

National Database Sets and Research on Labour Market Demand

Joan Roodt





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Preface

One of the gravest economic challenges facing South Africa is high unemployment, but at the same time, a skills mismatch. The market demand for skilled labour is greater than the number of individuals completing post-school education and training. Prospective employers often complain that the education system does not give individuals the necessary skills to be productive in the workplace, or to start their own enterprises.

Government acknowledges that the unemployment crisis is a systematic problem and cannot be addressed by ad hoc interventions scattered across line departments. With this 'big picture' thinking in mind, DHET aims to create broad and equitable access to a full spectrum of post-school opportunities and lifelong learning encompassing adult education and training, workplace training, the FET college system, artisan and technical training, higher education and innovation.

DHET's ability to create these learning opportunities requires a network of partners to gather and maintain a labour market intelligence system. Such a system can provide analytical insights to support policies and intervention programmes.

In February 2012, therefore, DHET commissioned a HSRC led research consortium to support its capacity to create and maintain a labour market information and intelligence system, guided by the national Delivery Agreement 5. The primary focus is the development of a 'strategic intelligence capability' towards the establishment of 'a credible institutional mechanism for skills planning'. The HSRC coordinated research project is organised in terms of six interlocking research themes, two which focus on labour market information and four which focus on labour market intelligence:

- Theme 1. Establishing a foundation for labour market information systems in South Africa
- Theme 2. Skills forecasting: the supply and demand model (a Wits EPU project)
- Theme 3. Studies of selected priority sectors
- Theme 4. Reconfiguring the post-schooling sector
- Theme 5. Pathways through education and training and into the workplace
- Theme 6. Understanding changing artisanal occupational milieus and identities

The consortium made a strategic decision that their research must not duplicate or repeat existing research about the challenges facing South Africa's education and training system and labour markets. Their research must address gaps, promote synergies and explore complementarities.

Hence, as a first step, working papers were commissioned to inform the research agenda for each theme. Although the working papers cover different issues, each has four common dimensions: policy challenges to institutionalise and build a post-school education and training system in South Africa, lessons from seminal national and international research, conceptual frameworks, methodological issues and data challenges raised by this research, and potential research gaps.

One of the HSRC led consortium's goals is to create a living community of practice that researches and debates education, skills and labour market issues. These working papers were presented at a conference in May 2012 to start building such a research network.

The dissemination of these working papers is intended to encourage more individuals to join the research community. We look forward to individuals' comments. They can be emailed to <u>agoldstuck@hsrc.za.za</u>. Welcome to the research community!

Theme 1:	Theme 3:	Theme 4:	Theme 5:	Theme 6:
Establishing a foundation for labour market information system in South Africa	Studies of selected priority sectors	Reconfiguring the post- schooling sector	Pathways through education and training into the workplace	Understanding changing artisanal occupational milieus and identities
Simon McGrath	Haroon Bhorat and Morne	Andre Kraak	Michael Cosser	Angelique Wildschut
Some international reflections on	Oosthuizen	Private post-school education	Pathways through education and	Conceptualising the study of
	in the South African Labour Market:	III South Africa	market	artisaris
	A Proposed Research Programme		market	
Phil Toner	Peter Jacobs and Tim Hart	Andre Kraak	Pundy Pillay	Jeanne Gamble
Establishing a foundation for	A critical review of the research on	Differentiation in the post-	Pathways through education and	Models and pathways to
labour market information	skills development in rural areas	school sector	training and into the workplace: a	institutionalise
systems in South Africa			concept paper	apprenticeships
Anthony Gewer	Shirin Motala	Joy Papier et al	Sharlene Swartz	
Developing a framework for	A critical review of research on	Contemporary issues in public	Navigational capacities for youth	
institutional planning and	skills development and labour	FET colleges	employment: A review of	
monitoring in FET Colleges	market demand in the early		research, policies, frameworks	
	childhood development sector		and methodologies	
Carmel Marock	Thembinkosi Twalo	Veronica McKay	Fiona Lewis	
Developing a framework for	A comparative review of skills	A critical review on Adult	Traffic jams or trees – how are	
understanding SETA	development in cooperatives	Basic Education (ABET) in	South African youth progressing	
performance: Monitoring and		South Africa	through the higher education	
evaluating their role in skills			sector? And what lessons can we	
planning, steering and enabling a			learn from current studies?	
supply within their sector				

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BongiweMncwangoTowards a demand side firm levelsurvey of labour information inSouth Africa	Margaret Chitiga and Stewart Development of a national skills forecasting model	ThenjiweMeyiwaandNoluthoDikoThe state of graduate teachertransitionstothelabourmarket	StephanieAlaisJobs?What jobs?Skills?skills?Anoverviewofstudiesexaminingrelationshipsbetweeneducationandtrainingandlabourmarkets	
Michael Cosser and Fabian Arendse Education and labour market indicators	Imraan Valodia Conceptualising skills development in the informal sector	Felix Maringe An overview of studies exploring systemic issues related to the South African post-school sector		
Joan Roodt National database sets and research on labour market demand		Peliwe Lolwana Is post-school education adult education and training? The shape and size of post-school education		
MarietteVisserNational database sets availableforpost school sector (supplyside)		MichelleBuchlerA critical review of researchonskillsdevelopmentqualifications structures		
Michael Gastrow Innovation, skills development and South African labour market intelligence		Volker Wedekind Towards responsiveness and employability in the post- school sector		

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ACRONYMS AND ABBREVIATIONS

AME	Average Monthly Earnings
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ASSA	Actuarial Society of South Africa
BEE	Black Economic Empowerment
BMR	Bureau of Market Research
CESM	Classification of Educational Subject Matter
CLAS	Cement, Lime, Aggregates and Sand Sector
CM	Chamber of Mines
CNCI	Cement and Concrete Institute
CPI	Consumer Price Index
CPLO	Catholic Parliamentary Liason Office
CSIR	Council for Scientific and Industrial Research
DACST	Department of Arts, Culture, Science and Technology
DHET	Department of Higher Education and Training
DoL	Department of Labour
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EIU	Economist Intelligence Unit
ESSA	Employment Services for South Africa
etqa	Education and Training Quality Assurance
FASSET	Financial, Accounting, Management Consulting and Other Financial Services
FET	Further Education and Training
GDP	Gross Domestic Product
GEAR	Growth Employment and Redistribution
GIZ	Gesellschaft für Internationale Zusammenarbeit
HCD	Human Capital Development
HEMIS	Higher Education Management Information System
HET	Higher Education and Training
HLFS	Household Labour Force Survey
HSRC	Human Sciences Research Council
HWSETA	Health and Welfare Sector Education and Training Authority
ICT	Information Communication Technology
IES	Income and Expenditure Survey
ILO	International Labour Organisation
IMF	International Monetary Fund
INSSO	International Network of Sector Skills Organisations
INSTAT	United Nations Industrial Development Organization Industrial Statistics Database
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISIC	International Standard Industrial Classification of all economic activities
IT	Information Technology
ITL	Industrial Training Organisation
ITO	Industry Training Organisations
JSE	Johannesburg Stock Exchange
KILM	Key Indicators of the Labour Market
LFS	Labour Force Surveys
LMI	Labour market intelligence
LMS	Labour Market Signalling
MAPP-SETA	Media, Advertising, Publishing, Printing and Packaging Sector Education and Training Authority

MQA	Mining Qualifications Authority
NAAMSA	National Association of Automobile Manufacturers of South Africa
NACI	National Advisory Council on Innovation
NGO	Non-governmental Organisation
NIDS	National Income Dynamics Study
NLRD	National Learner's Record Database
NQF	National Qualifications Framework
NSS	National Skills Survey
OECD	Organisation for Economic Co-operation and Development
OFO	Organising Framework for Occupations
OHS	October Household Survey
QES	Quarterly Employment Statistics
QLFS	Quarterly Labour Force Surveys
RPL	Recognition of Prior Learning
RSC	Regional Service Councils
SAABC	South African Automotive Benchmarking Club
SADC	Southern African Development Community
SALT	Southern African Large Telescope
SANBI	SA National Biodiversity Institute
SAPIA	South African Petroleum Industry Association
SAQA	South African Qualifications Authority
SARB	South African Reserve Bank
SARS	South African Revenue Service
SASCO	South African Standard Classification of Occupations
SEE	Survey of Employment and Earnings
SETA	Sector Education and Training Authority
SIC	Standard Industrial Classification
SKA	Square Kilometre Array
SMME	Small, medium and micro enterprises
SSP	Sector Skills Plan
Stats SA	Statistics South Africa
TVET	Technical and Vocational Education and Training
UCT	University of Cape Town
UNIDO	United Nations Industrial Development Organization
USA	United States of America
WSP	Work Skills Plan

EXECUTIVE SUMMARY

The National Planning Commission envisages that *the country needs an economy that serves the needs of all South Africans and in the short term jobs need to be created for millions of unemployed people, many of whom are young and low-skilled, while at the same time skills and knowledge needs to be upgraded for South Africa to increase exports and meet a greater share of global demand in the longer term.* A central objective of Government is aptly to establishing a credible institutional mechanism for skills planning to provide policy-makers with an analytical framework, grounded in the most accurate empirical data available, to guide the identification of policy priorities and the design of policy instruments aimed at creating employment and developing the country's human resources towards economic growth. A key dimension of LMI is to develop 'demand-led' skills development and put into place an integrated labour market system to redress high and growing levels of unemployment and poverty alongside the development of high-level skills to grow the economy.

LMI is required to inform skills planning nationally and the first challenge is to establishing a *national* standardised framework that will inform skills development across government and economic sectors. The second challenge is to enable *international* comparisons, because of a globalised labour market. The third challenge is to have *quality* data for quantitative analysis to be supplemented by complementary qualitative data. The final challenge is to develop comprehensive *capacity* for labour market forecasting.

It is recognised in most countries that it is not possible in a market economy to deliver precise answers about investment in education and training provision to address labour market demand and forecasts should be regarded as indicative of general trends of the most likely future rather than precise forecasts. There are various labour market forecasting approaches, but as South Africa's data is currently inadequate to build a sophisticated time series model (as shown in many of the studies that were conducted in the country), a *market signalling* approach is advised to identify skills requirements. A combination of forecasting approaches seems to be the best method to obtain labour market information where data is inadequate.

The literature study shows that none of the previous work on skills needs in South Africa can claim to have predicted detailed skills needs in different sectors with great quantitative precision, although it contributed to and informed skills planning in the country. The various methodologies that were used included: published research that made use of, inter alia, base year employment to project future occupational employment; economic growth predications by financial institutions, such as the banking sector; elasticities for labour market sectors calculated in one study and used in follow-up studies; analysis of documentary evidence; data obtained from private data houses, such as Global Insight, Who Owns Whom, and Quantec; various official datasets; SETA data; interviews and case studies; and surveys. A combination of methodologies is required in a country with an uneven economic and labour market landscape.

