

Development of a National Skills Forecasting Model

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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	Studies of selected priority sectors	Reconfiguring the post-	Pathways through education and	Understanding changing
labour market information		schooling sector	training into the workplace	artisanal occupational milieus
system in South Africa				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
developing VET indicators	Studies of Selected Priority Sectors	in South Africa	training and into the labour	artisans
	in the South African Labour Market:		market	
	A Proposed Research Programme			
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 skills	Contemporary issues in public	Navigational capacities for youth	
institutional planning and	development and labour market	FET colleges	employment: A review of	
monitoring in FET Colleges	demand in the early childhood		research, policies, frameworks	
	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				
Bongiwe Mncwango	Margaret Chitiga and Stewart	Thenjiwe Meyiwa and	Stephanie Alais	
Towards a demand side firm level		Nolutho Diko	Jobs? What jobs? Skills? What	
survey of labour information in	Development of a national skills	The state of graduate teacher	skills? An overview of studies	
South Africa	forecasting model	transitions to the labour	examining relationships between	
		market	education and training and	
			labour markets	

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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
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		
Mariette Visser National database sets available for post school sector (supply side)		Michelle Buchler A critical review of research on skills development qualifications 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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EXECUTIVE SUMMARY

Skills forecasting is necessitated by the need to improve transparency on South Africa's labour markets, the desire to increase the skill level of its population and the need to understand long term projections that then feed into policy making to inform education and training strategies. As the world economies have become more and more complex as well as barraged by crises, it becomes impossible to rely only on traditional signals such as markets and prices for future skills demand and supply. Skills forecasts are needed, not only by policy makers for budget allocations, projections of growth in the economy and education and training planning, they are also needed by the private sector; both industries and households. Indeed this information is so crucial that it could be taken as a public good. Skills forecasts are not to be interpreted as if predicting the future, as this is impossible, they are meant to guide plans for the future. Such an exercise allows for a mapping of different scenarios that under uncertainty are valuable for strategising for the future. It is important that the approaches be comprehensive and cover both supply and demand sides.

There is therefore a need for the economy to be able to conduct such forecasts in a standardised way and on an ongoing basis. Skills forecasting models can fulfil this role. Skills supply and demand models can be classified into two broad types. First a model that is used to analyse and/or forecast the labour market and second, a model in the form of a policy that is put in place in order to provide the supply of the skills demanded in the labour market. This concept note will first discuss the technical or analytical models and then the policy models of skills supply and demand.

After a discussion of the models available for skills forecasting, the policy challenges around efforts to develop such a tool at a national level will be discussed. Consistent with the common understanding around the issue it would appear that the major policy challenge facing South Africa's ability to build a skills forecasting capacity is the lack of sufficient information on both the supply and demand for labour. According to the Delivery Agreement 5 (a skilled and capable workforce to support an inclusive growth path), there is currently no institutional mechanism to provide credible information and analysis in regards to both the demand and supply (availability and supply pipeline) for labour skills.

The section that surveys the literature for both local and international examples of applications of a national skills forecasting tool will show that there have been a few attempts to try and develop such a tool in South Africa. In 2004, there was an attempt by the HSRC that was done in the form of a project that reviewed what it would entail to develop such a model. The project was conducted by the Employment and Economic Policy Research unit a former predecessor of the Economic Performance and Development Unit in conjunction with Warwick Institute for Employment Research. The two institutions were commissioned by the Department of Labour, with technical and financial support from the European Union's Labour Market Skills Development Programme. The results of the review were then published in a report entitled, 'Developing a National Skills Forecasting Tool for South Africa'. This work constituted an extensive review of all aspects of how a national skills forecasting tool could be developed. In as far as this report gives the most comprehensive review of developing a national skills tool and to avoid duplication of work, its main findings will be summarised in this concept note.

At the international level there have been a number of attempts by several countries to develop a national skills forecasting model. Since a country by country review is beyond the scope of this concept note it will focus on two countries, Australia and New Zealand, that have managed to implement such a national tool in a comprehensive and on going manner.

