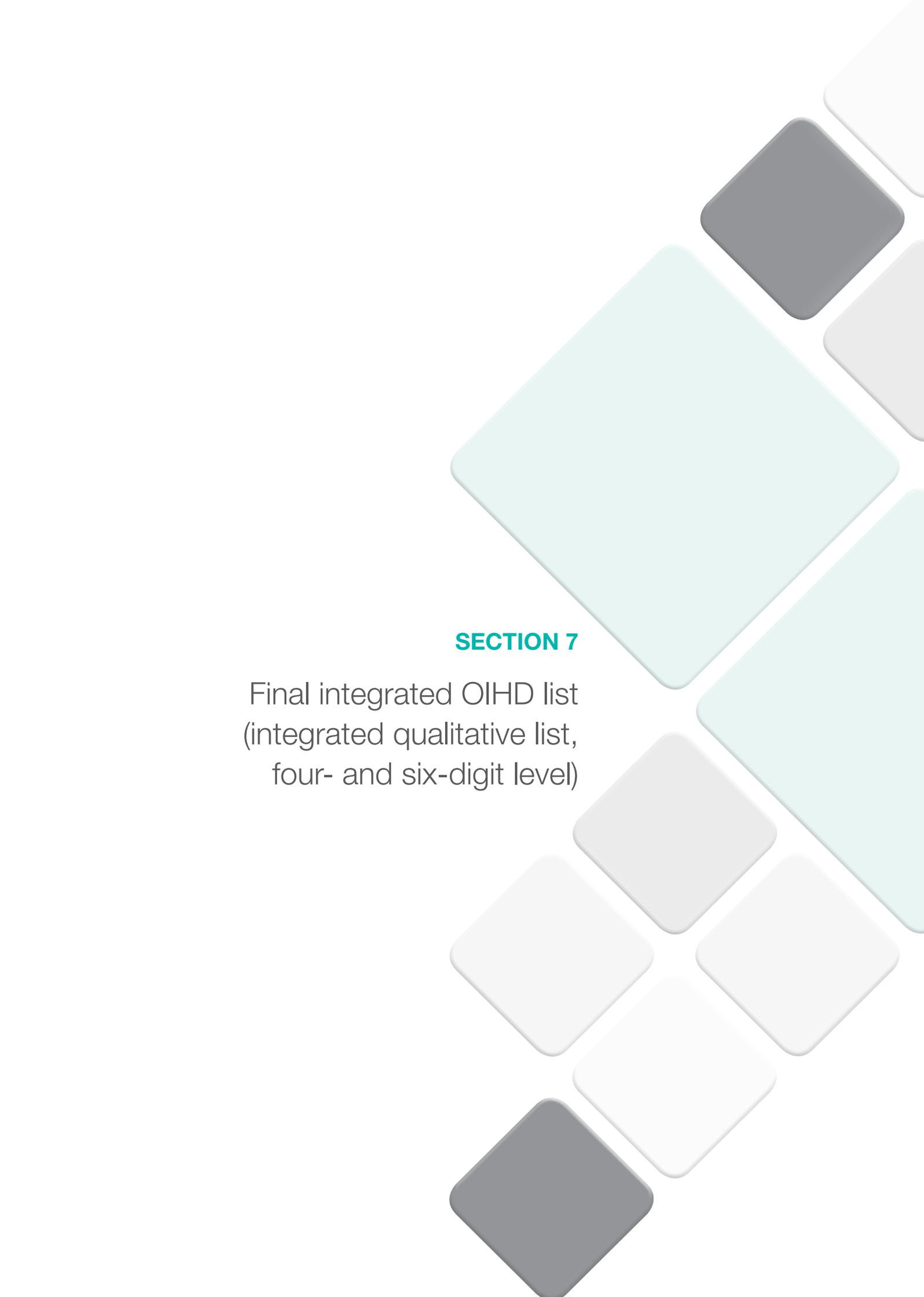
SECTION 7

FINAL INTEGRATED OIHD LIST (INTEGRATED QUALITATIVE LIST, FOUR- AND SIX-DIGIT LEVEL)

7.1 Consolidated list

This is the consolidated list of occupations at the four- and six-digit level that emerged from the process outlined in Table 8.

Table 19: Consolidated list of occupations at the four- and six-digit level

HIGHEST			
	Occupation		**OFO code**
1	1112.	Senior Government Officials	
1.1		General Manager Public Service	111202
1.2		Senior Government Official	111204
1.3		Senior Government Manager	111207
2	1211.	Finance Managers	
2.1		Chief Financial Officer	121101
2.2		Finance Manager	121101
2.3		Management Accountant	121101
2.4		Payroll Manager	121102
2.5		Credit Manager	121103
2.6		Internal Audit Manager	121104
3	1219.	Business Services & Administration	
3.1		Corporate General Manager	121901
3.2		Corporate Services Manager	121902
3.3		Physical Asset Manager	121903
3.4		Contract Manager	121904
3.5		Programme or Project Manager	121905
3.6		Labour Recruitment Manager	121907
3.7		Quality Systems Manager	121908
3.8		Sustainability Manager	121909

4	1221.	Sales & Marketing Managers	
4.1		Sales & Marketing Manager	122101
4.2		Sales Executive	122102
4.3		Sales Manager	122102
4.4		Director of Marketing	122103
4.5		Interactive & Direct Marketing Strategist	122104
4.6		Client Services Advisor	122105
4.7		Customer Service Manager	122105
5	1311.	Agricultural & Forestry Production	
5.1		Farm Manager	131101
5.2		Production/Operations Manager	131102
5.3		Production/Operations Supervisor (Forestry)	131103
6	1321.	Manufacturing Managers	
6.1		Manufacturer	132101
6.2		Production/Operations Manager (Manufacturing)	132102
6.3		Engineering Manager	132104
6.4		Power Generation Operations Manager	132105
6.5		Manufacturing Quality Manager	132106
7	1323.	Construction Managers	
7.1		Construction Project Manager	132301
7.2		Project Builder	132302
8	1324.	Supply, Distribution & Related Managers	
8.1		Supply & Distribution Manager	132401
8.2		Logistics Manager	132402
8.3		Road Transport Manager	132403
8.4		Warehouse Manager	132404
8.5		Fleet Manager	132405
9	1331.	ICT Service Managers	
9.1		Chief Information Officer	133101
9.2		ICT Project Manager	133102
9.3		Data Management Manager	133103
9.4		Application Development Manager	133104
9.5		Information Technology Manager	133105
9.6		Information Systems Director	133106
10	1349.	Professional Services Managers nec	
10.1		Environmental Manager	134901
10.2		Laboratory Manager	134902
10.3		Small Business Manager	134903
10.4		Office Manager	134904
10.5		Archives Manager	134907
10.6		Museum Manager	134909

10.7		Operations Manager (Non-Manufacturing)	134915
10.8		Operations Foreman (Non-Manufacturing)	134916
11	2114.	Geologists & Geophysicists	
11.1		Seismologist	211402
12	2132.	Farming, Forestry & Fisheries Advisors	
12.1		Agriculture Consultant	213201
12.2		Agricultural Scientist	213202
12.3		Forest Scientist	213203
12.4		Winemaker	213204
12.5		Food & Beverage Scientist	213205
13	2141.	Industrial & Production Engineers	
13.1		Process Engineer	214101
13.2		Industrial Engineer	214101
13.3		Industrial Engineering Technologist	214102
13.4		Production Engineer	214103
13.5		Production Engineering Technologist	214104
14	2142.	Civil Engineers	
14.1		Civil Engineer	214201
14.2		Industrial Engineer	214201
14.3		Civil Engineering Technologist	214202
15	2146.	Mining Engineers, Metallurgists & Related Professionals	
15.1		Mining Engineer	214601
15.2		Mining Engineering Technologist	214602
16	2149.	Engineering Professionals nec	
16.1		Quantity Surveyor	214904
16.2		Agricultural Engineer	214905
16.3		Agricultural Engineering Technologist	214906
16.4		Materials Engineer	214907
16.5		Materials Engineering Technologist	214908
16.6		Materials Non-Destructive Testing Operator	214908
17	2331.	Secondary or Intermediate & Senior Education Teachers	
17.1		Senior Secondary Schoolteacher (Grades 10–12)	233107
17.2		Junior Secondary Schoolteacher (Grades 8–9)	233108
18	2341.	Primary School or Foundational Phase Teachers	
18.1		Foundational Phase Schoolteacher	234101
18.2		Senior Primary Schoolteacher (Grades 4–7)	234102
19	2412.	Financial & Investment Advisors	
19.1		Investment Analyst	241201
19.2		Investment Manager	241202
19.3		Investment Advisor	241203
19.4		Financial Markets Practitioner	241204

20	2519.	Software & Applications Developers	
20.1		Quality Assurance Analyst (Computers)	251901
21	2611.	Lawyers	
21.1		Attorney	261101
21.2		Advocate	261106
22	2619.	Legal Professionals nec	
22.1		Adjudicator	261901
22.2		Legislation Facilitator	261902
22.3		Master of the Court	261903
22.4		Family Court Registrar	261904
23	3112.	Civil Engineering Technicians	
23.1		Civil Engineering Technician	311201
23.2		Surveying or Cartographic Technician	311202
23.3		Geometrician	311202
23.4		Town Planning Technician	311203
24	3113.	Electrical Engineering Technicians	
24.1		Electrical Engineering Technician	311301
24.2		Electric Substation Operations Manager	311302
24.3		Energy Efficiency Technician	311303
25	3115.	Mechanical Engineering Technicians	
25.1		Mechanical Engineering Technician	311501
25.2		Pressure Equipment Inspector	311502
25.3		Aeronautical Engineering Technician	311503
26	3118.	Draughtspersons	
26.1		Draughtsperson	311801
27	3123.	Construction Supervisors	
27.1		Building Associate	312301
27.2		Clerk of Works	312301
27.3		Construction Supervisor	312303
28	3132.	Incinerator & Water Treatment Plant Operators	
28.1		Water Plant Operator	313201
28.2		Waste Materials Plant Operator	313202
28.3		Water Process Controller	313203
29	3212.	Medical & Pathology Laboratory Technicians	
29.1		Medical Laboratory Technician	321201
30	3434.	Chefs	
30.1		Chef	343401
31	3512.	Information & Communications Technicians	
31.1		ICT Communications Assistant	351201

32	3521.	Broadcasting & Audiovisual Technicians	
32.1		Broadcast Transmitter Operator	352101
32.2		Camera Operator (Film, Television or Video)	352102
32.3		Sound Technician	352103
32.4		Television Equipment Operator	352104
32.5		Radio Station Operator	352105
32.6		Production Assistant (Film, Television or Radio)	352106
33	4221.	Travel Consultants & Clerks	
33.1		Tourist Information Officer	422101
33.2		Travel Consultant	422102
34	4413.	Coding, Proofreading & Related Clerks	
34.1		Coding Clerk	441301
34.2		Proofreader	441302
35	5311.	Childcare Workers	
35.1		Childcare Worker	531101
36	6711.	Building & Related Electricians	
36.1		Electrician	671101
36.2		Electrical Installation Inspector	671102
37	6712.	Electrical Mechanics & Fitters	
37.1		Millwright	671202
37.2		Mechatronics Technician	671203
37.3		Lift Mechanic	671204
37.4		Weapon Systems Mechanic	671205
37.5		Armature Winder	671207
37.6		Transportation Electrician	671208