Research found that in general there were a lack of quality data; skills shortages at the strategic management level; a national gap in foundational education skills; a small pool of matriculants with the necessary grades and mathematical and natural science subjects; a lack of opportunities to get the necessary work experience; racial inequality; and lack in gender parity. More specific, studies of professions found that immigration needs to be less cumbersome; and professionals from abroad need to be recruited back to South Africa and a study on medical doctors found that desirable conditions in the country would be the 'pull'of international job offers. Retired professionals also need to be recruited back to help with mentoring of less experienced entrants in the workplace. Among some professional body. Some professions had an over-supply of new entrants, such as the law profession for instance; while there was a need to establish dual career paths with the same benefits for managers and technical professionals in for instance engineering and the biodiversity professions. In the nursing profession there is a dearth of research to identify skills shortages at all

levels, while skills scarcity of educators varied according to geographical areas, school grades, subjects, race and age groups. A shortage of artisans was mainly due to the decline in apprenticeship training.

In South Africa there is a dualism between 'low' and 'high' value-adding production segments within the national economy; a divide between 'state' and 'market' regulation; and finally, a divide between 'internal' and 'external' forms of labour market formation. Therefore, differentiated policies customized to different sectoral needs will be required in South Africa. Some segments will require that intermediate to high skills needs be addressed to contribute to export markets for economic growth, while other segments will require policies that support and contribute to sustainable labour intensive jobs that require mainly low skills. Sector studies on labour-intensive sectors, resource-based sectors, services, public infrastructure sectors, and high-tech sectors found that there are similar skills needs across sectors, such as a limited culture of mentorship and uncertainties over exchange rates and corporate strategies, but then there are also skills needs specific to certain sectors. In the labour-intensive sector, the hospitality sub-industry, which forms part of the tourism industry, is for instance dominated by semi-skilled and unskilled workers and has the potential to contribute to reducing unemployment, but it cannot solve national unemployment, because of a lack in leadership and a gap in foundational life skills among workers. The clothing and textile industry is another example of the labour-intensive sector in which there is a need for a largescale, government-funded training programme; the creative industries sector are especially oversupplied with new entrants; in the agro-processing sector more recognition of prior learning and an update of training courses are especially required; the differentiation of rural and urban areas in the agriculture sector is problematic.

In the resource-based sector, the metals beneficiation industry has not managed to advance the beneficiation process of most metals to the final product stage and most metals are exported after the milling stage when relatively little value has been added to the product. However, a small number of leading firms, run by skilled engineers have benefitted from technological transfer as a result of alliances with larger firms. In the Chemicals sector there is a need for further downstream development in sub-sectors and in the wood, paper and pulp sector the production system appears to be stagnating as a result of skill shortages.

The services sector account for the largest share of employment in the economy and learnerships can especially play an important role to upskill the forkforce. In the public infrastructure sectors there is insufficient level 3 trainee output from FET colleges, a need for on-the-job training as the state cut back on investment in public infrastructure projects it affected training of state-owned enterprises and resulted in a shortage of artisans.

In the high-tech sectors a balance between science and other development activities is required in support of the catch-up process. Multinational corporations based in the country tend to invest more in training than locally owned firms in this sector. In the aerospace sector a critical challenge is to increase the participation of non-white, female and younger people in the technical occupational categories. The country also has ambitious high-science astronomy initiatives such as the Southern African Large Telescope (SALT) and the Square Kilometre Array (SKA) that will need a network of highly skilled scientists and engineers.

Future research

In future it would be important to focus on demand for labour in the formal as well as informal economy and to identify sectors that can absorb more low skilled people to address the high unemployment rate, sectors that require more intermediate skills and sectors that require scarce and critical skills. Data on remuneration is not readily available, while changes in wages for specific occupations may be symptomatic of changes in the relative availability of workers possessing the skills required for the occupation. Remuneration is thus an important means of identifying skills shortages and more focus should be on remuneration in the future.

South Africa can learn from experiences in the institutional design of labour market information systems in other countries. The country can for example also do supplementary surveys like New Zealand to gain remuneration, educational and vacancy data in addition to the current QLFS data. The study on the skills gap in the informal sector in India could also be further researched in the future in order to inform and determine the applicability in South African circumstances.

Data challenges

Labour market information may potentially serve all members of society over their lifetimes, particularly as they are engaged in the labour market. An optimal labour market information system relates quantitative labour demand and supply and presents qualitative analyses of supply/demand and other labour market relationships and trends. In addition, a labour market information system must provide for easy access to the information and need to fulfill a number of requirements to serve the needs of users, namely, accessibility, comprehensiveness, timeliness, regularity, scope and coverage, accuracy, and storage.

Although the country has the key datasets in place, these have their limitations and need to be improved upon to match that in other countries in order to facilitate comparisons and contribute to knowledge about where jobs and growth of the future will come from in a global environment. Labour market comparisons can internationally be made according to key indicators of the labour market (KILM). The 18 KILM are: the labour force participation rate; employment-to-population ratio; status in employment; employment by sector; employment by occupation; part-time workers; hours of work; employment in the informal economy; unemployment; youth unemployment; long-term unemployment; time-related underemployment; inactivity; educational attainment and illiteracy; average monthly wages; hourly compensation costs; labour productivity; and poverty, income and the working poor. Various datasets address these indicators, although each of these datasets has its challenges. Data from these datasets needs to be harmonised and merged into the envisaged LMIS.

Data on employment, vacancies, and replacement demand (retirement, mortality, migration and mobility) is required in order to make future demand projections. The LFS/QLFS are the best datasets of quantitative employment and especially employment trends according to occupation and industry. The Census is the best source with regards to labour market information at a particular moment in time. With employment trends the change from the SASCO to the OFO occupational classification needs to be taken into account in drawing conclusions. The LFS/QLFS is not sufficient for educational information and other sources also need to be consulted. Additional qualitative information is also required to supplement information obtained from the LFS/QLFS and/or Census to put quantitative information in context. WSPs can add an additional nuanced and SETA specific focus, but then WSP need to be improved and standardised across all SETAs. As far as data on vacancies are concerned, the DoL's dataset are available, but this needs to be incorporated into the ESSA system together with data from private employment agencies and Career Junction to form a holistic picture. Qualitative interviews and surveys or proper WSPs are required to further supplement vacancy data. LFS/QLFS and/or Census data is suitable to calculate retirement data and ASSA data is suitable for data on mortality. Stats SA, however, needs to improve information on migration. Interviews with employers, SETA surveys or WSPs that are well planned can inform on the level of productivity in industries in combination with trade flow data on the TIPS and INSTAT databases.

A relational database which can be defined as an integrated, self-describing collection of data describing sets of related entities and the relationships that interconnect databases, is the type of database that are most widely used as part of information systems. Relational databases have been designed to store quantitative information. A database, however, cannot be a substitute for labour market analysis, as the interpretation of signals and the translation into policies is not straightforward. Development of common formats to collect information would facilitate exchange of information.

INTRODUCTION

The unique South African context needs to be taken into account in establishing a foundation for labour market information systems in South Africa. Unemployment and poverty is the foremost challenges in South Africa that need to be addressed. To address unemployment is thus a priority in South Africa, but sustainable jobs can only be created if there is economic growth. The National Planning Commission (2011, p.11) thus envisages that *the country needs an economy that serves the needs of all South Africans and in the short term jobs need to be created for millions of unemployed people, many of whom are young and low-skilled, while at the same time skills and knowledge needs to be upgraded for South Africa to increase exports and meet a greater share of global demand in the longer term.* Government thus needs reliable information on industries and occupations that are growing, industries that can absorb those with low skills, those with intermediate skills and those that require high skills for innovation in order to increase exports. A track record must be kept of absorption of the unemployed into the labour market and upgrading of skills in the labour market from low to intermediate and to high skills levels.

Central to future skills needs planning is good intelligence about the labour market, as Labour Market Intelligence (LMI) is worldwide increasingly being used to develop 'demand-led' funding routes for skills training; to help government and industries to understand what skills are required; and to reform skills systems (INSSO 2011). Likewise, the South African government needs delivery and implementation plans for its foremost priorities and has agreed on *12 outcomes* as a key focus of its work (DHET 2012a). Outcome 5, namely: *A skilled and capable workforce to support an inclusive growth path* in turn consists of *three* separate delivery agreements, while agreement one of outcome 5 covers output 5.1, namely: *Establish a credible institutional mechanism for skills planning.* This output will be achieved via the development of frameworks for standardization and cooperation regarding information on the supply and demand of skills in the country, and the development of systems and system interfaces.

To follow a problem statement; the main challenges in anticipating skills requirements; a discussion on methodological issues; main findings, contributions and gaps in previous national research and in international comparative studies. Furthermore, an appropriate conceptual framework for demand studies in a South African context is suggested by drawing on a literature study, approaches followed abroad and those suitable for local circumstances. Subsequently, data challenges and appropriate current available datasets for demand studies are discussed. To conclude, a discussion on future research required to address identified gaps.

1. ESTABLISH A CREDIBLE INSTITUTIONAL MECHANISM FOR SKILLS PLANNING

1.1 Problem Statement

Currently there is no integrated information system in the country that provides data on the demand and supply of skills. There are disparate databases that collect information on either the supply or demand of skills, which need to be interfaced or integrated. In order to do this, standardised frameworks for cooperation will need to be established. Output 5.1, establish a credible institutional mechanism for skills planning, will be achieved via the development of frameworks for the standardization of skills supply and demand information, and the development of systems and system interfaces to supply the information and thereby create a credible mechanism for skills planning (DHET 2012a).

1.2 Challenges

Labour market information is in the first instance required to inform skills planning *nationally* and the challenge is thus to establish *a national standardised framework* for the determination of skills supply, shortages and vacancies by means of an *integrated information system* for skills supply and demand across government. Currently the demand side information is not fully reliable, especially the previous reliance on the National Scarce Skills List, which lacked credibility. The demand side information needs to be standardised and coordinated into an integrated mechanism (DHET 2012a).

Secondly, *international comparisons* of labour market and competitiveness indicators can provide a snapshot in time of the world economy (Guillard 2006). Technological innovation has increased trade and investment and made labour markets across countries more integrated in the sense that workers are competing for the same jobs worldwide (Dadush and Shaw 2012). Skills are increasingly global in terms of techniques and standards and a greater international focus on demand-led approaches for skills planning will be required. Labour market intelligence can contribute to knowledge about where jobs and growth of the future will come from (INSSO 2011). The value of national labour market information increases if it can be internationally compared to that in other countries, because of a globalized labour market. Development of common formats to collect information in an internationally standardized way can bring economies of scale and would facilitate exchange of information and experiences (Sparreboom 1999).

Indicators are means for measuring and comparing phenomena and form the foundation for labour market data that needs to be collected. The International Labour Organisation (ILO) launched the Key Indicators of the Labour Market (KILM) in 1999 to complement existing data collection programmes and to improve dissemination of data on the key elements of the world's labour markets. Country labour force participation rates are derived from several types of sources including labour force surveys, population censuses, established surveys, insurance records or official government estimates, although data from different types of sources are often not comparable (ILO 2011a). The ILO has assembled data on the KILM indicators for as many countries, areas and territories as possible (there is also an ILO office in Pretoria), but there may be missing data for some economies, usually because the economy involved was not in a position to provide information for the indicator or because the information they could provide did not satisfy the qualification criteria established for inclusion in KILM (ILO 2011b). The second challenge then is for South Africa to ideally provide information on all the international KILM (refer to Table 1 in paragraph 4 for ILO KILM). The envisaged DHET information system would be the ideal system to harmonise and merge data from various sources that can also feed into an international data collection programmes.