It goes without saying that there are many caveats in skills forecasting and anticipation:

- There is a general belief that current approaches are too focused on economics and tend to neglect the political and behavioural aspects of those involved as well as qualitative or social aspects.
- With respect to the forecasts aggregate results might be too general for concrete policies or educational programmes.
- Another concern is related to forecasts in general; the longer the forecasting period and the more detailed the categories, the less accurate and robust the results.
- The issue around the quality of data remains a universal concern which although pervasive is fortunately not significant enough to preclude the development of a skills forecasting tool.

These issues have to be taken seriously, which means every forecast has to indicate clearly its assumptions and limitations to prevent misinterpretation. Furthermore, forecasts should not be seen as precise predictions but as one source of information for informed decision making that provides early warning of what might come in the future.

INTRODUCTION

Skills forecasting is necessitated by the need to improve transparency on South Africa's labour markets, the desire to increase the skill level of its population, the need to understand long term projections that then feed into policy making to inform education and training strategies. As the world economies have become more and more complex as well as barraged by crises, it becomes impossible to rely only of traditional signals such as the market and prices for future skills demand and supply. Skills forecasts are needed, not only by policy makers in terms of budget allocations, projections of growth in the economy and education and training planning, they are also needed by the private sector, both industries and households. Indeed this information is so crucial that it could be taken as a public good. Skills forecasts are not to be interpreted as if predicting the future, as this is impossible, they are meant to guide plans for the future. Such an exercise allows for a mapping of different scenarios that under uncertainty are valuable for strategising for the future. It is important that the approaches be comprehensive and cover both supply and demand sides.

For planning purposes, given the long lead time required for education and training investments to 'pay off' it is important to have a clear forecast of skills needs in a country. This type of analysis will also assist individuals to make the right choices in terms of choice of training and education.

Of course all forecast models and attempts are limited in the event of unforeseen events, whether man caused or natural. Also, if new changes in economic and other behaviour occurs, this may render the forecasts less useful for the future. Obviously, because the world is so complex, models by their very nature are only abstractions from reality. However, insofar as these forecasts are taken as indications of trend, and as long as the trend still continues approximately, they prove to be very useful. It is important to continually review the forecasts in the light of new and better information.

It is easy to appreciate that some might be opposed to forecasting of any sort due to the limitations of data, to the unreliability of assumptions, etc. Such people would then argue that forecasting would then mislead the policymakers rather than help them. However to argue against forecasting is to argue against planning! It is of course crucial that the forecasts are done carefully and properly using the best available information and expertise, and as much consultation as possible.

1 SKILLS SUPPLY AND DEMAND MODELS IN DEVELOPING COUNTRIES

Skills supply and demand models can be classified into two broad types. First a model that is used to analyse and/or forecast the labour market and second, a model in the form of a policy that is put in place in order to provide supply of the skills demanded in the labour market. This section first discusses the technical or analytical models and then the policy models of skills supply and demand.

1.1 ANALYTICAL MODELS

According to Wilson *et al.*(2004), the development of quantitative models for skills supply and demand analysis and forecasting is constrained by data limitations, particularly in developing countries. The statistical infrastructure constraints what is feasible across countries. The

development of sophisticated quantitative models is argued to require considerable prior investments in statistical surveys and datasets as well as modelling capacity. In countries which do not have substantial levels of the required data, alternative approaches have been developed. The alternative approaches, however, while they are argued to provide some valuable insights, they are generally believed to be useful complements than substitutes of the more fully-fledged, model based projections. Each of the various approaches used to analyse or forecast labour supply and demand has its own weaknesses. They include "formal, national level, quantitative, model based projections; ad hoc sectoral or occupational studies; surveys of employers or other groups and focus groups/round tables and other Delphi style methods, including setting up "observatories" (these may include some quantitative aspects but are generally more qualitative)" Wilson *et al.* (2004: 5).

Skills supply and demand models help to provide information on how the labour market is shaped by economic and other forces as well as various policies.