HIGHER			
	Occupation		**OFO code**
38	1411.	Hotel Managers	
38.1		Hotel Manager	141101
39	1421.	Retail & Wholesale Trade Managers	
39.1		Importer or Exporter	142101
39.2		Retail Manager	142103
39.3		Service Station Manager	142103
40	2144.	Mechanical Engineers	
40.1		Mechanical Engineer	214401
40.2		Mechanical Engineering Technologist	214402
40.3		Aeronautical Engineer	214403
41	2161.	Building Architects	
41.1		Architect	216101
42	2211.	Generalist Medical Practitioners	
42.1		General Medical Practitioner	221101
43	2262.	Pharmacists	
43.1		Hospital Pharmacist	226201
43.2		Industrial Pharmacist	226202
43.3		Retail Pharmacist	226203
44	2311.	University & Higher Education Teachers	
44.1		University Lecturer	231101
44.2		Professor/Associate Professor	231101
45	2342.	Early Childhood Educators	
45.1		Early Childhood Development Practitioner	234201
46	2413.	Financial Analysts	
46.1		Financial Investment Advisor	241301
47	2423.	Personnel & Careers Professionals	
47.1		Skills Development Facilitator/Practitioner	242302
47.2		Labour Market Analyst	242306
48	2511.	Systems Analysts	
48.1		ICT Systems Analyst	251101
49	2512.	Software Developers	
49.1		Software Developer	251201
49.2		ICT Risk Specialist	251201
49.3		Programmer Analyst	251202
49.4		Developer Programmer	251203
50	2514.	Applications Programmers	
50.1		Applications Programmer	251401

51	2635.	Social Work & Counselling Professionals	
51.1		Social Worker	263507
52	3114.	Electronics Engineering Technicians	
52.1		Electronic Engineering Technician	311401
53	3131.	Power Production Plant Operators	
53.1		Fossil Power Plant Process Controller	313102
53.2		Hydro Power Plant Process Controller	313103
53.3		Nuclear Power Plant Process Controller	313104
53.4		Wind Turbine Power Plant Process Controller	313105
53.5		Concentrated Solar Power (CSP) Plant Process Controller	313106
53.6		Weatherisation Installers & Technicians	313108
53.7		Solar Photovoltaic Service Technician	313109
53.8		Wind Turbine Service Technician	313110
54	3142.	Agricultural Technicians	
54.1		Agricultural Technician	314201
54.2		Agricultural Laboratory Technician	314201
55	3251.	Dental Assistants & Therapists	
55.1		Dental Assistant	325101
55.2		Dental Hygienist	325102
56	3314.	Statistical, Mathematical & Related Associate Professionals	
56.1		Mathematical Assistant	331401
56.2		Data Quality Officer	331401
56.3		Decision Support Analyst	331401
56.4		Statistical Assistant	331401
56.5		Actuarial Assistant	331401
57	3321.	Insurance Representatives	
57.1		Insurance Agent	332101
57.2		Insurance Broker	332102
58	3324.	Trade Brokers	
58.1		Commodities Trader	332401
59	3332.	Conference & Event Planners	
59.1		Events Manager	333201
60	3432.	Interior Designers & Decorators	
60.1		Visual merchandiser	343203
61	3439.	Artistic & Cultural Associate Professionals	
61.1		Light Technician	343902
62	3513.	Computer Network & Systems Technicians	
62.1		Computer Network Technician	351301
62.2		Geographic Information Systems Specialist	351302
62.3		Geographic Information Systems Technician	351302

63	4111.	General Office Clerks	
63.1		Client Services Administrator	411101
63.2		General Clerk	411101
63.3		Administrative Assistant	411101
64	4131.	Typists & Word-Processing Operators	
64.1		Word-Processing Operator	413101
64.2		Machine Shorthand Reporter	413102
65	4132.	Data Entry Clerks	
65.1		Data Entry Operator	413201
66	4212.	Bookmakers, Croupiers & Related Gaming Workers	
66.1		Gaming Worker	421202
66.2		Bookmaker's Clerk	421204
67	4313.	Payroll Clerks	
67.1		Payroll Clerk	431301
68	4323.	Transport Clerks	
68.1		Road Traffic Controller	432301
68.2		Transport Clerk	432301
69	6415.	Carpenters & Joiners	
69.1		Carpenter & Joiner	641501
69.2		Carpenter	641502
69.3		Shutter Hand	641502
69.4		Joiner	641503
70	6426.	Plumbers & Pipe Fitters	
70.1		Plumber	642601
70.2		Solar Installer	642602
70.3		Gas Practitioner	642603
70.4		Fire Services Plumber	642604
70.5		Plumbing Inspector	642605
70.6		Heat Pump Installer	642606
70.7		Pipe Fitter	642607
71	6512.	Welders & Flame Cutters	
71.1		Welder	651202
71.2		Fitter-Welder	651203
71.3		Gas Cutter	651204
72	6513.	Sheet Metal Workers	
72.1		Sheet Metal Worker	651301
72.2		Boilermaker	651302
73	6523.	Metal Working Machine Tool Setters	
73.1		Metal Machinist	652301
73.2		Fitter & Turner	652302

74	6533.	Agricultural & Industrial Machinery Mechanics & Repairers	
74.1		Industrial Machinery Mechanic	653301
74.2		Mechanical Equipment Repairer	653302
74.3		Mechanical Fitter	653303
74.4		Fitter	653303
74.5		Diesel Fitter	653304
74.6		Small Engine Mechanic	653305
74.7		Diesel Mechanic	653306
74.8		Heavy Equipment Mechanic	653307
74.9		Tractor Mechanic	653308
74.10		Forklift Mechanic	653309
74.11		Lubrication Equipment Mechanic	653310
75	6613.	Jewellery & Precious Metal Workers	
75.1		Goldsmith	661301
75.2		Diamond & Gemstone Setter	661302
76	6713.	Electrical Line Installers & Repairers	
76.1		Electrical Line Mechanic	671301
76.2		Cable Jointer	671302
77	6834.	Upholsterers & Related Workers	
77.1		Upholsterer	683401
78	6842.	Shotfirers & Blasters	
78.1		Shotfirer	684201
78.2		Blaster	684202
79	7154.	Bleaching, Dyeing & Fabric Cleaning Machine Operators	
79.1		Textile Wet Process Production Operator	715401
79.2		Textile Wet Process Finishing Machine Operator	715401
79.3		Textile Printing Machine Operator	715401
79.4		Fabric Bleaching Machine Operator	715401
79.5		Textile Dyeing Machine Operator/Textile Dyer	715401
79.6		Textile Dyeing & Printing Preparation Machine Operator	715401
80	7156.	Shoemaking & Related Machine Operators	
80.1		Footwear Cutting Production Machine Operator	715601
80.2		Footwear Closing Production Machine Operator	715602
80.3		Footwear Bottom Stock Production Machine Operator	715603
80.4		Footwear Lasting Production Machine Operator	715604
80.5		Footwear Finishing Production Machine Operator	715605
81	7332.	Heavy Truck & Lorry Drivers	
81.1		Lorry Driver	733201
81.2		Truck Driver (General)	733201

HIGH			
	Occupation		**OFO code**
84	1212.	Human Resource Managers	
82.1		Personnel/Human Resource Manager	121201
82.2		Training & Development Manager	121202
82.3		Business Training Manager	121202
82.4		Recruitment Manager	121204
82.5		Employee Wellness Manager	121205
82.6		Health & Safety Manager	121206
82.7		Safety, Health, Environment & Quality (SHE&Q) Practitioner	121206
83	1439.	Services Managers nec	
83.1		Security Services Manager	143904
83.2		Security Risk Assessment Manager	143904
83.3		Environmental Education Manager	143901
84	2121.	Mathematicians, Actuaries & Statisticians	
84.1		Actuary	212101
84.2		Statistician	212103
84.3		Statistical Modeller	212103
85	2131.	Biologists, Botanists & Zoologists	
85.1		Biologist (General)	213102
85.2		Biochemist	213104
85.3		Biotechnologist	213105
85.4		Botanist	213106
85.5		Marine Biologist	213107
85.6		Microbiologist	213108
85.7		Zoologist	213109
86	2143.	Environmental Engineers	
86.1		Environmental Engineer	214301
86.2		Environmental Impact & Restoration Analyst	214302
87	2145.	Chemical Engineers	
87.1		Chemical Engineer	214501
87.2		Chemical Engineering Technologist	214502
88	2166.	Graphic & Multimedia Designers	
88.1		Graphic Designer	216601
88.2		Illustrator	216602
88.3		Multimedia Designer	216603
88.4		Web Designer	216604

89	2221.	Nursing Professionals	
89.1		Registered Nurse (Aged Care)	222102
89.2		Registered Nurse (Child & Family Health)	222103
89.3		Registered Nurse (Community Health)	222104
89.4		Registered Nurse (Critical Care & Emergency)	222105
89.5		Registered Nurse (Developmental Disability)	222106
89.6		Registered Nurse (Disability & Rehabilitation)	222107
89.7		Registered Nurse (Medical)	222108
89.8		Registered Nurse (Medical Practice)	222109
89.9		Registered Nurse (Mental Health)	222110
89.10		Registered Nurse (Operating Theatre)	222111
89.11		Registered Nurse (Surgical)	222112
89.12		Nurse Manager	222116
90	2251.	Veterinarians	
90.1		Veterinarian	225101
90.2		Veterinary Pathologist	225101
90.3		Veterinary Surgeon	225101
90.4		Veterinary Parasitologist	225101
90.5		Veterinary Epidemiologist	225101
90.6		Veterinary Pathologist	225101
90.7		Animal Doctor	225101
91	2263.	Environmental & Occupational Health & Hygiene Professionals	
91.1		Environmental Health Officer	226301
91.2		Construction Health & Safety Technician	226302
91.3		Safety, Health, Environment & Quality (SHE&Q) Practitioner	226302
92	2353.	Other Language Teachers	
92.1		English as a Second Language Teacher	235301
92.2		English Conversation Instructor	235301
92.3		English Language Teacher	235301
93	2513.	Web & Multimedia Developers	
93.1		Multimedia Specialist	251301
93.2		Web Developer	251302
94	2521.	Database Designers & Administrators	
94.1		Database Designer & Systems Administrator	252101
94.2		Database Designer & Administrator	252101
95	2523.	Computer Network Professionals	
95.1		Computer Network & Systems Engineer	252301
95.2		Network Analyst	252302
96	2529.	Database & Network Professionals nec	
96.1		ICT Security Specialist	252901