The third challenge is that of *data quality*. Wilson, Woolard and Lee (2004) indicate that there is general consensus that South Africa should adopt an international best practice in anticipating changing skills requirements and the best practice worldwide, usually involves *quantitative*, national level employment data in order to make supply and demand projections. The authors are of opinion that methods *other than quantitative* are generally *complementary* rather than substitutes. According to them there is some *useful data* in South Africa and some of these contributions will be highlighted in section 2 to follow. Concerns about the quality of current available datasets are elaborated on in the data challenges section (section 4).

Finally, there is the challenge of *capability*. There is limited capability accessible to government for strategic intelligence with regards to analysis, surveys, investigations, studies and research into the demand and supply of skills and labour market analysis and there is not comprehensive capability for labour market forecasting (DHET 2012a).

1.3 Methodological issues

It is recognised in most countries that it is not possible in a market economy to deliver precise answers about investment in education and training provision to address labour market demand, although there is a strong need for information about the future macroeconomic environment and the consequences for production and demand in specific sectors. According to Wilson, Woolard and Lee (2004: 17) it would not be necessary to build a new multi-sectoral model as there are a number of existing multi-sectoral macro models to provide the necessary sectoral employment forecasts.

On the demand-side, labour market forecast focuses on the expected quantity of jobs to be available and nature of skills in the future (Bartholomew et al. 1991). Labour market forecasting approaches can be categorised in four clusters, namely: Time series projection; 'bottom-up 'coefficient approach; 'top-down' forecasting models; and market signal approaches. Rather than rely exclusively on sophisticated long-term forecasts, together with their shortcomings and limitations, labour market planners increasingly bring labour market signalling (LMS) approaches into play (Wong et al. 2004).

The time series projection requires historical records and projection techniques to predict short-term demand, but errors can occur if discontinuities in data occur. The 'bottom-up' approach requires past data and considerable effort and expense to regularly update the database in order to provide occupational demand data. The 'top-down' approach makes use of extensive macroeconomic statistics, e.g. GDP, sectoral output, unemployment rate, productivity, interest rate, wage, etc. in order to make extrapolations to forecast long-term quantitative skilled labour force needs, but depends on the accuracy of assumptions. The Market Signalling approach is based on 'market signals' to identify job opportunities and skills requirements (Campbell 1997). Movement of relative wages, enrolment data, occupational employment trends and unemployment rate, job advertisements, etc. are examples of signals. This approach is particularly useful when data is inadequate to build a sophisticated time series model or econometric equations. A tracer study of graduates, interviews with experts in the field by using for instance the Delphi technique (focus groups or round tables) and surveys can help to assess if the skills supplied by institutions match what the market requires. A combination of forecasting approaches can be applied to obtain the information that is required (Wong et al. 2004). A combination of approaches are suggested for South Africa, as there are gaps in available South African datasets that needs to be supplemented by surveys and interviews with experts in sectors, as will be indicated in the section to follow.

2. 'STATE OF THE ART'

The following literature study shows that none of the previous work on skills needs in South Africa can claim to have predicted detailed skills needs in different sectors with great quantitative precision, although it contributed to and informed skills planning in the country (Wilson et al. 2004). The various approaches followed in these studies and gaps need to inform future research and best practices. Methodologies and datasets used, as well as findings and gaps need to be taken cognisance of in future planning and data population of the envisaged DHET labour market information system.

2.1 National studies

As South Africa requires high-skills sectors to compete globally, as well as a low-skills, labourintensive development strategy to curb unemployment, the following analysis of previous national studies will determine how these studies have contributed towards understanding the South African situation, which methodologies were followed and what future studies will need to be focused on and which studies need to be improved upon. Various national studies, namely, demand and supply studies, sectoral studies, remuneration studies, national skills surveys, provincial studies, studies on professions, and Sector Education and Training Authority (SETA) studies are discussed.

Demand and supply studies

In 1997 the Human Sciences Research Council (HSRC) was commissioned by government to conduct a National Research and Technology Audit (Van Zyl et al. 1997) and provide a supply and demand analysis for science, engineering and technology human resources in South Africa which was a highskills focus study. Trends in educational output were estimated from the 1991 population census; the 1994 and 1995 October Household Surveys; and the HSRC Register of Graduates. The project drew on labour demand projections made in the GEAR macro-economic strategy. The sectoral employment totals were broken down into occupational employment using industry occupational matrices. Manpower surveys conducted annually by the then Central Statistical Service were the main source of data. Occupational trends from 1970 to 1993 were used to estimate the 1995 base year employment and to project occupational employment to the year 2000. An organisational survey was conducted to establish a database of human resources in research and development outside the business sector. The audit provided a basis for future updates and comparative work.

In 1999 the HSRC undertook a study of South African labour market trends and workforce needs in respect of *formal* employment for the period 1998 to 2003. It was the first attempt to analyse and forecast demand in the South African labour market on a detailed occupational level. The focus was not only on forecasting demand and supply, but also on the identification of the main driving forces behind changes in these variables. Detailed forecasts of future demand were made at sub-sector level of professional and artisan occupations, as these occupations typically require at least three years' post-matric education. A forecast of the *supply* of *high level* human resources was also done. However, a comparison between supply and demand was not made, due mainly to the weak link between most occupations and educational qualifications. It is only in the clearly defined and regulated professions that supply and demand can be compared with a satisfactory level of confidence. In most other occupations the link between the occupation and educational qualifications is not clear enough to allow for such comparisons. The study incorporated demand and supply data; a survey of employers (to estimate the change in output and the change in employment within their sectors); and replacement demand (incorporating mortality rates and migration estimates) to arrive at an integrated demand forecasting model for the total number of persons employed in each of 81 occupational categories in 36 sectors (Whiteford et al. 1999). The 1999 HSRC study forecasted growth in especially the IT field, accounting and financial professions and electrical and chemical engineers. The informal sector was not included in this study.

In 2001, the European Union, the Department of Labour (DoL) and the Department of Trade and Industry (DTI) commissioned the Bureau of Market Research (BMR) to investigate key skills shortages and the fast tracking of skills development (BMR 2001). The BMR study used a mixture of qualitative, quantitative and secondary data methodologies to conclude that the country will need to especially produce more IT specialists, electronic engineers and specialist managers and align educational system needs to the needs of employers. As it would be important to increasingly work cross-disciplinary and include emerging research leaders and researchers from designated groups in the future and BMR envisages increased capacity to connect with non-governmental research organisations, industry, government, science councils and other research organisations (UNISA 2012), co-operation with the BMR in future is recommended.

The work of Whiteford et al. (1999) was updated by Woolard, Kneebone and Lee (2003) which also focused on employment forecasts for specific *high-skill occupations* over the period 2001-2006. Employment by occupations was estimated by using the Labour Force Surveys conducted in

February and September 2001, while ABSA's growth predictions were relied on for sectoral growth assumptions. Funding for a survey approach was not available and the elasticities obtained in the 1999 HSRC study were assumed to still hold for all sectors, except IT as a result of global changes. Interviews with several of the major IT companies were conducted which revealed a demand for *experienced* and *specialised* IT staff and only a very few "entry-level" positions. To calculate new demand for labour, replacement demand (retirement, net migration, movement into other occupations and in-service mortality) was considered.

Sectoral studies

Various sector demand studies made use of a *combination* of methodologies and secondary data: (e.g. SETA data; the Who Owns Whom sector studies; Statistics SA (Stats SA) October Household Survey (OHS), Labour Force Surveys/Quarterly Labour Force Surveys (LFS/QLFS) data; supply data from the DHET's Higher Education Management Information System (HEMIS), literature studies, case studies, and interviews. Sector studies indicate that a 'one-size-fits all' policy will not do and a differentiated skills development policy in a highly uneven economic and labour market landscape is required. To follow is a discussion of some of these sector demand studies according to sector type: labour-intensive sectors, resource-based sectors, services, public infrastructure sectors, and high-tech sectors.

Labour-intensive sectors

Examples of four labour-intensive sectors, the *tourism* industry; the *clothing and textiles* industry; creative industries; and agro-processing industry are discussed in Kraak (2009a). In the tourism industry, the *hospitality* sub-industry is dominated by semi-skilled and unskilled workers; the conservation and tourism services sub-industry has roughly equal employment of highly skilled and skilled workers, while the travel and tourism services sub-industry is dominated by highly skilled and skilled workers (Earle-Malleson 2009a). This study by Earle-Malleson encompassed an extensive literature study and case studies in Soweto and Hazyview which included semi-structured interviews with regional and provincial tourism marketing agencies, training providers, local tourism development agencies, associations, and managers of local tourist attractions. Unscheduled interviews were undertaken with staff and managers and owners at local tourist information offices, tour operators, accommodation establishments, local restaurants, shops, and then also with craftsellers and tourists in the region. The main finding of this study is that it is vital to address the skills shortages at the strategic management level first before other challenges can be addressed. Secondly, more opportunities for practical experience in the sector are crucial and more qualifications are required for which work experience prior to graduation is a prerequisite. Finally the large national gap in respect of foundational education and related skills is a severe challenge for any skills upgrading effort within this industry. The tourism industry is vital to national development efforts and can contribute to reducing unemployment and poverty, but it will not solve the national unemployment problem, as there is shortage of leadership, high skills and a substantial gap in terms of learners' foundation and life skills crucial to promote and advance the sector.

The *clothing and textiles* industry in South Africa, characterised as a low value-adding and poor performing labour market segment was analysed by Morris and Reed (2009). Information on the sector was obtained through a literature study and firm-level interviews with 15 clothing and 5 textile firms in the Western Cape and KwaZulu-Natal in 2007 and the sample covered the entire spectrum of firm sizes and types. Interviews were conducted to establish skills distributions in firms; skills shortages and gaps; firm strategies; government interventions to alleviate skills shortages; and to assess future skills needs in the sector. The clothing sector in South Africa represents a classic example of a poorly functioning internal labour market characterised by a neglect of training and minimal investments in the upgrading of technology and as a result the sector fails to shift to world-class manufacturing and becomes vulnerable to competitors such as China. It is concluded in this

study that there is a desperate need for a large-scale, government-funded training programme to raise and upgrade skills levels.

The creative industries sector study by Joffe and Newton (2009) applied a literature study, as well as case studies to gather information on the sector. The White Paper on Arts, Culture and Heritage (DACST 1996) highlights the value of the cultural industries in meeting broader government objectives relating to job creation and economic development. Many of the creative industries depend heavily on public-sector investment. The creative industries most often source skills from other related sectors such advertising, design, multimedia and the broader entertainment sector. Despite a range of scarce and critical skills (e.g. product developers and designers; craft and experienced script and screen writers in the film sector), the creative industries are over-supplied, especially with new entrants. Technological change, impacting on the way companies produce output, is the most important driver of skill demand. There is a lack of industry-appropriate training opportunities and continuous professional development is required and currently not catered for in this sector.