1.2 Types of quantitative models

Wilson et al (2004) mentions four methods that can be used to analyse the labour market as:

- Employer skill surveys: This approach asks employers questions on current skills deficiencies and future requirements. This approach is said to have been popular in the past but in recent times it is regarded as useful only in assessing current skill problems rather than anticipated future requirements. Employers' responses to questions on the future are said to be inconsistent and misleading.
- 2. Sectoral studies: These involve an in-depth analysis of the factors that determine the supply and demand for skills in a given sector of the economy.
- 3. Qualitative methods: Examples of these are in depth interviews with key stakeholders including employers, in-depth case studies (usually in combination with focus groups and round table discussions).
- 4. Quantitative methods and formal models: These include econometric methods like time series analysis and extrapolation of past trends (where only very limited time series information is available), micro and macro models like Input-Output and Computable General Equilibrium models are used.

1.3 POLICY MODELS

According to the International Labour Organisation (ILO) (2008), countries need skills policies in order to develop skills that are relevant, promote lifelong learning and ensure the delivery of high levels of competences and a sufficient quantity of skilled workers that can match skills supply with demand. Skills development models are meant to equip people with the skills required on the job market. These are meant to match skills supply and demand. The terms used for this skills training vary across countries and include technical and vocational education, technical vocational skills, technical and vocational education and training, life skills, work skills, technical education, vocational training as well as skills development (King and Palmer 2010).

According to the ILO (2008), "there is no single model of an effective national response to the challenge of upgrading skills development and bridging skills gaps". The ILO (2008) argues that the improvement in coordination and expansion of the availability of training are the two critical factors across a range of responses.

King and Palmer (2010) point out that when a number of countries began to gain political independence, particularly from the 1960s it was believed that technical knowledge transfer would be achieved through training. This resulted in the establishment of technical and vocational schools and institutes as well as technological universities, for example, the establishment of Indian Institutes of Technology from around 1947 when it got independence. It is important, however, to note that these training models were national models of technical and vocational training that were transferred from Western countries to developing countries in Latin America, Asia and Africa. This was driven through bilateral and multilateral aid agencies as well as international organisations like ILO, the World Bank and the United Nations and its subdivisions. The World Bank, for example, had its first education project in Tunisia from 1963 to 1979, lending the country money for vocational and technical education which the Bank believed would increase worker productivity (King and Palmer 2010). This is most likely because of the inability of developing countries to fund themselves, resulting in the implementation of policies that were not originally designed for them and are simply transferred from developed countries.

Skills development can be implemented during formal training in order to give graduates industry exposure in form of technical training, pre-service or in-service like industrial attachments or internship (King and Palmer 2010). South Africa encourages (and makes it compulsory for example in government departments) the recruitment of graduate and post graduate interns in order to develop their skills before they enter the job market. In Zimbabwe industrial attachment for a year (usually the third year) is a compulsory component of some university degrees.

1.4 POLICY CHALLENGES

The major policy challenge facing South Africa's ability to build a skills forecasting capacity is the lack of sufficient information on both the supply and demand for labour. According to the Delivery Agreement 5 (a skilled and capable workforce to support an inclusive growth path), there is currently no institutional mechanism to provide credible information and analysis in regards to both the demand and supply (availability and supply pipeline) for labour skills. The Delivery Agreement goes further to indicate that it is not that there are no information databases nor have there been no research initiatives, the problem is the lack of a standardised structure for the determination of the supply of skills as well as skills shortages and available vacancies, in addition, there is no integrated information system for skills supply and demand across government.

Both the Human Resource Development Strategy of South Africa (HRDSA) and the erstwhile Joint Initiative on Priority Skills Acquisition (JIPSA) have noted the following with regard to the lack of information:

a) the lack of appropriate information on both the demand and supply (both availability and in pipeline production of skills) of skill as the main impediment to the supply of relevant skills in South Africa;

- b) the need to update and modernise the South African Qualifications Authority's national learner record database (NLRD), and
- c) that the NLRD must be capable to provide every citizen's and workplace's learning record in the country ; as well as the need for credible information as it is a prerequisite for effective and efficient planning of skills provision.