97	2631.	Economists	
97.1		Labour Market Economist	263101
97.2		Economist	263101
98	2634.	Psychologists	
98.1		Clinical Psychologist	263401
98.2		Psychometrician	263409
99	3119.	Physical & Engineering Science Technicians	
99.1		Food & Beverage Technician	311903
99.2		Manufacturing Technician	311904
99.3		Industrial Engineering Technician	311905
99.4		Environmental Engineering Technician	311906
100	3141.	Life Science Technicians (Excluding Medical)	
100.1		Life Science Technician	314101
100.2		Environmental Science Technician	314102
101	3252.	Medical Records & Health Information Technicians	
101.1		Health Information Manager	325201
102	3257.	Environmental & Occupational Health Inspectors & Associates	
102.1		Environmental & Occupational Health Inspector	325701
102.2		Marine Safety Officer	325702
102.3		Agricultural/Horticultural Produce Inspector	325703
102.4		Aquaculture Produce Analyst	325704
102.5		Safety Inspector	325705
103	3323.	Buyers	
103.1		Retail Buyer	332301
103.2		Procurement Officer	332302
104	3339.	Business Services Agents nec	
104.1		Auctioneer	333901
104.2		Sales Representative (Business Services)	333903
104.3		Supply Chain Practitioner	333905
104.4		Marketing Coordinator	333908
105	4121.	Secretaries (General)	
105.1		Secretary (General)	412101
106	4223.	Telephone Switchboard Operators	
106.1		Phone Centre Operator	422301
106.2		Shift Telephonist	422301
106.3		Telecom Operator	422301
106.4		PABX Operator	422301
106.5		Telephone Operator/Attendant	422301
107	4321.	Stock Clerks	
107.1		Stock Clerk/Officer	432101
107.2		Dispatching & Receiving Clerk/Officer	432102

108	5131.	Waiters	
108.1		Waiter	513101
108.2		Cafe Worker	513102
109	5141.	Hairdressers	
109.1		Hairdresser	514101
110	5244.	Contact Centre Salespersons	
110.1		Call Centre Salesperson	524401
111	5322.	Home-Based Personal Care Workers	
111.1		Residential Care Officer	532201
111.2		Aged or Disabled Carer	532202
111.3		Community Care Worker	532203
112	5329.	Personal Care Workers in Health Services nec	
112.1		Nursing Support Worker	532903
113	5411.	Firefighters	
113.1		Firefighter	541101
113.2		Hazardous Materials Removal Worker	541102
114	5414.	Security Guards	
114.1		Aviation Security Trainer/Officer	541401
114.2		Security Officer	541401
114.3		Security Electronic Installations Officer	541401
114.4		Retail Loss Prevention Officer	541403
115	6211.	Forestry & Related Workers	
115.1		Tree Feller	621101
115.2		Forest & Conservation Worker	621102
116	6413.	Stonemasons, Stone Cutters, Splitters & Carvers	
116.1		Stonemason	641301
117	6419.	Building Frame & Related Trades Workers nec	
117.1		Scaffold Erector	641902
118	6421.	Roofers	
118.1		Roof Tiler	642101
118.2		Roof Plumber	642102
118.3		Roof Thatcher	642103
119	6615.	Glass Makers, Cutters, Grinders & Finishers	
119.1		Glass Maker	661501
119.2		Optical Mechanic	661502
120	6722.	ICT Installers & Servicers & Related Occupations	
120.1		Telecommunications Line Mechanic	672204
121	6832.	Garment & Related Patternmakers & Cutters	
121.1		Clothing, Home Textiles & General Goods Cutter	683201
121.2		Apparel & Related Pattern Maker	683202

122	7114.	Cement, Stone & Other Mineral Products Machine Operators	
122.1		Concrete Batching Plant Operator	711405
123	7152.	Weaving & Knitting Machine Operators	
123.1		Weaving Machine Operator	715201
123.2		Warping Machine Operator	715202
123.3		Braiding Machine Operator	715203
123.4		Non-Woven Machine Operator	715205
123.5		Textile Dry Finishing Machine Operator	715206
124	7159.	Textile, Fur & Leather Products Machine Operators nec	
124.1		Textile & Footwear Manufacturing Machine Minder	715901
125	7161.	Food & Related Products Machine Operators	
125.1		Bakery & Confectionary Products Machine Operator	716105
126	7219.	Assemblers nec	
126.1		Product Assembler	721901
127	7341.	Mobile Farm & Forestry Plant Operators	
127.1		Mobile Plant Operator	734101
128	7343.	Crane, Hoist & Related Plant Operators	
128.1		Crane or Hoist Operator	734301
128.2		Cable Ferry Operator	734302
128.3		Dredge Operator	734303
129	7344.	Lifting Truck Operators	
129.1		Forklift Driver	734402

The total number of four-digit Unit Group occupations is 129, with 369 six-digit occupations/ specialisations.

Future directions for
OIHD research in South Africa,
and concluding remarks
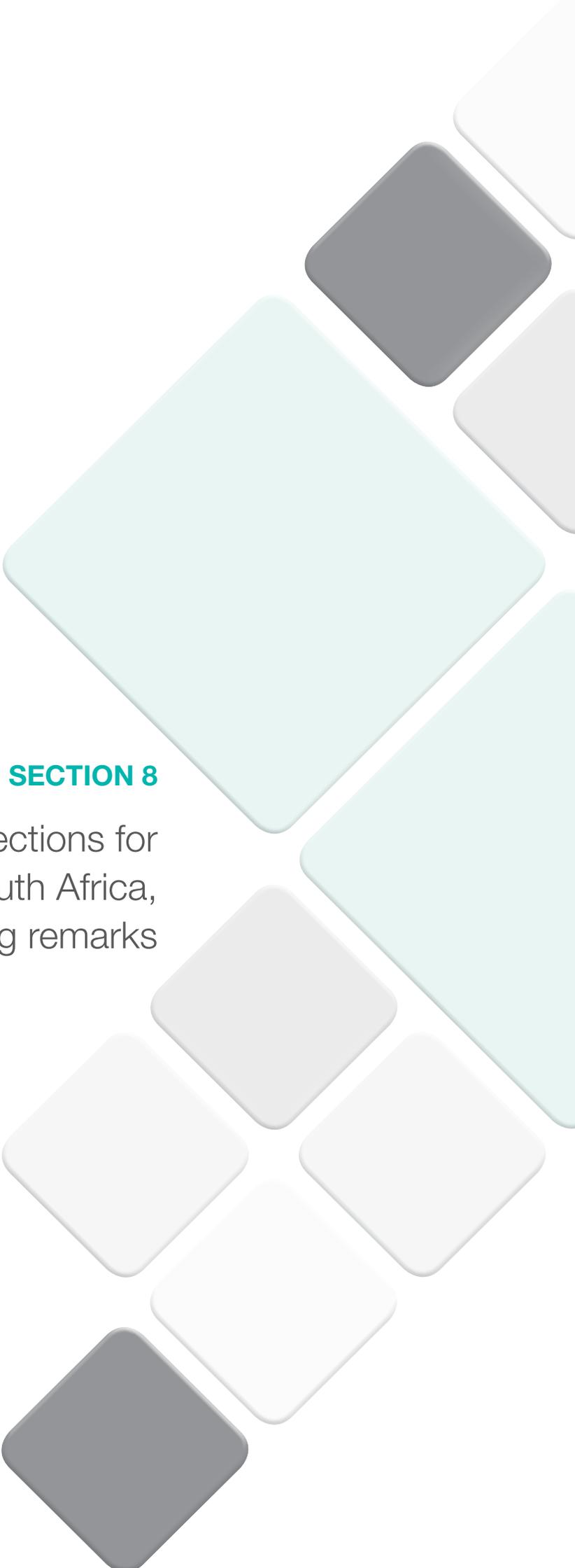
SECTION 8

FUTURE DIRECTIONS FOR OIHD RESEARCH IN SOUTH AFRICA, AND CONCLUDING REMARKS

This concluding section begins by identifying some key lessons for future research on South African Occupations in High Demand (OIHD) that arose from both the quantitative and qualitative research. Following this, the section provides some concluding remarks on the overall findings from the research in relation to the existing literature on skills and occupational demand in South Africa.

8.1 Future directions for the statistical component of the South African OIHD project

As identified at the outset, the 2018 OIHD methodology represents an important step in developing a composite index of OIHD. Given the requirement for transparency in this process and the comparability with similar approaches in other contexts, there is an important opportunity to review and refine the methodology regularly. As demonstrated in the formal review of the Migration Advisory Committee (MAC) methodology (MAC, 2010), it is important to ensure that the methodology remains current and relevant for the context in which it is situated. Future iterations of the OIHD should, therefore, review and reflect on a number of aspects of the research process. The future directions for research outlined in this section are not, however, exhaustive and simply indicate some of the key lessons from the 2018 OIHD research, input from the project advisors, as well as relevant lessons from experiences in other contexts.

8.1.1 Identifying indicators for each domain

The identification of indicators under each of the four domains was based largely on the data available for analysis in South Africa (at the four-digit Organising Framework for Occupations

(OFO) level), on suggestions from the project advisory team, on the experiences of similar research in other contexts, and, to some extent, on the indicators included in past versions of the South African OIHD. However, it is important to review these indicators regularly in order to determine whether they do in fact meet the needs of the OIHD objectives and provide relevant information on occupational shortages. It is also important to evaluate new sources of data which may provide new indicators of occupational demand, and which may either replace or complement the indicators used in the 2018 methodology. The decomposition analysis as well as the information in Appendix 3 provide a useful starting point for this discussion.

Together, these two analyses identify the indicators which have the greatest influence on the occupations which appear in each of the groups of OIHD and also illustrate the distribution of each of the indicators included in the 2018 methodology. Perhaps one consideration that emerges from the distributional analysis (Appendix 3) is that a large number of indicators, and particularly those derived from the Quarterly Labour Force Surveys (QLFSs), have a distribution which is centred around zero. This means that, between 2010 and 2015, there were no changes in, inter alia, employment, earnings, or work intensity for a large number of occupations. This finding also has implications for the time period being analysed (discussed later in this section). More broadly, however, the inclusion of indicators used to denote occupational demand should be reviewed regularly based on conceptual needs, the availability of additional data, and the underlying distribution of these signals of demand as captured by the QLFSs (and other data sources).

8.1.2 Identifying thresholds within each indicator

The statistical analysis in this report followed the MAC approach of assigning, where possible, an indicator threshold of the median value + 50%. As demonstrated in Appendix 3, this was a useful 'rule of thumb' in the process of identifying indicator thresholds. However, and as reported in the various MAC publications, this is not always appropriate based on the underlying distribution of an indicator, and, sometimes, a judgement call is still required by the research team. In the Appendix, each indicator threshold is carefully identified and substantiated, but there were several unavoidable cases where a judgement call was used. This was necessary when, for example, the distribution centred around zero or, as in some cases, when the indicator had a negative median value.

Future work on the South African OIHD should, therefore, pay some attention to how indicator thresholds are assigned and whether the MAC rule of thumb is a desirable approach. Of course, the construction of the indicators themselves as well as the time period and benchmarks used play an important role in determining the underlying distribution of each indicator such that these two issues (i.e. the method for assigning each threshold and the time period/benchmark used in the analysis) should be evaluated together in future work.

8.1.3 Assigning weights to each domain/ indicator

As with all composite indicators or indices, one of the crucial issues is how to assign weights to each domain or indicator. The approach used in this report was to assign equal weights to each domain and then, in turn, to assign equal nested weights to each indicator. The application of equal weights, however, is not without bias and requires a particular set of assumptions (i.e. that each domain is of equal importance to the measurement of the underlying construct). Despite being a relatively common approach in the construction of composite indices, we

suggest that the issue of weights be revisited in the next round of OIHD research. In practice, this is because the variation of weights might reflect several important features of the relevant indicators. Perhaps the two most important are: (1) whether the indicator/domain is measuring the concept (in this case occupational demand) that it is intended to measure; and (2) whether it is doing a good job of measuring this concept (i.e. whether data constraints, sample sizes, etc., are limiting the value of the indicator in question).