The *agro-processing* sector as discussed by Pieterse (2009) made use of case studies and employment trend data obtained from a secondary dataset, Quantec. Supply data on Further Education and Training (FET) and Higher Education and Training (HET) was obtained from the DHET. A literature study provided the necessary qualitative information. The study indicated future economic growth in the food and beverage sub-industry, but there was a lack of work experience and 'soft skills' among graduates; a need for more private-sector involvement; improved racial equality in the workplace; recognition of prior learning (RPL); targeted training interventions linked to identified growth areas; achieving gender parity; and a shortage of private training providers. Conversely, the leather and leather products sub-industry has experienced retrenchments, although more employment equity candidates need to be employed in key positions. Investment is required in improvements in the capabilities of local designers to encourage downstream activity in niche products that use indigenous materials. Furthermore, National Qualification Framework (NQF) unit standards and training courses have to be updated to ensure that these respond to future scarce skills requirements.

Agriculture is often promoted as the backbone of the rural economy and a driver of rural economic development. The National Advisory Council on Innovation (NACI) commissioned the HSRC to do a study on the role of women in the agricultural and agro-processing sector (Hart et al. 2010). The methodology invoked, utilised the analysis of a number of datasets, a literature review and analysis of existing studies, as well as a qualitative interview component. Analysis of QLFS demand data; data from the HSRC learnership database; supply data from HEMIS; analysis of recent Census of Commercial Agriculture (2002 & 2007) data; and General Household Survey data (2005, 2007, 2008 and 2009) were used for quantitative data. Datasets and national surveys in general have limitations and the differentiation of rural and urban areas was often problematic and proxies were used where possible. The results from different datasets often conflict due to sampling size and frame, methodology, different phrasing of questions, and public availability of data. Analysis indicated that there has been a positive shift in the proportion of women towards reaching close to half of employment in the sector. More people with high and intermediate skills were required in this sector and less with only low skills levels, as a result of technology advancement, mechanisation and global market competiveness. Despite these requirements in the agricultural sector, there were a decline in the number of both men and women employed in the professional category. Furthermore, most learnership enrolments in agriculture related fields of study over the period of analysis (2005-2006), as well as FET attendance in agriculture related fields of study by both males and females in 2009 were at the low skills levels. Upgrading of skills in the agriculture sector is thus required.

Resource-based sectors

The study by Maree, Lundall and Godfrey (2009) on the *metals beneficiation* sector analysed Quantec employment data and HEMIS supply data. Primary research interviews conducted at 11

firms provided information on the dynamics between the firm's strategic objectives and their skills requirements. The conclusion was made that although South Africa is richly endowed with metals, it has not managed to advance the beneficiation process of most metals to the final product stage and most metals are exported after the milling stage when relatively little value has been added to the product. However, there has been partial transition to world-class manufacturing amongst a small number of leading firms in the sector. These firms are usually run by skilled engineers who have established alliances with larger firms and often benefitted from technological transfer and improved management systems in the process.

The study on the *chemicals* sector by van Zyl (2009) used various secondary datasets: e.g. CMCS & Ozone Business Consulting database; South African Revenue Service (SARS); South African Reserve Bank (SARB) and conducted interviews to obtain the required information on the sector. Core functions include manufacturing, sales and administration, while services such as IT, catering, cleaning, security and logistics are often outsourced on a contract basis. The study found that the chemical sector is stagnant in terms of job creation due to efficiency improvement as well as a general trend towards automation and capital intensivity. There is a need for future skills development to be directed towards areas of active investment, as well as further downstream development in sub-sectors that have proven to be feasible to develop further. Identified skills for active investment include artisans and engineers for the construction of new improved operations. There is concern over the low pass rate of African matriculants in mathematics and natural science that are required as operators in the chemical sector.

The study on the *wood, paper and pulp* sector by Pogue (2009) consulted secondary datasets (e.g. Quantec, Forestry South Africa, Paper Manufacturers Association of South Africa) and conducted 10 interviews with experts in the field. The new production system appears to be stagnating in this sector and shortcomings in skills development is a critical contributing factor to poor management in the sector. Systemic problems such as a limited culture of mentorship were identified as barriers to further changes in the skills system.

Services

A study by Rènette du Toit (2008) on intermediate-level workers in the services sector indicated that the services sector accounts for the largest share of employment in the economy and is for that reason important in terms of human resources development. The majority of the workforce in the services sector needs to be upskilled from NQF level 4 to NQF level 5 and the study argues that learnerships can play an important role in this regard. Employment data in the services sector was calculated from the Quantec database, learnership data was obtained from the DoL, while technikon graduate output was calculated from HEMIS data.

During the second half of the 20th century structural change has occurred in the economy and the services sector as a whole increased in size, while mining and manufacturing declined in relative terms (Archer 2009). A combination of sources, namely, South African Reserve Bank (SARB); Standard Bank; Development Policy Research Unit at UCT; SETAs; and various reports were consulted regarding demand and supply data. Employment in this sector is concentrated in jobs that are non-manual and either at the intermediate- or high-level, along with clerical and secretarial occupations at lower levels. The author indicates that even way back in the past forecasting of skills requirements were found problematic in the light of uncertainties over technology, exchange rates, and future corporate strategies. Forecasts should be regarded as indicative of general trends of the most likely future rather than precise forecasts and results are intended to provide a useful benchmark for debate and policy deliberations about underlying employment trends (Sector Skills Development Agency 2006).

An HSRC study on private Information Communication Technology (ICT) skills provision (Roodt 2003), commissioned by the Department of Communication, indicated that private training institutions offer unique opportunities to those who do not qualify for university of technikon training to obtain intermediate level qualifications. The study indicated that private ICT training had a stronger growth

rate than public ICT training over the 1997 to 2001 period, as private ICT training was more productspecific and structured for fast-changing trends in technology and practices. The study highlighted the need for quality ICT demand and supply data, especially from private training institutions that are not registered and accredited. The research methodology used incorporated both qualitative and quantitative indicators based on supply data from Trainingweb and ITWeb Internet sites, while interviews were conducted with public and private training providers and employers. The study also indicated the need for regulation of private ICT training providers and the profession.

Another study in the services sector by Paterson and Roodt (2009) analysed LFS employment and remuneration data; HEMIS supply data and data from a HSRC survey of vacancies. The study found that projections of labour market demand and supply are deficient if used in isolation. It was indicated that skills 'shortages' and 'needs' are driven by a range of factors that are exogenous (e.g. global labour market pressures), as well as endogenous to firms (e.g. weak commitment to skilling and retaining own workers). The authors conclude that what is lacking in order to make coherent plans regarding sector support measures, such as skills development strategies, is a properly researched decision to target particular ICT economic activities. Government and the business sector need to be clear about specific ICT economic growth opportunities in order for higher education institutions to meet the needs in the ICT sector.

Public infrastructure sectors

The state-guided labour market needs to attend to the human capital and technological needs of the state-owned enterprises, particularly those high-end functions in energy and transportation that are dependent on new science and technology inputs (Kraak 2009a).

The *energy* sector study by Lomey and McNamara (2009) found that there are insufficient diplomats and graduates from FET and HET institutions respectively to meet the human resources needs of the state's planned expansion of the electrical energy sector that is required to meet the country's growing energy requirements, especially relevant to renewable energy (RE), although the year-onyear supply of high-level skills should meet demand in the future. The study applied a combination of approaches in obtaining the required information on the sector, such as a literature study and data from secondary sources, namely, HEMIS data, FET output data (DHET) and Quantec employment trend data. With regard to low-level skills, the study found that there will be insufficient Level 3 trainee output from FET colleges, which will need to be remedied with workplace learnerships and on-the-job training. In the case of intermediate skills in craft, trades and technical skills, the quantity of supply from educational institutions is likely to meet demand for a couple of years, although the quality of the training received may vary and would require further shop-floor up-skilling to upgrade competencies.

The study by Havenga (2009) on the *transport* sector constructed data from Stats SA's OHS and LFS, conducted interviews for critical evaluation and undertook desktop research and modelling of the data (based on secondary test cases) to fill the gaps that existed. The study concluded that there are differences in employment supply and demand issues for the sub-industries of the sector, especially when the future is considered. There is a big gap between demand for and supply of technical/operational skills for all sub-industries, but sub-industries change over time as a result of external factors and the demand for skills can grow exponentially and result in significant shortages.

Kraak (2009a) conclude that as a result of the austere measures by GEAR to reduce the fiscal deficit, the democratic state cut back dramatically on investment in public infrastructure projects. These cutbacks and restructuring efforts affected the training functions of state-owned enterprises and resulted in a reduced output of technically trained artisans, technicians and engineers. Government will have to ensure the effective expansion of the production of skilled professionals and associate professionals on the supply side to meet the demands in state-owned enterprises.

High-tech sectors

Kraak (2009a) indicates that the high-tech sector is reliant on large-scale state support and sciencebased inputs from universities. The production of high skills and a ready supply of engineers is a key component of state support. Companies in this sector regularly send high-skill employees abroad for formal training to remain globally competitive. A balance between big science and other developmental activities is required in support of the catch-up process (Lorentzen and Petersen 2009).

The study of the successful *automotive* sector by Barnes (2009) encompassed firm-level data analysis of secondary data sources, a comprehensive literature review, quantitative data from the South African Automotive Benchmarking Club (SAABC) and structured qualitative interviews at 12 auto component firms spread across the country to limit regional biases in findings. An estimation model by B&M Analysts was used to project future employment in the sector. The automotive sector is the most successful manufacturing sector in the country and needs to achieve extremely high quality standards to maintain this status. A range of programmes has been initiated to support skills development in the sector. However, only the upper tier of South African component suppliers operates at levels that are close to the global frontier, while performance in other parts of the sector is not so impressive. Growing global connectivity has facilitated technology and skill transfer and other spill-overs, but South African firms have not been at the core of this activity. Underperformance resulted from insufficient investment in enterprise training. Multinational corporations based in South Africa have invested more on training than locally owned firms. Barnes is also concerned about the quality of courses offered by public FET and HE institutions and the deterioration of skills supply in the sector.

The study by Kraemer-Mbula (2009) on the *aerospace* sector obtained employment data from Quantec and DTI, supply data from DHET, and qualitative information from national and international reports, as well as personal communication with relevant institutions in the sector. The South African aerospace industry is largely owned by the public sector and not a major contributor to employment in the country. A critical challenge facing the sector is increasing the participation of non-white, female and younger people in the technical occupational categories. The demand for lower skills is rising and there is also a demand for intermediate skills in this manufacturing sector. Conversely, in the wider overall manufacturing sector the skills base is moving from a low-skill base towards a higher-skilled profile.

In Lorentzen and Petersen's study (2009) on three new high-tech sectors (nuclear power and technology; space technology; and biotechnology) various sources were consulted, e.g. HEMIS, personal communications, information from various associations, Sunday Times database, Euroconsult, Department of Science and Technology's (DST's) space portal and the Square Kilometre Array (SKA) international, as well as SKA South African project. The nuclear sector experiences a lack of scarce skills at the high-skill level. Hence the nuclear training academy at Koeberg will be set up in partnership with multinational companies that will participate in the nuclear build programme to ensure continuous flow of scientific expertise to the sector. South Africa has ambitious high-science astronomy initiatives, such as, inter alia, the Southern African Large Telescope (SALT) and the SKA and will need a vast network of highly skilled scientists who are currently not available in the numbers that are required. The small biotechnology sector currently does not have a skills shortage, although graduates do not always have the requisite experience and most up-skilling will have to be done on-the-job by firms and research groups.