Previously there had been a lack of coordination between key partners, which exacerbated the information problem. This issue of coordination has to be addressed by allocating the skills function to the Minister of Higher Education and Training, and the separation of Basic Education functions from post school education. This has been noted to allow for interfacing, coordination, as well as integrating data from the supply side under one ministry. However, there is still much to be done concerning the demand side of this equation. Information from the demand side has been deemed to be not wholly reliable, and an example is information from the National Scarce Skills List, which according to the Delivery agreement 5, lacked credibility.

Wilson *et al* (2004) have argued that there is a possibility for much confusion when employment sources are compared directly as they can be found to be quite divergent. To demonstrate this, they make a comparison between data for formal employment and GDP from the Survey of Employment and Earnings (SEE) and Labour Force Survey (LFS) for the periods 1975 – 2002 and 1995 – 2002 respectively by making use of a graph. The results show a discrepancy between employment data from the two data sources (the SEE shows a downward trend, while the LFS indicates a general upward trend for employment). This further shows the importance of standardisation of data sources if a national skills forecasting capability is to be achieved.

Twelve delivery partners have been identified by the Delivery agreement 5 for setting up the system for skills planning and these include Ministers of Basic Education; Finance; Home Affairs; Labour; Rural Development and Land Reform; Science and Technology; Trade and Industry, and Ministries that deal with Economic Development; National Planning Commission; Performance Monitoring and Evaluation; Public Service and Administration; as well as the members of the executive council (MECs) for Education. These are partners from a wide range of institutions and therefore a high level of coordination is of paramount importance for achieving the intended goal of skills planning.

The International Labour Organisation's (ILO) "Skills for improved productivity, employment and development" 2008 report states that once the enhanced flow of information has been achieved, increased training provision must follow. Training institutions must therefore also get the proper and necessary information on the kind and levels of training that are needed so that these can be supplied to the labour market. One way of ensuring this is for training institutions to have links with the prospective employers as these will indicate exactly what kind of skills they need and in what quantities.

The National Skills Development Strategy III of the Department of Higher Education and Training (DHET) states its vision as to promote "a skilled and capable workforce that shares in, and contributes to, the benefits and opportunities of economic expansion and an inclusive growth path". South Africa faces a large formal economy which coexists with a large unorganized informal economy (ILO, 2008). Figure 1 shows employment in both the formal and informal sectors of the South African economy, and it is clear from this figure that informal sector of the economy is quite significant. The challenge for South Africa would then be to "include" these people in the informal sector by using training as a way of bringing them towards the formal sector where productivity is

higher and there is decent work, ultimately resulting in better livelihoods. This will also go a long way in curtailing the difficulties faced in prediction as some of the issues stemming from high unemployment, lack of opportunities and inequality will be addressed.



Figure 1: Employment in the formal and informal sectors of the economy (thousands)

Source: StatsSA Quarterly labour force survey, Q4 2011 Table A: Key labour market indicators

There is a pressing need to improve access to quality skills development outside high growth urban areas (ILO, 2008). The report indicates that in developing countries (such as South Africa), there is inadequate access to relevant education and training programs that could boost productivity, it also notes that the available training may not accommodate the needs of certain population groups such as women and migrant workers. South Africa launched a "National Rural Youth Service Corps", a programme aimed at youths between the ages of 18 and 35 (including the disabled) who have completed Grade 10 (or old Standard 8), and these are to be trained in technical, artisan and social-work skills over a period of two years. This is a step in the right direction, but more still needs to be done in this regard.

A challenge that is faced by South African policy makers is the need to improve the quality of education, ensuring that all South Africans have access to high quality education and training.

2 METHODOLOGIES FOR FORECASTING SKILLS DEMAND AND SUPPLY

This section looks at the state of the art with respect to the forecasting of skills, it summarises the focus and main findings of current research conducted in South Africa and internationally.