As project advisors have indicated throughout the research process, there are concerns with both of these issues in the South African OIHD methodology. In terms of the conceptual issues, it is not clear whether employment pressure and strategic/priority demand are particularly good measures of occupational demand. The Organisation for Economic Co-operation and Development (OECD), for example, assigns less weight to the employment pressure indicator in its work, and project advisors and stakeholders have been divided since the beginning of the project on whether the Strategic Integrated Projects (SIPs) and sector education and training authority (SETA) Pivotal Lists should be included in the index. In terms of data quality, there are particular concerns with the vacancy data (which may not be capturing certain types of occupations and is, therefore, not an exhaustive signal of occupational shortage) and the data from the QLFSs (small sample sizes make the disaggregation to the four-digit OFO level particularly problematic). Six of the ten indicators in the statistical index are based on QLFS data, so pushing the data beyond its intended use has very real implications for the conclusions which can be drawn from this research.

The approach adopted in this report was to conduct a series of robustness checks to determine how 'stable' the index is in terms of its sensitivity to different weightings. Somewhat reassuringly, at least from a methodological standpoint, the identification of OIHD was fairly robust to different weighting schemes. While there was some variation in the groupings (high, higher and highest), there was a strong

correlation between the occupations identified on each of the respective reweighted indices. Nonetheless, the findings (particularly the decomposition analysis and the robustness checks) from this research report should be reviewed prior to the construction of the next OIHD list, and the conceptual merits of each of the domains should be evaluated and carefully considered prior to the commencement of the research phase.

8.1.4 Aggregating the index

Perhaps somewhat less critical is the need to reconsider the aggregation of the domains and sub-indices into a single composite index score. The approach adopted in this report is simple, transparent, easily replicable and lends itself to an intuitive decomposition exercise. While these are the strengths of the aggregation methodology, its simplicity is also its weakness. If the signals of demand that are picked up by these indicators are, instead, measuring cyclical changes in the labour market (or wider economy), then they are not necessarily signals of relative demand. This is a concern which is inherent in the use of a set of proxy indicators to measure demand. In other words, each indicator is an imperfect proxy for demand and could be measuring a number of other features of, or changes in, the labour market. One solution is to attempt (see OECD, 2017) to isolate the signals of occupational demand from those of cyclical changes through a fairly sophisticated 'statistical filter'. The advantage is that the research is not based on the assumption that the signals are not affected by economic cycles, but the disadvantage is that the methodology becomes less transparent – particularly to non-specialists (of course, one also has to have some confidence that the filter is, indeed, doing what it is intended to do).

There are examples in the international literature of both approaches, that is, those that do (OECD) and those that do not (MAC and NILS) attempt 'to filter' noisy signals of demand from a composite index. In addition to considering, on a regular basis, the time period to be analysed for the South African OIHD, the use of a filter should also

be evaluated from time to time. Data constraints and methodological considerations related to this approach would be a good starting point.

8.1.5 Clustering occupations into groups

One of the innovations associated with the 2018 OIHD research is that it attempted, for the first time, to rank occupations in relation to one another. It was decided at the outset, however, that, rather than releasing the index rankings for each occupation, occupations would be grouped into three broad classifications (high, higher, highest). The logic behind this decision was that the data limitations associated with the creation of an index were to an extent that the precise ranking of an individual occupation was not likely to be particularly meaningful. However, assigning occupations to a broad group seemed like a safer approach given the concerns with the data (QLFSs and the vacancy data sources) as well as the many assumptions that were attached to the specification (including identifying the thresholds), weighting and aggregation of the various indicators.

The choice of three mutually exclusive groups derived from a mean cluster analysis (of index scores) was fairly arbitrary and was based on the conceptual appeal of having a small number of groups to compare. In reality, as pointed out by one project advisor, the occupations could have been clustered into any number of groups (e.g. 4, 5, 6, 7). A future consideration is, therefore, how many groups of occupations are accessible to the users of the OIHD list and whether a smaller or larger number is required for the purposes of using the list for planning. Should a different number be preferred, a secondary question is whether this number is determined on a conceptual basis (as was the case in this report) or whether a data-driven approach to determine the ideal number of occupational groupings is used instead.

8.1.6 Identifying a time period for analysis

Arguably, the most important consideration for future OIHD lists in South Africa is the consideration of the time period to be analysed

and whether/how a particular year is used as the benchmark. The analysis in this report is based on changes in the labour market between 2010 and 2015. The baseline year (2010) is a potentially relevant starting point given that it is generally associated with the period of recovery from the job losses resulting from the 2008 global financial crisis. Therefore, while not necessarily a high point in the economy, it is also not a low point. The analysis of changes over this period (as illustrated in Appendix 3) also demonstrates that the labour market was remarkably static over this period. The previous OIHD (2016) made use of indicators measuring changes at both two- and five-year intervals, but it is not clear whether the shorter-terms trends were different from the longer-terms changes (particularly once statistical significance is considered). More broadly, then, the identification of an appropriate period of analysis should be made largely on a conceptual basis (but informed by data).

Related to the above, and highlighted by both the OECD- and MAC-affiliated project advisors, it is important to consider whether a particular year should be identified as a benchmark year ('automatic stabiliser') as the basis for comparison for each OIHD list. If this is a desirable approach, then the advantage would be that the lists in various years would be comparable with one another. The challenge is to identify a strong candidate for the base year (MAC uses 2008), and the static nature of the South African labour market may bring some challenges to this task. On the other hand, if the benchmarking/automatic stabiliser approach is not taken, then some type of 'system' for establishing a uniform approach to identifying the period of analysis is required (i.e. the five years prior to the release of the list [subject to data availability]). On the whole, the consensus among the project team is that a benchmark approach should be applied, and, therefore, careful consideration should be given to the selection of the baseline year – again, this should be discussed in detail with a wide range of stakeholders well in advance of the beginning of the research (ideally this should be specified in the project Terms of Reference). One limitation,

however, is the availability of QLFS data. The QLFS was phased in, starting in 2008, so it is not clear that the quarters prior to the financial crisis would be reliable sources of data for the purposes of the OIHD analysis (i.e. there were some teething problems in the early versions of the QLFS).

8.1.7 The specification of the conditional measure of earnings

As suggested in the review of the MAC methodology, it is advisable to review the specification of the indicator based on conditional earnings on a regular basis (or to at least identify how sensitive the indicator is to alternate specifications and whether there are large variations across [groups of] occupations). In the analysis presented in this report, earnings are estimated as conditional only on age and province. Introducing a number of other covariates (such as spatial type, gender, education, race, etc.) may yield different estimates of conditional earnings and should be explored in more detail. One danger, of course, is that the earnings data come from annualised QLFS data such that small sample sizes may constrain the ability to condition earnings growth for a larger number of covariates. Should this recommendation be taken forward in further iterations of the OIHD research, then a careful consideration of the trade-off between sample size and more 'accurate' earnings estimates should be made.

8.1.8 'Staggering' the top-down and bottom-up approaches

Finally, and leading into the recommendations for the qualitative component in future, one possibility for improving the integration of the quantitative and qualitative work is to 'stagger' the quantitative and qualitative research components by alternating years. The use of triangulation between the two methods proved to be a valuable addition to the 2018 methodology, but the potential for deeper research was constrained by time limitations on the research itself. Given more time, the two respective

methods could be used to interrogate each other to a greater extent. Ideally, qualitative interviews should aim to follow up on occupations for which there is relatively limited statistical evidence of demand or conflicting 'bottom-up' evidence. Similarly, identifying which statistical signals of demand are in evidence for specific occupations for which there is strong qualitative evidence could also help refine both methods for future OIHD research. In short, allowing more time for the quantitative and qualitative components to work together is perhaps one of the strongest recommendations to come out of the 2018 OIHD research process.

8.2 Future directions for the qualitative component of the South African OIHD project

The qualitative analysis methodology is a work in progress. Some of the lessons learnt from the development of the current list may be useful in informing the approach taken for the development of future OIHD lists.

8.2.1 Sufficient time is needed to curate the list properly

The qualitative analysis was guided by the findings from the quantitative analysis. This was helpful in delimiting the scope of the exercise. Although there are some occupations whose inclusion or exclusion may appear counter-intuitive, the fact that they were findings from the quantitative analysis became sufficient motivation for looking further into the factors driving their demand. Further investigation through stakeholder engagement was helpful in clarifying how the variables from the quantitative analysis (vacancy rates, wage pressure, etc.) confirm the finding, or have alternative explanations (short tenure, high turnover) that can be misinterpreted as high demand.

The main constraint on this aspect of the research was the time and timing. The amount of time available, compounded by conducting the research during the holiday season when many respondents were unavailable, affected

the extent of follow-up that was possible. Ideally, more time is needed to curate the list adequately and to cross-check between the drivers identified in the quantitative analysis and those identified by industry representatives. It would also have been ideal to check with more than one respondent per industry/occupation group, but time and availability did not permit.

Recommendation: Ensure that adequate time is allowed to prepare for the qualitative aspects of the research and to follow up on a broader range of occupations for which there is insufficient empirical evidence at the six-digit level.

8.2.2 Gaps in the findings can inform future research by SETAs or the DHET

Reliance on Sector Skills Plans (SSPs) Scarce-Skills Lists is a double-edged sword. The benefit of the lists is that the SETAs are generally using the same definition of scarcity, which means the data is generally comparable. Most SETAs undertake some form of stakeholder validation of their Scarce-Skills Lists, which raises the level of confidence in the occupations identified. However, the quality and robustness of the underlying research methodologies are highly variable across SETAs. For purposes of this analysis, SETAs remain a useful source for this information, as they are best positioned to identify industry-specific needs for skills. As the quality of SSPs improves, so, too, will the value of the Scarce-Skills Lists.

Recommendation: Use gaps in the findings to identify areas for future research either by the Department of Higher Education and Training (DHET) or by SETAs in order to strengthen the value of the Scarce-Skills Lists.

8.2.3 Value addition from the Call for Evidence

The results from the Call for Evidence (CFE) were similarly variable, particularly with respect to the substantiations provided. The most useful responses were those that were able to identify specific occupations and substantiate them on the basis of empirical evidence. Even when the underlying

foundation for the evidence was not attached, some respondents were able to substantiate the inclusion of occupations in a credible way based on their expert knowledge or research. This made the decision to include or exclude much easier. It may be helpful to provide a more structured CFE that assists respondents both to prioritise the identified occupations and to substantiate their inclusion in a more substantive manner.

Recommendation: The CFE approach should be reviewed holistically. The respondents should be targeted based on the outcome of the initial quantitative findings so that the CFE supports the analysis strategically. The format of the CFE should also be more directed, giving respondents clarity on the nature of information required. This will improve the coherence and consistency of the responses.

8.2.4 Conceptualisation and sequencing of the OIHD process

Some lessons also emerged from the timing of each stage of the analysis (literature review, quantitative analysis, qualitative analysis, CFE, stakeholder consultations). The roll-out of the project experienced some delays, which led to the concurrent implementation of key aspects of the research. The way each stage feeds into the other and the iterative approach necessary for the proper curating of the list point to the need for more time and better scheduling of each phase. For example, if the quantitative analysis is the primary foundation for the list, which must be supported by the qualitative inputs, the CFE can be better directed by targeting respondents based on the output of the quantitative analysis. A roposed approach is illustrated in Figure 7.