National Skills Surveys

In 2000 the HSRC published a report on a baseline survey of industrial training in South Africa (Kraak, Paterson, Visser & Tustin, 2000). This was followed by a report on the first full-scale National Skills Survey (Paterson, McGrath and Badroodien 2005) – a survey of skills development in 2002/03 – and by a report on the NSS2007 (Paterson, Visser and Du Toit 2008) – a survey of skills development in 2006/07. The NSS2007 devoted a chapter to comparing skills development in small, medium and

large enterprises in 2002/03 and 2006/07. In 2009 the DoL commissioned the HSRC to conduct an assessment of the impact of skills development support on small, medium and large enterprises, Black Economic Empowerment (BEE) enterprises, and BEE co-operatives. The outcomes of the study specified in the Terms of Reference were to be a review of the literature on BEE firms and BEE co-operatives, particularly from a skills development perspective, and a National Skills Survey (NSS) of training in private enterprises in 2010, but this was not useful.

Provincial studies

The HSRC has conducted various studies on employment in each of the nine provinces over the years. A key dimension of provincial growth and development strategies is to identify policy interventions to redress high and growing levels of unemployment and poverty alongside the development of provincial human resource development strategies. As is the case at all spheres of government and across all departments in South Africa, the design and implementation of policy measures to create sustainable jobs is a central preoccupation of provincial governments. In order to design these strategies provincial governments requires a review of their provincial labour markets. In particular, an analysis of the composition of the active labour force and employment and unemployment trends are required. A comprehensive analysis of structural change in the provincial economy, the role and changing nature of the rural economy, trends in employment and unemployment, the migration patterns of labour, the process of skill formation and labourabsorbing and labour-shedding are critical to develop an understanding of the dynamics in the provincial labour market. Information from secondary data and literature has been sourced and analysed by the HSRC for most of the provinces over a number of years. The findings were tested and the analysis deepened through interviews with key players in the provinces. Published research was reviewed and the following databases were analysed in many of the provincial studies: The OHS and LFS; the Income and Expenditure Surveys (IES); the Survey of Earnings and Expenditure (SEE); the 2001 census data; the SARS database on firms paying levies to the SETA's; provincial socioeconomic databases; the workplace skills plans submitted to the various SETA's; and other regional economic data as was available.

A central objective of the strategic review of provincial labour markets was to provide policy-makers with an analytical framework, grounded in the most accurate empirical data available, to guide the identification of policy priorities and the design of policy instruments aimed at creating employment and developing the province's human resources. The provincial reports provided a conceptual framework for thinking about policy interventions in the various provinces. The implementation of active labour market policies usually takes place at the provincial level and hence they represent an important policy instrument for intervening in the labour market.

Studies on professions

Globalisation has impacted on the prosperity of nations and companies and those countries and companies that can attract, develop and retain skills, are bound to be successful in the 'global skills race'. Government policy and company strategies will be shaped by growing competition among countries around common resources and capabilities (World Economic Forum 2012). Globalisation offers opportunities for advancement, while developing countries are losing professionals they educate to countries with better incentives. It is thus very important to monitor the demand and supply of professionals in the country and address the challenges to retain and develop more professionals.

In South Africa a major concern is the loss of capacity, largely as a result of affirmative action, which has led to many experienced white professionals leaving their positions and often the country. Furthermore, the national gap in respect of foundational education skills is a challenge for increasing

the pool of professionals in the country. The country has a very small pool of matriculants who have the necessary grades and subjects to access programmes like engineering, medicine and accounting (Erasmus and Breier 2009). Studies by the HSRC on various professions in South Africa (managers, social workers, engineers, doctors, nurses, law professionals, ICT professionals and associate professionals, educators, artisans, and city planners) provide insights into the reasons for shortages and surpluses in these professions (Erasmus and Breier 2009). The focus of studies on professions is usually on high level skills, while this monograph also addressed intermediate skills levels in the artisan trades, nursing, and associate ICT professions and the need for professional services in the rural areas. Multiple sources and methodologies were applied in the various chapters on professional demand and supply studies, such as, inter alia, a literature review, official statistics from Stats SA, statistics from professional councils, government departments, HEMIS data, data from a survey of vacancies and interviews. In order to overcome the problem of fluctuations in demand and supply data in some of the studies, averages for the period covered were calculated in order to establish trends in employment. To follow is a discussion on some of the studies on professions.

If one uses the strict definition of a profession as a group of people whose practice is shaped by training and credentialing against a rigorous body of knowledge (Spender 2005: 1282), management does not yet qualify as a profession and there is no single training programme or degree requirement for managers or a common body of knowledge associated with managerial competence (Mbabane 2009). Mbabane concludes the management profession in South Africa should be regulated by creating one national professional body to which all managers should belong. Part of the professionalization process should include the structuring of career paths for managers, with components such as internships.

Emerging from a consideration of both the quantitative and the qualitative aspects of a study on Social workers (Earle-Malleson 2009b), there is currently in South Africa an absolute scarcity of social work skills. This is underscored by data on vacancies within the Department of Social Development, the high levels of staff turnover within the Non-governmental organisation (NGO) sector, and the replacement demand for social workers over the next decade as compared with output from the higher education system. The reasons for this absolute scarcity are multi-faceted, but to a great extent as a result of the re-focus of welfare services towards previously disadvantaged groups; the escalation of welfare needs of the previously disadvantaged population due to HIV and AIDS; and because Government is in the process of legislating welfare service delivery in order to comply with its constitutional obligations to vulnerable groups. The result is that there is an increasing demand for social workers to cover all the new services. The three critical recommendations that have been accepted by key stakeholders are in summary, improved funding for social work education at a national level; funding for fourth-year social work students that can also improve access to especially rural students; and cooperation between DoL, Health and Welfare SETA (HWSETA) and providers of the NQF Level 4 learnership in Social Auxiliary Work to reduce the burden of training provision placed on agencies that are already under-staffed and under-funded.

A study by du Toit and Roodt (2009) indicated a slow growth rate in engineering professional employment over the 1996-2005 period, while most engineering professionals worked in the financial and business services sectors where they did not always apply their technical skills and assisted with risk management in industry through consulting agencies. The increase in numbers of those studying towards an engineering qualification at tertiary institutions is encouraging, but the throughput rates are poor. Factors, such as the poor quality of the school system in general, and mathematics and science education at school level specifically, are challenges in light of engineering skills shortages. Lawless (2005) drafted a list of interventions at the tertiary education and training phase, inter alia, disbursing higher subsidies to tertiary institutions for scarce skills such as engineering; developing a standardised model for selection of engineering students; sufficient bursary schemes; reviewing curricula in line with industry needs; improving staff-to-student ratios; encouraging companies to enlist more national diploma students on learnerships and to provide

opportunities for experiential training; investment in learnerships; and the establishment of a framework for the transfer of knowledge from experienced engineering professionals to younger cohorts. Strategies to attract and retain engineering professionals included the introduction of a scarce skills allowance; establishing a dual career path (same benefits for managers and technical experts); flexible working arrangements, especially for women; making immigration less cumbersome; recruiting retired engineering professionals; recruiting South African engineering professionals back from abroad; and placing a moratorium on employment equity requirements in relation to scarce skills.

According to a study on medical doctors (Breier 2009) there is no doubt that there is a shortage of medical doctors in South Africa and the country do not achieve the doctors-per-population norms of even middle-income countries internationally. Ultimately, it would seem that desirable conditions in the country would be the 'pull 'of international job offers and the retention of our doctors is a political problem requiring political solutions.

A study on nurses (Wildschut and Mgqolozana 2009) concluded that there is a dearth of independent quantitative research on nursing skills demands in order to estimate skills gaps. It is imperative that shortages be correctly identified at all nursing levels, as well as in specific sectors in order for strategies to address the unique health context in the country.

Godfrey's study on law professionals (2009) revealed that there was not an absolute scarcity of law professionals, but that African attorneys and advocates are relatively scarce. While demand has been increasing, it appears to be well below supply, which means that legal firms have the luxury of picking articled clerks and admitted attorneys who are perceived to be the best qualified. African graduates from historically black universities are forming a surplus and increased supply is therefore not changing the demographics of the profession. Root causes are the school system that is not functioning properly.

A study on ICT professionals and associate professionals by Roodt and Paterson (2009) found relatively low proportions of applications for vacant ICT positions were considered suitable for employment and that a shortage of ICT professionals and associate professionals will be experienced in future if graduate output did not increase.

Mda's study on educators (2009) found that South Africa has a shortage of specific skills and teacher qualities rather than a shortage in the number of teachers available. The skills scarcity of educators varies according to geographical areas, school grades, subjects, race and age groups.

A study on artisans by Mukora (2009) indicated a shortage of artisansin in key technical fields due to the decline in apprenticeship training over the last two decades. Todes'study on city planners (2009) also found a shortfall of planners, although difficult to quantify in light of the poor quality of the data. Capacity deficits were worse outside the cities in the rural areas. Although, shortages of planners were primarily at the level of more skilled and experienced planners, the decline in graduate output does seem to have been a contributing factor.

In 2009 the Lewis Foundation and the SA National Biodiversity Institute commissioned the HSRC to develop guidelines towards a human capital development strategy (HCD) in the biodiversity conservation sector (Vass et al. 2009). The purpose of the research was to provide background on the key issues affecting the recruitment, retention, development and exit of qualified and experienced professionals and managers in the biodiversity conservation sector. This was in support of the drive in the biodiversity sector to become a "sector of choice", through the development of a HCD strategy, which would address the twin challenges of transforming the sector to be more representative, and the problem of scarce skills by attracting and retaining qualified and experienced science professionals and managers. The research methodology combined two interlinked

processes: analysis of quantitative data (including official and administrative statistics and other secondary research data) as well as qualitative data derived from interviews and analysis of documentary evidence. Through a process of triangulation, the aim was to provide a more holistic and evidence-based background to the development of a HCD strategy in the sector. The research was not exhaustive, but provided a baseline set of information and data on the most fundamental issues. Inevitably it uncovered gaps in knowledge and information, which may be the starting point for future investigations, to improve depth of knowledge and inform planning.

Sector Education and Training Authority (SETA) studies

SETAs are regarded as critical intermediaries in the relationship between training and economic demand. SETAs are thus required to prioritise employment and growth trends in Sector Skills Plans (SSPs) through a process of labour market analysis. Several reviewers are, however, concerned about SETA SSPs (Elliot 2007; Singizi 2007; Wilson et al. 2004) and indicate that there is some unreliable reporting at both enterprise and SETA level on labour market data; and SETAs experience difficulty in identifying critical and scarce skills. Employers submit Work skills plans (WSPs) to SETAs in order to claim back a portion of the skills development levies (SDLs) paid by them and these WSPs inform on scarce and critical skills. However, not all companies submit WSPs and small, medium and micro enterprises (SMMEs) are generally underrepresented. Reviewers propagate a standardised and centralised system for the collection and analysis of labour market information. However, there has been some good reporting on some sectors. The HSRC has in the past for instance contributed to a number of SETA studies that took into account economic growth, employment-output elasticity, mortality in the sector, retirement, emigration and number of people leaving the sector by analysing official statistics, WSPs, and supply data in combination with employer and training provider interviews (e.g. Erasmus et al. 2006; Hall et al. 2005; Van Zyl et al. 2003; Hall et al. 2002).