2.1 SOUTH AFRICA

There have been a few attempts to try and develop a national skills forecasting model in South Africa. In 2004, there was an attempt by the HSRC to develop such a tool. This was done in the form of a project that reviewed what it would entail to develop such a model. The project was conducted by the Employment and Economic Policy Research unit in conjunction with Warwick Institute for Employment Research. The two institutions were commissioned by the Department of Labour, with technical and financial support from the European Union's Labour Market Skills Development Programme. The results of the review where then published in a report entitled, *'Developing a National Skills Forecasting Tool for South Africa'*¹. This work constituted an extensive review of all aspects of how a national skills forecasting tool could be developed. In as far as this report gives the most comprehensive review of the process involved in developing a national skills tool and to avoid duplication of work, its main findings will be summarised in this section. The review broadly covers work that was done in South Africa from the early 1990s to 2003, this work is still relevant as very little work has been done that attempts to develop such a tool.

To gain an understanding of where the state of knowledge was with respect to the process of developing a national forecasting skills tool, Wilson *et al* (2004) started off by conducting fieldwork with the aim of assessing the perceptions of a number of key experts about the situation in South Africa as it pertains to the following topics.

- 1. The validity and reliability of data for use in a skills forecasting model in South Africa;
- 2. The suitability of existing South African forecasting models for identifying future skill needs/requirements;
- 3. Review forecasting models used in other countries and identify their applicability for use in South Africa;
- 4. Develop and pilot a forecasting model for use in the South African context;
- 5. Incorporate the forecasting model into the Skills Planning Tool Kit (SPTK);
- 6. Improve the capacity of the Skills Development Planning Unit (SDPU) to identify future skill needs;
- 7. Identify what future activities should be undertaken to identify future skill needs.

This process of the research found that several approaches could be used although there was a general feeling that South Africa should adopt international best practice. It was established that there was existing capacity in the area of multi-sectoral forecasting in South Africa which could be used to underlie a skills forecasting model. This would avoid the need to make substantial investments in building such capacity from scratch. Finally although several data sources could be identified, several concerns were raised with the quality of the data.

This phase of the research was then followed by a review of the most prominent work that had been done since the 1990s. At the time there had been one national survey that tried to analyse the implications for trends in occupational employment structures together with a number of more partial exercises. These studies provided a good foundation on which to develop a forecasting tool but more work needed to be done to come up with a more comprehensive tool that could meet the needs of a national skills forecasting tool. The following is a summary of some of the studies that were reviewed by Wilson *et al* (2004).

¹Wilson *et al*(2004)

Although there was evidence of skills forecasting in the 1990s this work had been dimmed unsatisfactory and as such not very useful. 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 covered eight of the nine economic sectors of the economy. The first step was to conduct detailed forecasts of future demand; these were done at sub-sector level of the 68 professional and 10 artisan occupational categories. These forecasts would then be fed into an integrated demand forecasting model for 1998 to 2003. The model provided highly disaggregated estimates; demand forecasts were made for the total number of persons employed in each of 81 occupational categories in 36 sectors. Some of the key findings of that work were as follows, fewer than 50,000 jobs would be created over the period 1998 to 2003, despite an estimated growth in output of 2.7%. The trade sector was expected to be the largest creator of employment, followed by the finance and construction sectors. In terms of occupational demand, the highest growth was expected to be in the IT field. Commercial occupations such as accounting and financial professions were also expected to be robust.

A few years later the Department of Labour, the Department of Trade and Industry together with the European Union commissioned another study to investigate key skills shortages and the fast tracking of skills development. This work was done by the Bureau of Market Research (BMR) in 2001. Several methodologies were used and these included a mixture of qualitative (interviews and workshops), quantitative (questionnaire and demographic analysis) and meta-analytical (secondary data) methodologies. The main findings concluded that the pool of people in the South African labour market occupations increased dramatically from 296,000 in 1965 to 1,110,000 in 1994. The faster growth in demand over this period was for engineers and engineering technologists, engineering technicians, accountants and auditors, specialist managers, computer programmers, systems analysts and software engineers.