Figure 7: Illustrative model for future development of the OIHD list
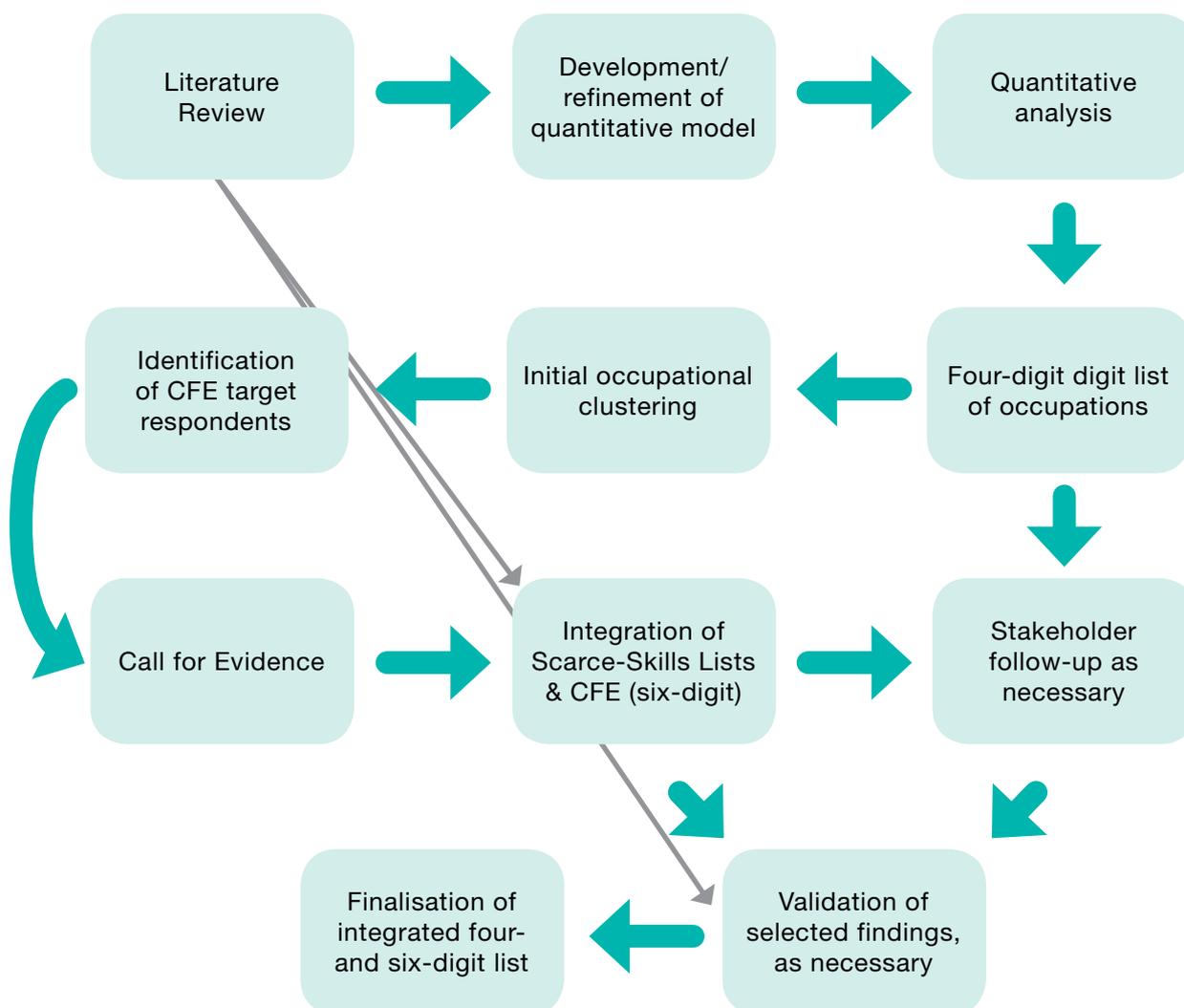
8.3 Concluding remarks

This technical report has presented the 2018 list of OIHD in South Africa. Critically, in response to the ever-evolving skills needs of the country, the report acknowledges a need for a simple, replicable, and transparent approach for assessing and identifying OIHD. Using a novel methodology adopted after a detailed review of a number of international approaches (including those of MAC, NILS and the OECD) used to identify and measure skills and occupational needs, the report also provides a detailed account of all frameworks, data sources, domains, and indicators and related processes employed in compiling the list.

The project team understood the main purpose of the list as one of informing the planning processes of the DHET with respect to the post-school education and training (PSET) systems, particularly in relation to enrolment planning, resource allocation, career advice and qualification development. The list is, however, important for a number of reasons and is also intended for use by other stakeholders to inform their decision-making processes. In this case, the list may require that users adapt or refine it according to their needs.

The design of the 2018 OIHD project methodology adopted a hybrid approach where both top-down and bottom-up evidence was considered and integrated to identify the OIHD. The starting point was to identify domains and indicators which best capture the main characteristics of OIHD. Informed by both conceptual and practical elements, the following four dimensions of occupational demand were identified: wage pressure, vacancy pressure, employment pressure and priority/strategic demand. These consisted of ten sub-indicators which were then aggregated into a single multidimensional index of occupational demand. After exploring a number of potential data sources, six different data sources were used for the OIHD index as follows: Quarterly Labour Force Surveys (QLFSs), the Labour Market Dynamics Study (LMDS), the Job Opportunity

Index (JOI), Career Junction (CJ), the SETA Pivotal Lists and the Strategic Integrated Projects (SIPs) List. It should be noted that occupations were available at four-digit level for all sources.

The main objective of the qualitative component was, firstly, to extend the list from the four-digit Unit Group Level to the six-digit Occupational Level, and, secondly, to triangulate signals for demand by comparing quantitative and qualitative evidence, thus providing justification for the inclusion or exclusion of occupations from the list. The bottom-up evidence considered was drawn from the Scarce-Skills Lists in the SETA SSPs, the CFE, the Talent Survey, the SIPs List, literature reviews (including a review of government's new growth strategies), and interviews with industry representatives.

The 2018 OIHD research project has yielded a long list of occupations which are currently in high demand, or are expected to be in demand in the future. Moreover, the list of occupations fits well within the existing literature on occupational shortages as well as with future growth initiatives. For example, the OECD identified skills gaps in the broad areas of management, health and teaching. The 2018 list identifies, inter alia, finance managers, business managers, information and communications technology (ICT) managers, and construction project managers in the highest group of occupations in demand. Medical laboratory technicians and health care assistants are also in the top group of occupations as identified through the OIHD research. Nurses, while on the list, are slightly further down in the classifications, but, nonetheless, are identified as being in high demand. Somewhat reassuringly, and despite some of the mismatches in the placement of teachers described in the literature review, both primary and secondary phase teachers are identified in the highest group of occupations in the 2018 list.

Similarly, the Manpower Survey identified the top four groups of occupations as including: skilled trades (welders, plumbers, bricklayers, etc.), management, office support staff, accounting

and finance. There is, again, a clear overlap with the findings presented in this report, given the large number of managers identified at the top of the list. Finance managers, in particular, are marked as occupations in high demand as are office services staff. In addition to these occupations, the Adcorp Study emphasised professionals in engineering, accounting and law, specialist technicians and artisans. Again, there is evidence from the 2018 OIHD list that these groups of occupations are also covered. In terms of engineering, our results suggest that civil engineers, mining engineers, industrial engineers as well as several types of engineering professionals and technologists are in the top group of OIHD. Not all occupations in the highest demand group are strictly professionals and the OIHD also identifies several types of artisans such as electrical mechanics and fitters as being in high demand. Finally, the broad categories identified by the Human Resource Development Council of South Africa (HRDCSA), namely engineering, health, education, agriculture, finance and social workers, are all represented, in some detail, in the OIHD results.

Not only does the 2018 OIHD list complement other studies of occupational demand

and shortage in South Africa, but it also demonstrates a forward-looking understanding of demand, which is in line with other work. For example, the policy scan of new growth initiatives which was undertaken as part of this project suggests that jobs in aquaculture, agriculture, agroprocessing, medical management, ICT, and construction will be important in the future. Not surprisingly, the emphasis on infrastructure development more broadly, and at the provincial and municipal levels in particular, suggests that there will be a strong need for construction professionals and artisans of various types. Therefore, the inclusion of building associates, clerks of work, construction supervisors, construction project managers, draughtspersons, and project builders at the top of the list is reassuring. Moreover, the large number of civil engineers and related technicians also accords well with the various government growth initiatives reviewed for this report. Similarly, the forecasts from the Macro-Education Model for South Africa suggest that craft and related workers as well as plant and machine operators will be in demand in the future. These broad occupation groups are well represented in the two highest groups of the 2018 OIHD list.

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APPENDIX 1

Figure 8: Distribution of OIHD index scores for all four-digit occupations (normal and kernel density curves plotted)
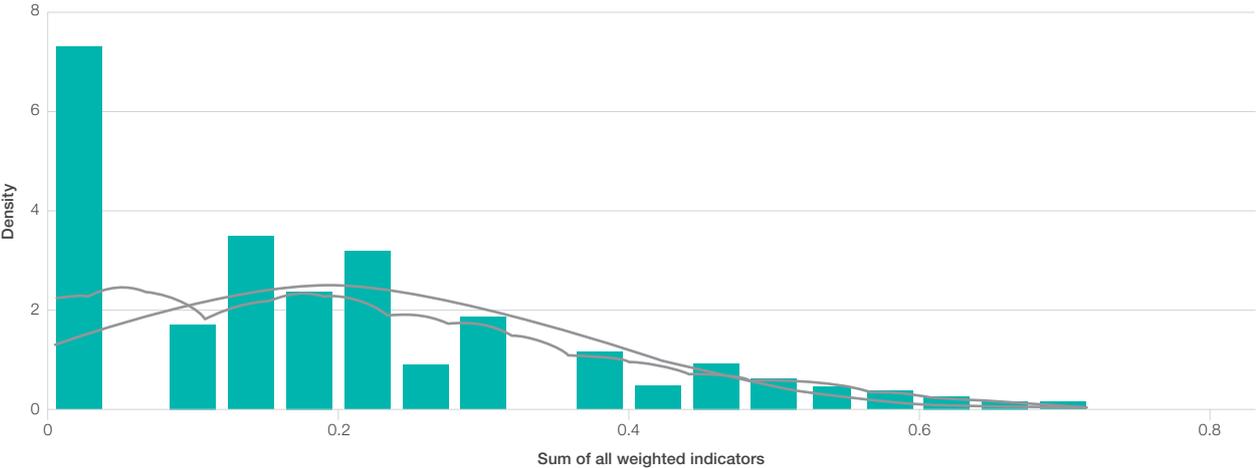
APPENDIX 2