Summary of national studies

Each of the studies provided useful information for specific sectors or professions, but also informed on common challenges, such as gaps in data; skills shortages at strategic management level; the need for value adding skills; opportunities to gain practical experience; a lack of foundational skills; mathematical and natural science skills deficiencies; the impact of technology on skills requirements; downstream development of sub-sectors; the recruitment of up-skilling; a lack of skills in the rural areas; and poor throughput rates at training institutions. It is further clear that currently there is not only one method or source that is sufficient in providing the labour demand data that is required to address strategic skills planning in the country. Various data sources and informants were used in the multifaceted sectors of the South African economy. The census provides detailed snapshot labour market data; the LFS/QLFS provides employment trend data, but not sufficient remuneration, educational or SETA demarcated data; WSP provides SETA demarcated data, but not from all companies, especially not from SMMEs; and government, various associations and institutes all provide some useful data, but no one source is adequate to provide a full picture for skill planning purposes.

There is thus a need for the envisaged labour market information system that draws on a variety of sources, although these sources may have applied different methodologies, definitions and time series. The data from these different sources needs to be collated, harmonised and developed into an integrated model. Additional questions on for instance education, remuneration, vacancies and reasons for certain employment trends may be required by doing supplementary surveys. Co-operation between stakeholders are crucial and institutions such BMR, universities, other training providers, research councils, government departments, and employers all need to come to the party.

2.2 Remuneration studies and datasets

Dramatic growth in employment in a particular occupation over time is likely to reflect a significant rise in demand for candidates in the labour market with the requisite skills. Likewise, rapidly rising relative remuneration in a particular occupation may imply that the demand for workers exceeds the supply (Veneri 1999). Vacancy rates, fill rates and wage fluctuation are the most important means to identify skills shortages in the labour market. Changes in wages for specific occupations may be symptomatic of changes in the relative availability of workers possessing the skills required for the occupation (Infometrics Ltd 2006:22-23). Remuneration is thus an important means of identifying skills shortages.

The HSRC has undertaken regular remuneration surveys from 1971 to 2000 to monitor the income of graduates. These studies informed the demand for high level occupations in the labour market, but were discontinued since the year 2000. The HSRC's database of graduates was updated annually to keep graduate contact details current. It was a rich source of information and provided the opportunity to monitor occupational and remuneration information of graduates nationally. The South African Qualifications Authority (SAQA) took over the database of graduates from the HSRC since 2000 and currently SAQA's National Learner's Record Database (NLRD) provides information on labour market trends and education and training and do verification of qualifications obtained by individuals in South Africa. Contact details of graduates are, however, not updated and the NLRD cannot be used to do surveys and remuneration studies. Currently the following information is available on NLRD (SAQA 2012): University achievements from 1986 to 2008 in full; partial information from 1965 to 1985; and a small amount of information from 1964 back to 1900; information from 2009 and 2010 is currently being loaded, and can be verified against the unaudited dataset that is held separately from the NLRD itself; technikon achievements from 1999 to 2005; Senior Certificate achievements from 1992 to 2010; and achievements submitted by Education and Training Quality Assurance bodies (ETQAs).

Given the importance of social transformation in the country, the Presidency decided in 2005 that South Africa needed a national panel study to provide the information base to benchmark progress in social mobility. Wave 1 of the *National Income Dynamics Study (NIDS)* provided the basis from which to track progress. In 2010/2011 Wave 2 of NIDS re-interviewed the sampled people, gathering information on developments in their lives since interviewed in 2008. The comparison of Wave 1 and 2 provides information on socio-economic circumstances and how South Africans have fared over two years (Brown et al. 2012). NIDS analyses employment, unemployment, poverty and income inequality, however, it slightly underestimates employment rates relative to the LFS (Ranchod 2009). Sectors cannot be studied at detailed level as industry data is only available at the one-digit level, as opposed to a three-digit level on the LFS and five-digit level on SETA WSP datasets. Occupational codes are truncated down to the one-digit level, but disaggregated occupational codes are available at the NIDS on the secure data computer (Brown et al. 2012).

Stats SA provides income data in various datasets. The Labour Force Surveys (LFS) provided income information up and including to 2007, but not from 2008 onwards. The IES collects income and spending patterns of households in all types of settlements. The Quarterly Employment Statistics (QES) replaced the SEE, but only covers employees in enterprises registered for income tax and VAT. The QES cannot be disaggregated by occupation. The Census also includes data on income.

P-E Corporate Services (Pty) Limited conducts *The South African Salary Survey* among a representative sample of public, private and non-profit organisations to update their comprehensive remuneration database. P-E Corporate Services sell remuneration information for profit. CareerJunction is an online recruitment web service to recruiters and career seekers since 1997 and a medium to find a job and source candidates for positions. It also monitors the online

labour market in the country by providing labour market trends, identifying skills shortages, analysing labour market cycles, and also releases by occasion industry related salary figures and reports (Career Junction, 2012). Deloitte also has information on compensation and global mobility programs. PayScale is another online database which was launched in 2002 and headquartered in Washington. PayScale has the largest database of online employee salary data globally and provides country specific, including South Africa, salary data.

2.3 Comparative international insights

Experiences in the institutional design of labour market information systems elsewhere could be useful to countries that are in the process of establishing new systems (Sparreboom 1999). Some countries like the United States of America (USA) have sophisticated datasets and statistical infrastructure, while in some other countries quality data to develop supply and demand models do not exist and alternative approaches have been developed, but these alternative approaches cannot be substitutes for quantitative model based projections. A combination of approaches is thus often applied in countries where data gaps exist (Wong et al. 2004). Quantitative models, however, are increasingly being adopted in developed and developing countries as the availability of data and the capacity for model building improves (Wilson et al. 2004).

Focused labour market research from other countries is valuable in providing information on best practice initiatives led by sector skills organisations and the way specific employment challenges are addressed. In the Netherlands for instance, institutions paid by the government have the duty to present only courses in which students have sufficient opportunity to find work. Courses are linked to places available for students to do an internship and labour market prospects for graduates. National Centres of Expertise in Netherland develop up-to-date labour market information that are used as input for the qualification structure, vocational guidance, and regional policies (Cras 2011).

In New Zealand it was found that the challenge with official statistics were currency and accuracy and to address this the Industry Training Organisations (ITOs) make use of various sources in order to obtain the information that are required. Similar to South Africa, the most commonly used information in New Zealand comes from official statistics, such as the census that is conducted every five years and more regular official data such as the quarterly Household Labour Force Survey (HLFS) which is seen as reasonably accurate. Supplements to the HLFS include questions on income and education among other. South Africa could consider such supplements to the QLFS to obtain remuneration and better education information that is currently lacking in the QLFS. The Industry Training Federation in New Zealand compiled a raft of official statistics and combined them in tables and charts organised by subject matter to assist the ITOs (Baker 2011).

In most developing countries the technical and vocational education (TVET) system is based on government supply side efforts which resulted in TVET provisioning being out of touch with the actual needs of industry and outdated curricula. In Pakistan this was addressed by reforming the TVET system and anchoring itself in a demand driven governance framework which incorporated competency-based training, greater involvement of the private sector, greater autonomy to training institutions, improved information systems, capacity to analyse information and integrate it into policy decisions (Latif 2010).

In Australia for instance a combination of various techniques are followed in producing an annual environmental scan, namely, structured on-line telephone surveys; focus groups; feedback contained in Industry Skills Councils registers; interaction with enterprises; research in industries; industry and government planning information; and economic, demographic and other data. These are used to inform workforce development initiatives, validate skills shortages, provide real-time

advice to training providers, and inform local government, schools, universities and research bodies on workforce development (Paton 2011).

In Canada each sector council track information on their own labour markets by using various approaches. Some of the councils have sophisticated methodologies and make use inter alia of a macroeconomic model; a network of regional LMI committees comprised of industry and government stakeholders; and ECO Canada use LMI to assist in defining the "Green economy" and the "Low Carbon Economy". Three of the councils are on their way in developing complex LMI systems by making use of inter alia surveys/interviews with employers and educational institutions and extensive review of official data. The rest of the councils have various other forms of LMI, be it sector studies or other more focused forms of intelligence. (Cardozo 2011).

In 2009 the Indian government announced the new Skill Policy and Sector Skills Councils were to set up Labour Market Information Systems to assist planning and delivery of training and this marked a new era of skills development in India. A multi-sectoral Human Resources and Skills requirement study was carried out in 20 high growth sectors as well as the unorganised (informal) sector, because 93% of employment in India is in the unorganised sector. Lack of data resulted in some of the information being incomplete and interviews were also done. In most cases the research was funded by government or through an industry association. A common methodology across different industries was followed. Broadly the current state of an industry, size and growth, demand drivers, success factors, risk, drivers of competitiveness, employment, profile of the employed, skills requirements, skills gaps, trends, projected human resource requirements and focus areas for skills development were covered in a report. A skills gap study in the informal sector draw on government reports, surveys, various sources and also used primary information collected by means of surveys, the census and wage-related data. There are initial steps to create a labour market information system incorporating a variety of government data, collating those with differing time series and develop a model that would integrate all the data. Each sector skills council would subsequently build a portal that would link all stakeholders and the plan is to have a one-stop-portal across all geographies, sectors, ministries, states, training organisations, employer organisations, sector skills councils, and other stakeholders (Chenoy 2011).

South Africa can learn from these countries. The country can for example also do supplementary surveys like New Zealand does to gain remuneration, educational and vacancy data in addition to the current QLFS data. The study on the skills gap in the informal sector in India could also be further researched in order to inform and determine the applicability in South African circumstances.

3. CONCEPTUAL FRAMEWORK

Kraak (2009b) indicates that the traditional segmented labour market theory and recent 'varieties of capitalism' and 'high-skills' literature fail to account for several labour market segments operating simultaneously in one economic sector. Differentiated policies customized to different sectoral needs will be required in South Africa. Some segments will require that intermediate to high skills needs be addressed to contribute to export markets for economic growth, while other segments will require policies that support and contribute to sustainable labour intensive jobs that require mainly low skills. Kraak concludes that in South Africa there is thus a dualism between 'low' and 'high' value-adding production segments within the national economy; a divide between 'state' and 'market' regulation; and finally, a divide between 'internal' and 'external' forms of labour market formation.

Kraak argues that firstly, structured labour market arrangements will be needed to grow the number of engineers, artisans and scientists that are required in a *state-guided external labour market* segment. The state has for instance chosen a developmental path wherein it targets aerospace, nuclear energy and space science for renewed growth and government assistance. The state has to ensure that adequate supplies of high-tech knowledge and high-skill personnel are channeled through to these sectors in appropriate quantities.

Secondly, Kraak refers to a *top-end flexible external market* that has emerged in South Africa in the film industry, ICT, financial services and consultant engineering. These sectors thrive because of the individualistic 'entrepreneurial culture' in this segment. As an important counter to the destructive side of the flexible labour market, the state will need to pursue the industrial policies designed to support these sectors as generators of employment growth.

Thirdly, Kraak discusses the *high value-adding internal labour market* with its mature industries such as for example the auto and the wood, paper and pulp sectors, where knowledge-intensive methods of production need to be improved further through inter-firm co-operation and cluster development.