Table 20: List of four-digit OFO codes ranked by OIHD index scores

HIGHEST	
OFO	**OIHD index score**
1331. ICT Service Managers	0.7083334
6712. Electrical Mechanics & Fitters	0.6666667
1211. Finance Managers	0.625
1323. Construction Managers	0.625
3123. Construction Supervisors	0.625
1321. Manufacturing Managers	0.5833334
1349. Professional Services Managers nec	0.5833334
2331. Secondary or Intermediate & Senior Education Teachers	0.5833334
2519. Software & Applications Developers	0.5833334
3118. Draughtspersons	0.5833334
2141. Industrial & Production Engineers	0.5416667
2142. Civil Engineers	0.5416667
3112. Civil Engineering Technicians	0.5416667
3115. Mechanical Engineering Technicians	0.5416667
4221. Travel Consultants & Clerks	0.5416667
6711. Building & Related Electricians	0.5416667
1112. Senior Government Officials	0.5
1219. Business Services & Administration	0.5
1311. Agricultural & Forestry Production	0.5
2149. Engineering Professionals nec	0.5
2341. Primary School or Foundational Phase Teachers	0.5
2412. Financial & Investment Advisors	0.5
2619. Legal Professionals nec	0.5
3512. Information & Communications Technicians	0.5
3521. Broadcasting & Audiovisual Technicians	0.5
1221. Sales & Marketing Managers	0.4583333
1324. Supply, Distribution & Related Managers	0.4583333
2114. Geologists & Geophysicists	0.4583333
2132. Farming, Forestry & Fisheries Advisors	0.4583333

2146.	Mining Engineers & Metallurgists	0.4583333
2611.	Lawyers	0.4583333
3113.	Electrical Engineering Technicians	0.4583333
3132.	Incinerator & Water Treatment Plant Operators	0.4583333
3212.	Medical & Pathology Laboratory Technicians	0.4583333
3434.	Chefs	0.4583333
4413.	Coding, Proofreading & Related Clerks	0.4583333
5311.	Childcare Workers	0.4583333
5321.	Health Care Assistants	0.4583333

HIGHER

2161.	Building Architects	0.4166667
2511.	Systems Analysts	0.4166667
3131.	Power Production Plant Operators	0.4166667
3321.	Insurance Representatives	0.4166667
4111.	General Office Clerks	0.4166667
4323.	Transport Clerks	0.4166667
6834.	Upholsterers & Related Workers	0.4166667
1411.	Hotel Managers	0.375
2144.	Mechanical Engineers	0.375
2211.	Generalist Medical Practitioners	0.375
2262.	Pharmacists	0.375
2311.	University & Higher Education Teachers	0.375
2413.	Financial Analysts	0.375
2512.	Software Developers	0.375
2514.	Applications Programmers	0.375
3117.	Mining & Metallurgical Technicians	0.375
3314.	Statistical, Mathematical & Related Associate Professionals	0.375
3421.	Athletes & Sports Players	0.375
3513.	Computer Network & Systems Technicians	0.375
4313.	Payroll Clerks	0.375
5111.	Travel Attendants & Travel Stewards	0.375
6426.	Plumbers & Pipe Fitters	0.375
6533.	Agricultural & Industrial Machinery Mechanics & Repairers	0.375
1113.	Traditional Chiefs & Heads of Villages	0.3333333
1421.	Retail & Wholesale Trade Managers	0.3333333
2342.	Early Childhood Educators	0.3333333
2423.	Personnel & Careers Professionals	0.3333333
2635.	Social Work & Counselling Professionals	0.3333333

3114.	Electronics Engineering Technicians	0.3333333
3142.	Agricultural Technicians	0.3333333
3251.	Dental Assistants & Therapists	0.3333333
3324.	Trade Brokers	0.3333333
3332.	Conference & Event Planners	0.3333333
3432.	Interior Designers & Decorators	0.3333333
3439.	Artistic & Cultural Associate Professionals	0.3333333
4131.	Typists & Word-Processing Operators	0.3333333
4132.	Data Entry Clerks	0.3333333
4212.	Bookmakers, Croupiers & Related Gaming Workers	0.3333333
6415.	Carpenters & Joiners	0.3333333
6512.	Welders & Flame Cutters	0.3333333
6513.	Sheet Metal Workers	0.3333333
6523.	Metalworking Machine Tool Setters	0.3333333
6613.	Jewellery & Precious Metal Workers	0.3333333
6614.	Potters & Related Workers	0.3333333
6713.	Electrical Line Installers & Repairers	0.3333333
6842.	Shotfirers & Blasters	0.3333333
7154.	Bleaching, Dyeing & Fabric Cleaning Machine Operators	0.3333333
7156.	Shoemaking & Related Machine Operators	0.3333333
7332.	Heavy Truck & Lorry Drivers	0.3333333

HIGH

1212.	Human Resource Managers	0.2916667
1439.	Services Managers nec	0.2916667
2221.	Nursing Professionals	0.2916667
2631.	Economists	0.2916667
3141.	Life Science Technicians (Excluding Medical)	0.2916667
3257.	Environmental & Occupational Health Professionals	0.2916667
5411.	Firefighters	0.2916667
5414.	Security Guards	0.2916667
6419.	Building Frame & Related Trades Workers	0.2916667
7219.	Assemblers nec	0.2916667
7341.	Mobile Farm & Forestry Plant Operators	0.2916667
7343.	Crane, Hoist & Related Plant Operators	0.2916667
2121.	Mathematicians, Actuaries & Statisticians	0.25
2131.	Biologists, Botanists & Zoologists	0.25
2143.	Environmental Engineers	0.25
2145.	Chemical Engineers	0.25

2166.	Graphic & Multimedia Designers	0.25
2251.	Veterinarians	0.25
2263.	Environmental & Occupational Health Professionals	0.25
2353.	Other Language Teachers	0.25
2513.	Web & Multimedia Developers	0.25
2521.	Database Designers & Administrators	0.25
2523.	Computer Network Professionals	0.25
2529.	Database & Network Professionals nec	0.25
2634.	Psychologists	0.25
2651.	Visual Artists	0.25
3119.	Physical & Engineering Science Technicians	0.25
3252.	Medical Records & Health Information Technicians	0.25
3255.	Physiotherapy Technicians & Assistants	0.25
3323.	Buyers	0.25
3339.	Business Services Agents nec	0.25
4121.	Secretaries (General)	0.25
4213.	Pawnbrokers & Moneylenders	0.25
4223.	Telephone Switchboard Operators	0.25
4321.	Stock Clerks	0.25
5131.	Waiters	0.25
5141.	Hairdressers	0.25
5153.	Building Caretakers	0.25
5244.	Contact Centre Salespersons	0.25
5322.	Home-Based Personal Care Workers	0.25
5329.	Personal Care Workers in Health Services nec	0.25
6111.	Field Crop & Vegetable Growers	0.25
6113.	Gardeners, Ornamental Horticultural & Nursery Growers	0.25
6211.	Forestry & Related Workers	0.25
6413.	Stonemasons, Stone Cutters, Splitters & Carvers	0.25
6421.	Roofers	0.25
6524.	Metal Polishers, Wheel Grinders & Tool Sharpeners	0.25
6615.	Glass Makers, Cutters, Grinders & Finishers	0.25
6722.	ICT Installers & Servicers & Related Occupations	0.25
6832.	Garment & Related Patternmakers & Cutters	0.25
7114.	Cement, Stone & Other Mineral Products Machine Operators	0.25
7142.	Plastic Products Machine Operators	0.25
7152.	Weaving & Knitting Machine Operators	0.25
7159.	Textile, Fur & Leather Products Machine Operators nec	0.25
7161.	Food & Related Products Machine Operators	0.25
7344.	Lifting Truck Operators	0.25

	LOW-SCORING	
1111.	Legislators	0.2083333
1342.	Health Service Managers	0.2083333
1412.	Restaurant Managers	0.2083333
2151.	Electrical Engineers	0.2083333
2165.	Cartographers & Surveyors	0.2083333
2352.	Special Needs Teachers	0.2083333
3111.	Chemical & Physical Science Technicians	0.2083333
3241.	Veterinary Technicians & Assistants	0.2083333
3334.	Real Estate Agents & Property Managers	0.2083333
3343.	Administrative & Executive Secretaries	0.2083333
3411.	Legal & Related Associate Professionals	0.2083333
4312.	Statistical, Finance & Insurance Clerks	0.2083333
4412.	Mail Carriers & Sorting Clerks	0.2083333
4419.	Clerical Support Workers nec	0.2083333
5223.	Shop Sales Assistants	0.2083333
6412.	Bricklayers & Related Workers	0.2083333
6414.	Concrete Placers& Concrete Finishers	0.2083333
6431.	Painters & Related Workers	0.2083333
6514.	Structural Metal Preparers & Erectors	0.2083333
6622.	Printers	0.2083333
7121.	Metal Processing Plant Operators	0.2083333
7311.	Locomotive Engine Drivers	0.2083333
7322.	Car, Taxi & Van Drivers	0.2083333
1121.	Managing Directors & Chief Executives	0.1666667
1312.	Aquaculture & Fisheries Production	0.1666667
1431.	Sports, Recreation & Cultural Centres	0.1666667
2411.	Accountants	0.1666667
2622.	Librarians & Related Information Professionals	0.1666667
2641.	Authors & Related Writers	0.1666667
2643.	Translators, Interpreters & Other	0.1666667
3213.	Pharmaceutical Technicians & Assistants	0.1666667
3259.	Health Associate Professionals nec	0.1666667
3322.	Commercial Sales Representatives	0.1666667
3413.	Religious Associate Professionals	0.1666667
4214.	Debt Collectors & Related Workers	0.1666667
4226.	Receptionists (General)	0.1666667
5113.	Travel Guides	0.1666667
5132.	Bartenders	0.1666667
5151.	Cleaning & Housekeeping Supervisors	0.1666667
5163.	Undertakers & Embalmers	0.1666667

5415.	Intelligence Operators	0.1666667
6222.	Skilled Inland & Coastal Waters Fishery Workers	0.1666667
6422.	Floor Layers & Tile Setters	0.1666667
6619.	Handicraft Workers nec	0.1666667
6621.	Pre-Press Technicians	0.1666667
6721.	Electronics Mechanics & Servicers	0.1666667
6822.	Cabinet Makers & Related Workers	0.1666667
6831.	Tailors, Dressmakers, Furriers & Hatters	0.1666667
6836.	Shoemakers & Related Workers	0.1666667
6849.	Craft & Related Workers nec	0.1666667
7112.	Mineral & Stone Processing Plant Operators	0.1666667
7131.	Chemical Products Plant & Machine Operators	0.1666667
7141.	Rubber Products Machine Operators	0.1666667
7151.	Fibre Preparing, Spinning & Winding Machine Operators	0.1666667
7181.	Glass & Ceramics Plant Operators	0.1666667
1114.	Senior Officials of Special-Interest Organisations	0.125
1213.	Policy & Planning Managers	0.125
1222.	Advertising & Public Relations Managers	0.125
1223.	Research & Development Managers	0.125
1344.	Social Welfare Managers	0.125
1345.	Education Managers	0.125
2111.	Physicists & Astronomers	0.125
2112.	Meteorologists	0.125
2113.	Chemists	0.125
2133.	Environmental Protection Professionals	0.125
2152.	Electronics Engineers	0.125
2162.	Landscape Architects	0.125
2164.	Town & Traffic Planners	0.125
2321.	Vocational or Further Education Teachers	0.125
2421.	Management & Organisation Analysts	0.125
2422.	Policy Administration Professionals	0.125
2424.	Training & Staff Development Professionals	0.125
2522.	Systems Administrators	0.125
2612.	Judges	0.125
2621.	Archivists & Curators	0.125
2632.	Sociologists, Anthropologists & Related Professionals	0.125
3116.	Chemical Engineering Technicians	0.125
3121.	Mining Production/Operations Supervisors	0.125
3122.	Manufacturing Supervisors	0.125
3133.	Chemical Processing Plant Controllers	0.125
3143.	Forestry Technicians	0.125
3151.	Ships' Engineers	0.125