In the fourth instance, there is the *low value-adding internal labour market*, where major commitments are required from employers and the state to increase training levels, invest in equipment, upgrade the knowledge base and strengthen linkages along the value chain in sectors such as clothing, metals, chemicals and agro-processing.

A main gap in previous South African demand studies is the focus on mainly formal employment and intermediate to high skills levels. South Africa has to address high unemployment by creating more job opportunities at the lower skills levels. Ashton (2004) indicates that it would be appropriate for South Africa to apply a skills strategy which targets jobs with basic skills as an essential prerequisite to a subsequent re-balancing of the economy in the direction of a higher proportion of intermediate and higher-level skills. It would thus be important to focus on demand for labour in the formal as well as informal economy and to identify sectors that can absorb more low skilled people to address the high unemployment rate, sectors that require more intermediate skills and sectors that require scarce and critical skills.

4. DATA CHALLENGES

Labour market information can be defined as:

Statistical and non-statistical information concerning labour market actors and their environment, as well as information concerning labour market institutions, policies and regulations that serves the needs of users and has been collected through the application of accepted methodologies and practice to the largest possible extent (Sparreboom 1999).

An optimal labour market information system is demand driven, that is, it is driven by a wide range of possible user needs. An optimal system is designed to support effective decision making by participants in the labour market. There are a large number of different players in the labour market presenting a diverse set of needs. User requirements should play a key role in defining many of the features and elements of a labour market information system. It is crucial that any labour market information system take into account the needs of intermediaries and consider the role of intermediaries as part of the overall design of the system, regardless of the environment of these intermediary services, e.g., in public employment offices, private employment services, counselling services in educational and training institutions, economic development planning, human resource specialists and consultants, etc. Basically, labour market information may potentially serve all members of society over their lifetimes, particularly as they are engaged in the labour market (Woods and O'Leary 2006).

An optimal labour market information system relates quantitative labour demand and supply and presents qualitative analyses of supply/demand and other labour market relationships and trends (Frugoli 1983). In addition, an optimal system must provide for easy access to the information and

provide support in using the information. Labour market information need to fulfill a number of requirements to serve the needs of users, namely, accessibility, comprehensiveness, timeliness, regularity, scope and coverage, accuracy, and storage. Questions such as whether unemployment has really decreased or whether wages in an industry has really increased or whether it is only the definition applied during data collection that has changed can only be answered if labour market data are systematically stored and documented (Sparreboom 1999).

A relational database which can be defined as an integrated, self-describing collection of data describing sets of related entities and the relationships that interconnect databases, is the type of database that are most widely used as part of information systems. Relational databases have been designed to store quantitative information. A database, however, cannot be a substitute for labour market analysis, as the interpretation of signals and the translation into policies is not straightforward. Development of common formats to collect information would facilitate exchange of information (Sparreboom 1999). Therefore the importance of establishing a credible institutional mechanism for skills planning, according agreement 5.1.

Although the country has the key datasets in place, these have their limitations and need to be improved upon to match that in other countries in order to facilitate comparisons and contribute to knowledge about where jobs and growth of the future will come from in a global environment (INSSO 2011). Table 1 indicates the 18 KILM and the datasets that address the indicators according to which labour market comparisons internationally can be made. The various datasets are subsequently discussed.

KILM	KILM description	Current SA datasets	Discontinued datasets
1	Labour force participation rate	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT, ADCORP	OHS
2	Employment-to-population ratio	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT	OHS
3	Status in employment	LFS/QLFS, CENSUS, QUATEC, NIDS, GLOBAL INSIGHT, ADCORP	OHS
4	Employment by sector	LFS/QLFS, SETAS, CENSUS, QUANTEC, SARS, GLOBAL INSIGHT, QES, PERSAL, NIDS, WHO OWNS WHOM, DELOITTE, CAREER JUNCTION	онѕ
5	Employment by occupation	LFS/QLFS, SETAs, CENSUS, QUANTEC, PERSAL, NIDS, GLOBAL INSIGHT, CAREER JUNCTION	OHS
6	Part-time workers	LFS/QLFS, SETAs, CENSUS, QUANTEC, GLOBAL INSIGHT	онѕ
7	Hours of work	LFS/QLFS, QUANTEC, GLOBAL INSIGHT	OHS
8	Employment in the informal economy	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT, ADCORP	OHS
9	Unemployment	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT, ADCORP	OHS
10	Youth unemployment	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT	OHS
11	Long-term unemployment	LFS/QLFS, CENSUS, QUANTEC, GLOBAL INSIGHT, ADCORP	OHS
12	Time-related underemployment	LFS/QLFS,,QUANTEC, GLOBAL INSIGHT, ADCORP	
13	Inactivity	LFS/QLFS, CENSUS	OHS
14	Educational attainment and illiteracy	CENSUS, LFS/QLFS, QUANTEC, GLOBAL INSIGHT	OHS
15	Average monthly wages	IES, SARS, QES, NIDS, QUANTEC, GLOBAL INSIGHT, PERSAL, CAREER JUNCTION	SEE, AME
16	Hourly compensation costs	SARS, NIDS, DELOITTE	
17	Labour productivity	TIPS, QUANTEC, INSTAT	
18	Poverty, income distribution and the working poor	IES, CENSUS, QUANTEC, QES, NIDS	

Table 1: Key Indicators of the Labour Market (KILM)

Source: Author's table, derived from ILO (2011) with various datasets in South Africa added to match KILM

4.1 Employment and remuneration datasets

Various sources of employment provide information for different purposes and are not always directly comparable. To follow is a review of the sources linked to indicators as provided in Table 1:

Stats SA datasets

The *Income & Expenditure Survey (IES)* run by Stats SA (2008a) is collected on the income and spending patterns of households in South Africa. It is used to update the consumer price index (CPI) which is the main economic indicator of inflation. The IES enable the measurement of economic growth and transformation; prices; employment; poverty; population dynamics; health; education; safety and security; sustainable resource management; and rural development, food security and land reform. The most recent update was in 2007 (based on data collected in 2005/06). The most

recent survey was done from August 2010 to September 2011. An advantage is information on *all types of settlements.*

The *Quarterly Employment Statistics (QES)* survey replaced the discontinued SEE at Stats SA (2008b). The QES only covers employees among those enterprises registered for Income Tax, including those registered for VAT. The *informal sector is thus not covered*. The QES is in accordance with the ILO definitions and concepts. It provides estimates for employment and earnings as well as average monthly earnings.

LFS/QLFS datasets (Stats SA 2008c) are more focused on *labour issues* than its predecessor (the OHS). The LFS sample is representative of all provinces and strata (which are District Councils) within provinces. The LFS was redesigned because of criticisms related to scope, coverage, timeliness and frequency by the International Monetary Fund (IMF). In addressing these issues, Stats SA decided to embark on a quarterly cycle for the collection of labour market information. The LFS/QLFS are adequate for sectoral data, occupational employment data, as well as other indicators as indicated in Table 1. The LFS/QLFS have data challenges:

Firstly, employment data according to precise SETA demarcation is not available in the LFS/QLFS datasets which use the Standard Industrial Classification (SIC) codes to demarcate the national labour market into various industries and sectors. SETAs are demarcated according to a *four* digit code, while industries on the LFS/QLFS are only demarcated up to a *three* digit level. At the three-digit SIC code level, some of the SETA data in the LFS/QLFS overlaps and precise numbers cannot be calculated. In addition, information on WSPs thus also needs to be incorporated in order to provide a more complete picture of employment and future needs in industries. WSPs analysed in isolation are in turn not sufficient, because not all companies submit WSPs;

Secondly, there are occupational data challenges in the LFS/QLFS datasets (DHET 2012b). The South African Standard Classification of Occupations (SASCO) were used in the LFS from 2000 to 2008, while the Organising Framework for Occupations (OFO), based on the Australian and New Zealand Standard Classification of Occupations (ANZSCO), were used in the QLFS from 2009 to 2011 to classify occupations. Statistics South Africa adapted the International Standard Classification of Occupations (ISCO) of the ILO to track the shifting occupational profile of the country's workforce. It was known as the SASCO. SASCO, however, was outdated and did not define occupations in more detail and could therefore not be used by the Department of Labour for skills planning purposes. As the content of ANZSCO reflected the occupational environment more accurately and also included occupations and occupational descriptors, it was used as the basis for the Organising Framework for Occupations (OFO) to assist in the process of skills planning within and across sectors. In 2010 the DHET, supported by GIZ, decided that the annual updating of the OFO should also include adapting the OFO (Version 9) to better reflect the structure of ISCO - 08 in an attempt to create a standardised framework which would also align to the international framework. ISCO – 08 took a number of developments in the economies of countries all over the world into consideration, such as the developments brought about in the ICT sector, to reflect the important changes that have taken place in the world of work. There is also a relation between ISCO - 08 and the United Nations' International Standard Industrial Classification of all economic activities (ISIC). It contributed also to the ease of comparison of labour market and skills information with international data. It was further decided to change the title of the OFO to reflect the year of update (rather than a version). The OFO 2011 released in March 2011 reflected the structure, definitions and tasks of ISCO - 08 including 1259 of the total of 1320 occupations of the OFO (Version 9). The framework used for the design and construction of ISCO-08 and therefore the OFO 2011 and 2012 is based on two main concepts: the concept of the kind of work performed or job and the concept of skill. The classification units are therefore the jobs (reflected as occupations on the OFO) whilst the classification variable is the kind of work done (that is, the tasks and duties), and the classification criteria for identifying Major, Sub Major, Minor and Unit Groups are the two dimensions of skill, i.e. skill level and skill specialisation.

The output of occupations clustered under the fourth level of the OFO (Unit Group) is described in terms of tasks and a descriptor. Occupations are thus related to the tasks defined at the Unit Group and an occupation descriptor describes what the application of the variety of tasks ultimately produces or delivers

in the world of work. An occupation descriptor always either indicate the unique service the occupation renders.

Skill is defined as 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. Skill level is defined as a function of the complexity and range of tasks and duties to be performed in an occupation. It must however be mentioned that the level of formal education defined in terms of the International Standard Classification of Education (ISCED-97) is only one of the measures used in determining the skill level and should be seen as indicative only. As the educational level differs between different countries this create ambiguity and Job content (i.e. tasks and duties) are thus given priority over national education and training requirements. In other words, occupations that involve the performance of broadly the same sets of tasks and duties are always classified in the same category, even in cases where national skill level requirements measured in terms of formal education are different

Thirdly, there are educational data challenges in the LFS/QLFS datasets. The OHS provided information on the highest level of qualification as well as a detailed level of fields of study. The LFS also provided the highest level of qualification and initially also fields of study. However, as from 2007 onwards the LFS and QLFS only provided the highest level of qualification and no fields of study. It would have been of great help if the list of highest qualifications on the LFS/QLFS also included learnerships and trade test completions. It is also a pity that qualifications on the LFS/QLFS are not linked to institutions where qualifications were obtained.

In the fourth instance, there are challenges with regard to remuneration data on the LFS/QLFS datasets. Stats SA previously had data on remuneration in the LFS datasets up to and including 2007, however, currently remuneration data is no longer available in the LFS/QLFS datasets. The Census still include remuneration data.