| 3211.	Medical Imaging & Therapeutic Equipment Technicians	0.125
3312.	Credit & Loans Officers	0.125
3313.	Accounting Associate Professionals	0.125
3331.	Clearing & Forwarding Agents	0.125
3341.	Office Supervisors	0.125
3514.	Web Technicians	0.125
3522.	Telecommunications Engineering Technicians	0.125
4222.	Contact Centre Information Clerks	0.125
4311.	Accounting & Bookkeeping Clerks	0.125
4322.	Production Clerks	0.125
5112.	Transport Conductors	0.125
5121.	Cooks	0.125
5412.	Police Officers	0.125
6423.	Plasterers	0.125
6511.	Metal Moulders & Core Makers	0.125
6515.	Riggers & Cable Splicers	0.125
7321.	Motorcycle Drivers	0.125
7342.	Earthmoving & Related Plant Operators	0.125
2261.	Dentists	0.0833333
2351.	Education Methods Specialists	0.0833333
3221.	Nursing Associate Professionals	0.0833333
3231.	Traditional & Complementary Medicine Associate Professionals	0.0833333
3311.	Securities & Finance Dealers & Brokers	0.0833333
3315.	Valuers & Loss Assessors	0.0833333
3355.	Police Inspectors & Detectives	0.0833333
3431.	Photographers	0.0833333
5221.	Shopkeepers	0.0833333
5413.	Prison Guards	0.0833333
6112.	Tree & Shrub Crop Growers	0.0833333
6121.	Livestock & Dairy Producers	0.0833333
6129.	Other Animal Producers nec	0.0833333
6131.	Mixed Crop & Animal Producers	0.0833333
6432.	Spray-Painters & Varnishers	0.0833333
6522.	Toolmakers & Related Workers	0.0833333
6531.	Motor Vehicle Mechanics & Repairers	0.0833333
6617.	Handicraft Workers in Wood, Basketry & Related Materials	0.0833333
6623.	Print Finishing & Binding Workers	0.0833333
6811.	Butchers, Fishmongers & Related Food Preparers	0.0833333
6812.	Bakers, Pastry Cooks & Confectionery Makers	0.0833333
7111.	Miners & Quarriers	0.0833333
7212.	Electrical & Electronic Equipment Assemblers	0.0833333

APPENDIX 3

Employment growth

Relative employment growth over the period (see Figure 9) is skewed with a number of occupations even experiencing negative growth. The median growth rate is 13.6%, so the median plus 50% results in a threshold of 20% growth between 2010 and 2015. Once this threshold is applied, 104 occupations or about 47% of NQF3 and above occupations with at least ten observations in the QLFS, experienced employment growth pressure.

Figure 9: Distribution of employment growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
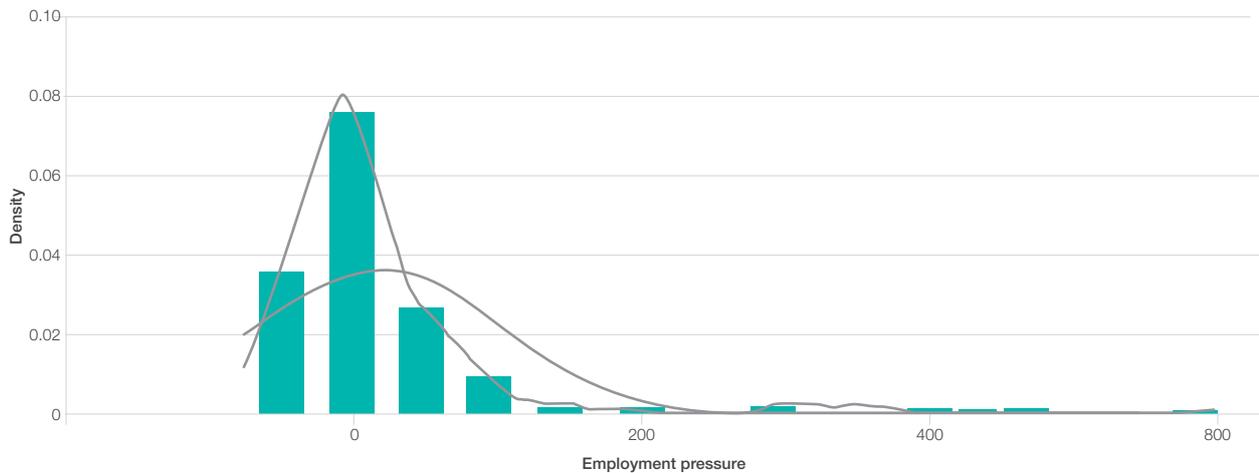
Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised).

Employment intensity growth

Relative employment intensity growth over the period (see Figure 10) is close to zero with a number of occupations even experiencing negative average growth in hours worked. The median rate itself is close to zero (0.5%), so some type of judgement call on setting the threshold was required. Based on the distribution, occupations with positive growth (between 2010 and 2015) above 2% in hours worked were set as the threshold. This resulted in 74 occupations experiencing employment intensity growth above the threshold (or about 33% of the possible occupations being considered).

Figure 10: Distribution of employment intensity growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
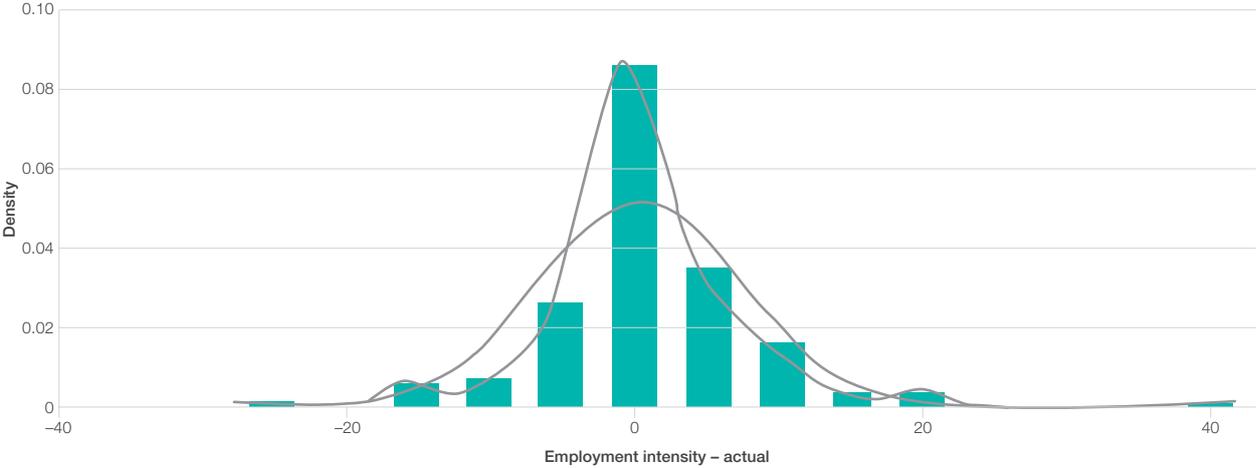

Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised).

Short-term employment duration growth

The distribution of relative growth in the proportion of employees with tenure of less than one year is skewed. Since the median growth rate is negative (−4.6%) for this indicator, the threshold was set at 0 so that all occupations with positive growth in the percentage of employees in their jobs for less than a year were above the threshold. This resulted in 95 occupations experiencing employment (short-term) duration growth above the threshold (or about 43% of the possible occupations being considered).

Figure 11: Distribution of employment turnover growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
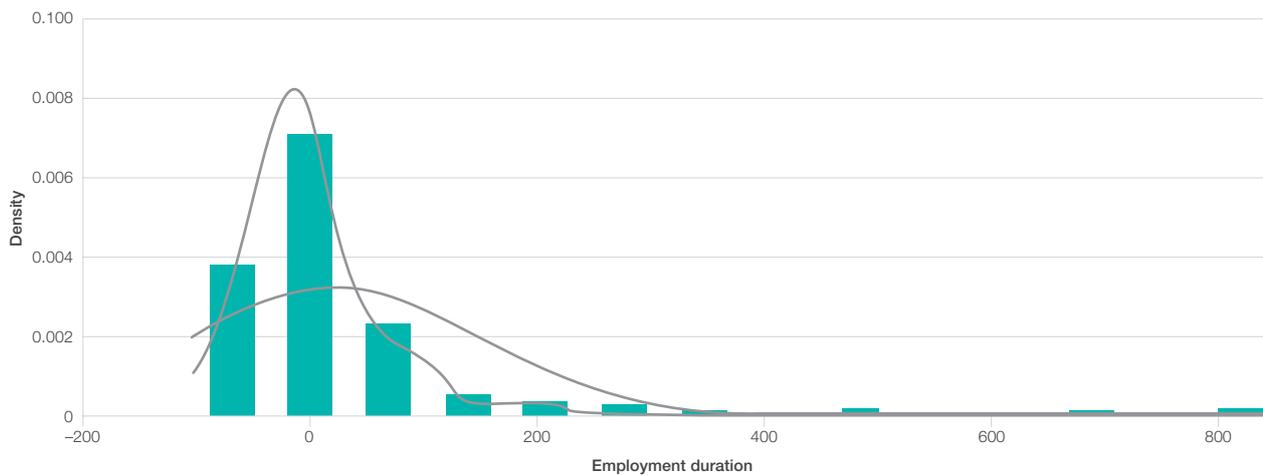

Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised).

Mean wage growth

The distribution of relative growth in real mean monthly earnings (between 2010 and 2015) is skewed but largely positive. The median is 16.94%, so the threshold is set at 26% based on the median plus 50% 'rule of thumb'. This resulted in 98 occupations experiencing employment (short-term) duration growth above the threshold (or about 44% of the possible occupations being considered).

Figure 12: Distribution of real mean wage growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
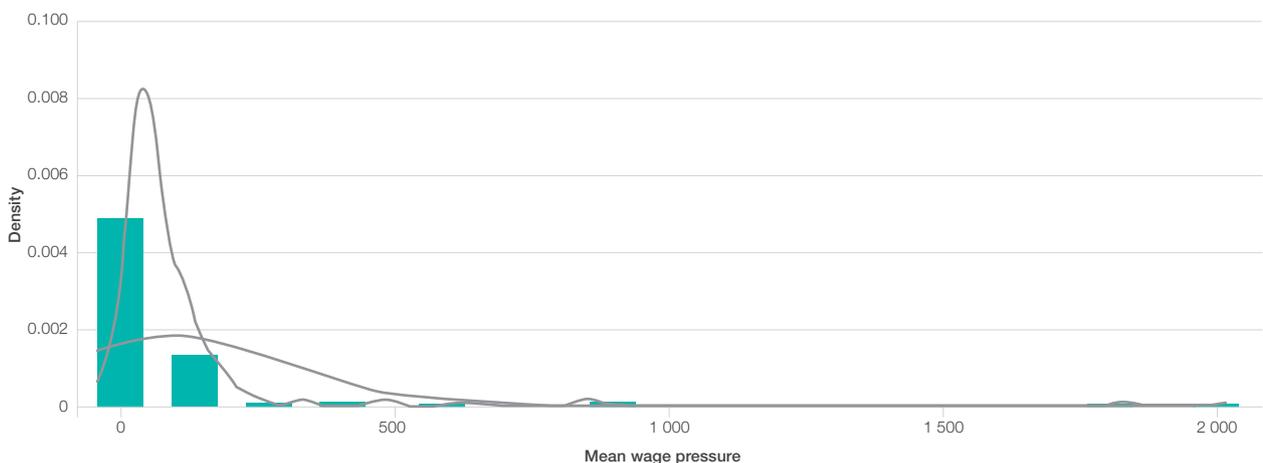

Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised and released in the LMDS series).

Median wage growth

The distribution of relative growth in real median monthly earnings (between 2010 and 2015) is more evenly distributed and centres around zero. The median, however, is slightly negative (−2.41%), so a judgement call was required based on the distribution. The right tail is skewed, so setting the threshold at 15% is roughly equivalent to the earnings of the 70th percentile. This resulted in 67 occupations experiencing median wage growth above the threshold (or about 30% of the possible occupations being considered).

Figure 13: Distribution of real median wage growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
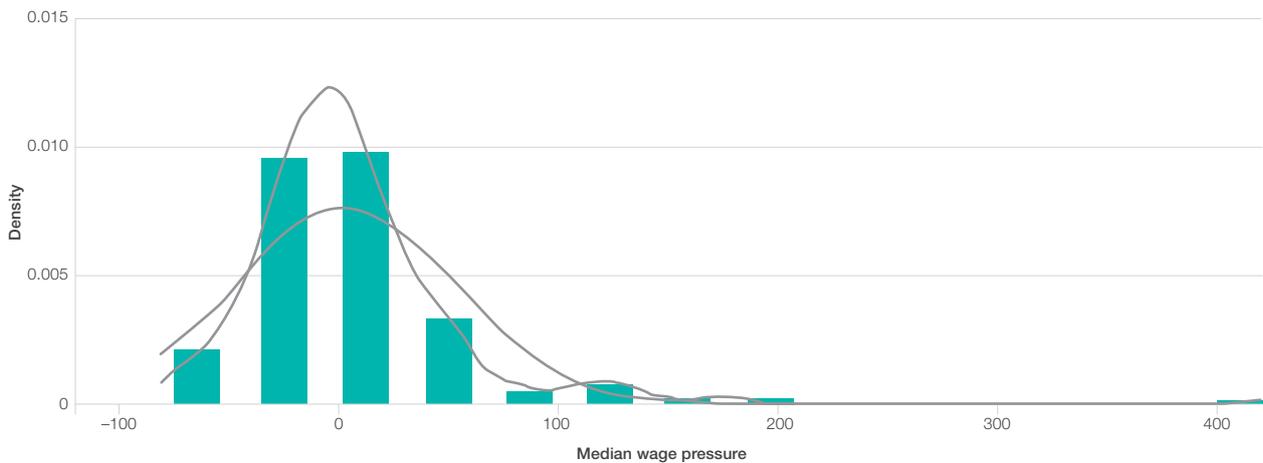

Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised and released in the LMDS series).

Conditional wage growth

The distribution of relative growth in real mean conditional monthly earnings (between 2010 and 2015) is evenly distributed and positive. The median is 24.47%, so applying the median plus 50% 'rule of thumb' results in a threshold of 37%. This resulted in 45 occupations experiencing conditional wage growth above the threshold (or about 20% of the possible occupations being considered).

Figure 14: Distribution of real mean conditional wage growth for all four-digit occupations with more than ten (unweighted) observations in both 2010 and 2015, by four-digit OFO occupation (normal and kernel density curves plotted)
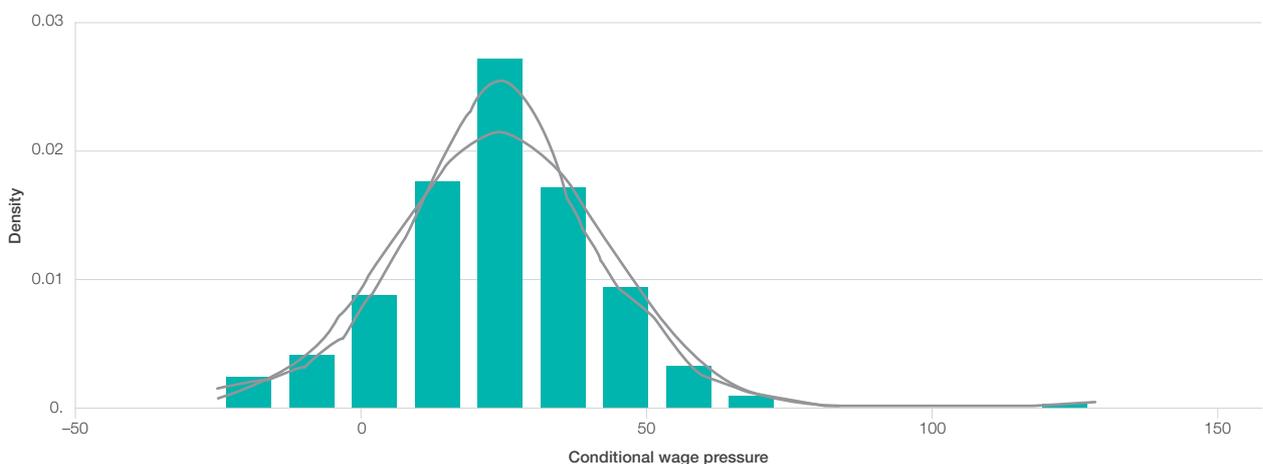
Source: Own calculations from Statistics South Africa's 2010 and 2015 QLFSs (annualised and released in the LMDS series).

Vacancy growth

The distribution of relative growth in the number of vacancies (between 2010 and 2015) from the combined DoL and CJ databases is unevenly distributed and largely negative. The median is –2% and the right tail is highly skewed. As such, the threshold is set at the 75th percentile, which is a 35% growth in the number of vacancies. This resulted in 88 occupations experiencing long-term vacancies.

Vacancy duration growth

Based on listings from the CJ database, this indicator measures the relative change in vacancy renewals (a proxy for vacancies which are 'hard to fill'). A large number of occupations experienced negative growth in the number of 'hard-to-fill' vacancies, which is reflected in the value of –10.14% for the median. Setting the threshold at 25% aligns the cut-off with the 70th percentile and identifies 32 occupations as having experienced growth pressure in the form of vacancy durations.

SIPs report

Fifty-six occupations are listed in the SIPs report at the OFO four-digit level. These were all included in the indicator under the domain of strategic/priority demand.

SETA Pivotal List

The SETA Pivotal List identifies occupations which have been determined to be critical by government, labour and the private sector. The list includes both a list of occupations as well as an estimate of the quantity of each that will be needed. The threshold was set at the median (165) number of positions needed. This resulted in 62 four-digit occupations being identified as high-demand occupations.

APPENDIX 4

Stakeholders who responded to the DHET's Call for Evidence:

1	Trade and Industrial Policy Strategies
2	Contractors Plant Hire Association
3	Department of Agriculture, Forestry and Fisheries
4	Actuarial Society of South Africa
5	South African Veterinary Council
6	Institute of Risk Management South Africa
7	South African Weather Service
8	South African Wildlife College
9	South African Institute of Chartered Accountants
10	Fibre Processing and Manufacturing Sector Education and Training Authority
11	Agriculture Sector Education and Training Authority
12	South African Geomatics Council
13	Retail Motor Industry Organisation
14	South African National Biodiversity Institute
15	South African Facilities Management Association
16	Western Cape Premier's Office
17	Business Unity South Africa
18	Department of Telecommunications and Postal Services
19	Old Mutual
20	South African Institution of Civil Engineering

APPENDIX 5

Respondents interviewed:

	Title	Organisation
1	Research Manager	Business Process Enabling South Africa (BPESA)
2	Manager: Coding & Nomenclature	South African Dental Association (SADA)
3	Professional Liaison Consultant	South African Society of Physiotherapy (SASP)
4	Administrator	National Textile Manufacturers Association (NTMA)
5	Administrator	Narrow Fabric Manufacturers Association (NFMA)
6	Director: Learning and Development	Association for Office Professionals of South Africa (OPSA)
7	Industry Expert	Weaving Industry (sits on the FP&MSETA Board)
8	Chief Executive Officer	Plastics Convertors Association of South Africa (PCASA)
9	Chief Executive Officer	Airlines Association of Southern Africa (AASA)
10	Chairperson	Oral Hygienist Association of South Africa (OHASA)

LABOUR MARKET INTELLIGENCE PARTNERSHIP
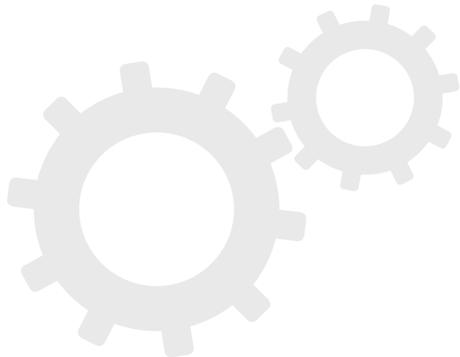
About the LMIP

The Labour Market Intelligence Partnership (LMIP) is a collaboration between the Department of Higher Education and Training, and a Human Sciences Research Council-led national research consortium. It aims to provide research to support the development of a credible institutional mechanism for skills plannning in South Africa. For further information and resources on skills planning, the South African post-school sector and labour market, visit http://www.lmip.org.za.

Occupations in High Demand (OIHD) in South Africa: A Technical Report

The purpose of this technical report is to present the background, the theoretical debates, the methodologies and processes leading to the development of the 2018 list of Occupations in High Demand (OIHD) for South Africa.

DHET defines OIHD as those occupations that show relatively strong employment growth, or are experiencing shortages in the labour market. More specifically, occupations are said to be in high demand if they:

- have shown relatively strong employment growth over the past 5 years;
- are currently showing relatively strong employment growth (that is, relatively strong growth over the two years);
- are expected to show relatively strong employment growth in the future;
- have been identified as being in shortage in the labour market; or
- are new and expected to emerge in the near future as a result of innovation, technological advancements and the development of new industries (for example, the establishment of new occupations in 'green' industries).

Numerous reports have cited challenges of skill shortages in the country as bottlenecks in both the production of goods as well as in the provisioning of services within both the public and private sectors. For the government, and more specifically the Post-School Education and Training (PSET) system to respond effectively to the skills needs of the country, it is important to, firstly, understand the nature and extent of skills needs and, secondly, adopt specific interventions that will respond to the skills challenges facing the country.

Using a novel methodology adopted after a detailed review of a number of international approaches employed to identify and measure skills and occupational needs, the design of the 2018 OIHD project methodology adopted a hybrid approach where both top-down (statistical) and bottom-up (qualitative) evidence were considered and integrated to identify occupations in high demand. This exercise yielded a list of 129 occupations at the 4-digit Unit Group with 369 6-digit occupations which are currently in high demand or are expected to be in demand in the future.

The project team understood the main purpose of the list as to inform the planning processes of DHET with respect to the post school education and training systems, particularly in relation to enrolment planning, resource allocation, career advice and qualification development. The list is however important for a number of reasons and is also intended for use by other stakeholders to inform their decision making processes. In this case the list may require that users adapt or refine accordingly to their needs.

WWW.LMIP.ORG.ZA