Census data: According Wilson, Woolard and Lee (2004) Census data are more robust than other data sources and as a result, provide the more accurate portrayal of the South African labour market at a *particular moment in time*. The authors indicate that the LFS/QLFS could be used as not only a benchmark, but also as a means of filling in the blanks with regard to the interlinking years which are not covered by the Census. The census also underreports on employment in the informal and subsistence agricultural sectors, particularly among those who work only a few hours per week which are addressed by the LFS/QLFS.

The *Persal* dataset (2012) is an integrated transversal system for the administration of human resource transactions and payment of salary for the South African Government at National and Provincial spheres and can be used as a source of employment and remuneration in government spheres. Vulindlela is a Data Warehousing Environment across government spheres that enables the consolidation and integration of disparate operational / transversal systems across different platforms into the single source of quality management information.

Adcorp (2012), is one of South Africa's largest diversified employment services companies with various sources of data, both within the group (permanent and temporary placements, job search times, work applications, etc.) and from industries and sectors in which the group operates (skills development levies, unemployment insurance claims, labour relations cases, etc.). Adcorp's data is based on more than 1 million labour market transactions per year, although not fully representative of the South African economy. Adcorp's and Statistics SA's estimates of formal sector employment correspond fairly closely, with a correlation of 85%. However, Adcorp's estimates of informal sector employment – based on the so-called "currency demand" method – are substantially higher than Statistics SA's estimates.

SETA data: SETA data, although useful, has limitations, as all employers do not submit WSPs. If these could be improved, it could be a valuable tool to supplement gaps in other employment data. Some

SETAs have better data than others and if data collection could be standardized, it would be possible to centralize all data in one dataset.

The *SARS database*: The SARS database provides comprehensive information according to enterprises disaggregated by sector based on the 5 digit SIC sectoral codes. It is updated continuously and therefore useful in indicating sectoral change. It is, however, not a good source of occupational data (Wilson et al. 2004).

The *SA Institute of Race Relations* has published the South Africa Survey annually since 1946. It covers demographics, the economy, employment and incomes, business and labour, education, health and welfare, living conditions and communications, crime and security, politics and government. It is available as a hard copy book or as nine standalone reports all electronic and include both PDF and excel versions. Individual reports may be purchased online but are considerably more costly than receiving the reports through a subscription. The Institute publishes a number of monthly, annual, and occasional reports on South Africa. These cover the fields ranging from the economy, business, and labour, to education, healthcare, and social welfare. The Institute provides a variety of analytic and risk analysis presentations on South Africa.

Private data houses:

Quantec and *Global Insight* produce their own employment series by harmonizing a variety of labour market information sources and are therefore good time-series data sources for trend analysis (Wilson et al. 2004), but this comes at a cost. Global Insight's database (2012) provides access to historical and forecast data and has additional source options. It also makes international comparisons possible. Global Insight's regional economic focus draws on various sources: BMR; Stats SA; SARB; SARS; Regional Service Councils (RSC); Council for Scientific and Industrial Research (CSIR); Chamber of Mines of South Africa (CM); Cement and Concrete Institute (CNCI); South African Petroleum Industry Association (SAPIA); various government departments; and private research houses. Quantec (2012) maintains and distributes economic data collections covering macroeconomic, regional socio-economic, industry and international trade data. Quantec also provides the Economist Intelligence Units (EIU) data products, covering industry, economic and market data to South Africa and the rest of Africa. Various sources include SARB; Stats SA LFS/QLFS; National Association of Automobile Manufacturers of South Africa (NAAMSA); ABSA and other.

Who Owns Whom is a comprehensive dataset that provides sector information and microanalyses of companies in each sub-sector. Sub-sectors are defined by Stats SA's SIC codes. Their research uses the full five-digit code, which provides the most detailed description of each sub-sector. Powergroups provide ownership details of South African corporations, JSE listed companies and empowerment groups.

4.2 Vacancy datasets

The DoL currently updates a database on vacancies compiled from advertisements in the media. This needs to be linked to the Employment Services for South Africa (ESSA) dataset together with data from private employment agencies and Career Junction. The ESSA system is a comprehensive data system, but needs to be linked to other sources in order to serve as a one-stop access point to all work seekers and inform the supply of graduates (Prinsloo et al. 2011).

4.3 Replacement demand

In order to inform the supply of human resources, not only current employment data and vacancy data is required, but also replacement data which includes data on retirement, migration, movement into other occupations, and in-service mortality data.

Retirement data can be calculated from LFS/QLFS or Census data by considering the fraction of the occupational class that is aged 55 to 65 in a given year and then assume that some fraction of this group would retire each year (Wilson et al. 2004).

Mortality rates are contained in the Actuarial Society of South Africa's (ASSA) aids demographic model developed from Census data. The ASSA model can be used to calculate the risk of dying in each of the occupational classes to determine the number of people that will be required to replace those dying over a specific period (Wilson et al. 2004).

The official Stats SA data are a severe undercount of *emigration* in the country, because completion of departure forms is not enforced and Stats SA categories have changed over the years which make it difficult to formulate trend analyses (Wilson et al. 2004). With regards to *immigration*, the South African government has turned to immigrants to alleviate the skills shortage, but serious thought needs to be given to policies that will address undocumented migration and the skills needs of the country (CPLO 2012).

Calculations on movement into other occupations is hampered by the fact that the LFS/QLFS do not provide information on fields of study, but only data on highest level of qualification and then also very broadly, because a degree is for instance not split into the different types of degrees. Positive is that the Census data do provide fields of study in detail.

4.4 Labour productivity

For economists the most important aspect of any discussion on skills is its relationship to productivity in the firm, while Government has defined skills shortages without taking this relationship into account (Daniels 2007). Measures of labour productivity are a core indicator for the analysis of economic growth. However, there are different approaches to productivity measurement and their calculation and interpretation requires careful consideration, especially when international comparisons are involved. The calculation of productivity has to be complemented by institutional, historical and case study information to explore underlying causes of growth, innovation and productivity change (OECD 2001). Interviews with employers, surveys and improved WSPs would shed light on the level of productivity and causes of un-productivity, whether inappropriate skills, shortages of skills or other causes in specific industries.

Both skills shortages and skills gaps can lead to a loss of competitiveness as wage rates are bid up and productivity lowered within industries where skills problems exist. A skill shortage is a situation in which demand exceed the supply of a specific skill and a skill gap is a situation in which the level of skills of the employed is lower than that which is required to perform a job adequately. Productivity may be low when firms are forced to place lower-skilled workers in skilled positions (European Centre for the Development of Vocational Training 2010).

TIPS has developed the first consistent and comprehensive database of Southern African countries' trade flows. The database is available online and is updated regularly. It currently contains data covering the period 2000 to 2006 for most Southern African Development Community (SADC) member states and includes a downloadable analytical tool for generating key trade ratios and indicators. The database is available in a web version and an offline version on CD.

The United Nations Industrial Development Organization (UNIDO) Industrial Statistics Database (INSTAT) at the 3-digit SIC level contains information on production, value added, labour compensation and employment for a large group of countries, including South Africa. TIPS data is preferable to UNIDO as the South African INSTAT data is sometimes incomplete (Edwards and Golub 2002).

Quantec maintains a set of economic data collections covering macroeconomic, regional socioeconomic, industry and international trade data. Information is organised hierarchically in separate databases that can be accessed individually or treated as a comprehensive collection. The South African economic indicator time-series database incorporates a set of indicator time-series covering all aspects of the South African economy. The emphasis is on demographics, labour, prices, general economic indicators, financial and capital markets, public finance, balance of payments statistics, national accounts and industry data (Quantec 2012).

4.5 Summary

Data on *employment, vacancies,* and *replacement demand* (retirement, mortality, migration and mobility) is required in order to make future demand projections. The LFS/QLFS are the best datasets of *quantitative* employment and especially *employment trends* according to occupation and industry. The Census is the best source with regards to labour market information at a particular moment in time. With employment trends the change from the SASCO to the OFO occupational classification needs to be taken into account in drawing conclusions. The LFS/QLFS is not sufficient for educational information and other sources also need to be consulted. Additional *qualitative* information is also required to supplement information obtained from the LFS/QLFS and/or Census to put quantitative information in context. WSPs can add an additional nuanced and SETA specific focus, but then WSP need to be improved and standardised across all SETAs.

As far as data on *vacancies* are concerned, the DoL's dataset are available, but this needs to be incorporated into the ESSA system together with data from private employment agencies and Career Junction to form a holistic picture. Qualitative interviews and surveys or proper WSPs are required to further supplement vacancy data.

LFS/QLFS and/or Census data is suitable to calculate retirement data and ASSA data is suitable for data on mortality. Stats SA, however, needs to improve information on migration. Interviews with employers, SETA surveys or WSPs that are well planned can inform on the level of productivity in industries in combination with trade flow data on the TIPS and INSTAT databases.

5. FURTHER RESEARCH REQUIRED

Most previous research focussed on formal and intermediate to high skills employment, while South Africa has to address high unemployment by creating more job opportunities at the lower skills levels. According to Ashton (2004), South Africa needs to examine *the strategy to initiate a low skills route to full employment and facilitate a subsequent move into a high skills society.*

On the supply side, some valuable studies with regard to learnerships and apprenticeships at the lower to intermediate skills levels were done. More research on linkages between the location of FET colleges with employers and work experience opportunities are, however, crucial. At the higher education level, better alignment of Classification of Educational Subject Matter (CESM) categories with OFO demand data is required to ease demand and supply forecasting.

On the demand side, quite a number of valuable studies have been conducted of which many by the HSRC. Some of these studies were discussed in this paper, however, it would be necessary to

allocate time for further analysis of many more of these studies in order to gain insights with regard to best practices, methodologies, models to duplicate, main findings, and gaps to be addressed in further research. It has been indicated that more research needs to be focussed on employment opportunities in the informal sector, rural areas, SMMEs or self-employment, and sectors that are most suitable in providing labour-intensive work opportunities. In a country rich in mineral resources, value-adding innovation activities from the lower skills levels up to the high skills levels need to be interrogated and researched.

Rather than rely exclusively on sophisticated long-term forecasts, together with their shortcomings and limitations, labour market planners increasingly bring labour market signalling (LMS) approaches into play. A tracer study of graduates, interviews with experts in the field by using for instance the Delphi technique (focus groups or round tables) and surveys can help to assess if the skills supplied by institutions match what the market requires.

Data on remuneration is not readily available, while changes in wages for specific occupations may be symptomatic of changes in the relative availability of workers possessing the skills required for the occupation. Remuneration is thus an important means of identifying skills shortages and more focus should be on remuneration in the future. Measurement of productivity would inform the alignment of productivity and remuneration, as well as the need for skills upgrading to improve productivity.

South Africa can learn from experiences in the institutional design of labour market information systems in other countries. The country can for example also do supplementary surveys like New Zealand to gain remuneration, educational and vacancy data in addition to the current QLFS data. The study on the skills gap in the informal sector in India could also be further researched in the future in order to inform and determine the applicability in South African circumstances.

Available datasets need to be merged and harmonised in order to address gaps and the needs of all users and industries. Towards this end it is necessary that current datasets on supply and demand be standardised and centralised to inform skills development policy, career guidance, work seekers and school leavers. The HSRC research on the ESSA system provides a good starting point and if improved and refined can serve as an example to link all datasets to provide a comprehensive system that links employment, vacancy and replacement demand data with supply data.

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