In 2003 the HSRC updated the work that had been done in 1999, this would provide employment forecasts for specific high-skill occupations over the period 2001-2006. One of the key differences in the two studies was the data sources. The first one had used the Manpower Survey to obtain the occupational structure of employment within each sector; however, the most recent available *Manpower Survey* was from 1995. Therefore data from the Labour Force Surveys conducted in February and September 2001 were used instead. After the data issues were resolved they obtained sectoral growth forecasts for the period 2001-2006, relying heavily on the ABSA growth predictions for the forecast period (ABSA, 2001) which forecast the performance of 37 sectors of the South African economy.

The Wilson *et al* (2004) review also noted that research had been conducted on Sector Education and Training Authorities (SETAs) and this work represented examples of sector specific studies that had been done in South Africa. However, the weakness of these studies lies in the fact that they only give a sector perspective as opposed to an economy-wide view that simultaneously factors in the impact of changes in the rest of the economy. The review highlighted three such studies on the Financial and Accounting Services (FASSET), Chemical Industries Education and Training Authority (CHIETA), and Forest Industries Sector Education and Training Authority which were all conducted by the HSRC. In 2009, Umhlaba Skills Services conducted a study for the Manufacturing, Engineering and Related Services Sector Education and Training Authority (MERSETA) on a skills forecasting model for sector skills planning. The purpose of the project was to develop a model which can provide a long-term basis for identifying the sector skills needs in the MERSETA sector. The model had four components, a value chain analysis of each sub-sector; a drivers, signals and indicators component; a forecasting and a validation and prioritization component. The results of this study in terms of the skills forecast were never published.

This section shows that there has been some research in South Africa on skills forecasting. However, this work was not done at the same level that is required for a national skills forecasting tool. The studies where largely conceived as once off studies which stand in contrast to the need to develop an on-going national skills forecasting framework. More importantly there was very little involvement with the relevant stakeholders such as training and educational state organs.

2.2 INTERNATIONAL

At an international level there have been a number of attempts by several countries to develop a national skills forecasting model. Since a country by country review is beyond the scope of this concept note, we will focus on two countries, Australia and New Zealand, that have managed to implement such a national tool in a comprehensive and on going manner. In as far as the different European countries have relatively different approaches to skills forecasting this section will briefly review research that has been done by the European Centre for the Development of Vocational Training (CEDEFOP) which focuses on future skill supply in Europe. Evidence of a national skills forecasting tool in developing countries proved scarce. The availability of good sources of employment data forms a central component of any skills forecasting effort and as such the unavailability of data might be acting as a constraint in the development of a national skills forecasting tool in these countries.

2.2.1 Australia

Australia's skills forecasting is conducted by the Centre of Policy Studies (CoPS) at the University of Monash. CoPShavea model for skills forecasting which extensively rely on their applied computable general equilibrium model which has been developed for labour market forecasting, see Meagher et al, 2000 and Adams et al 2010. Australia has one of the longest histories of using economy wide models in forecasting. According to CoPS (2011) its core forecasting model, MONASH, was developed in 1993. The MONASH Model is fully documented in the book, Dynamic General Equilibrium Modelling for Forecasting and Policy: A Practical Guide and Documentation of MONASH, published by North-Holland in 2002.

MONASH is a dynamic computable general equilibrium (CGE) model of the Australian economy designed for forecasting and for policy analysis. The model distinguishes up to 140 industries, 56 regions and 340 occupations. It is used to analyse the likely effects of changes in economic policy, especially changes in taxes, tariffs, environmental regulations and competition policy. MONASH is also used to produce labour market and Income distribution forecasts.

CoPS skills forecasts are conducted within an economy-wide framework so as to bring together disaggregated employment forecasts for industries and occupations with a scenario of the macro economy. This economy-wide framework integrates a macro model (used to determine aggregate employment), an applied general equilibrium model (MONASH, which is used to determine employment by industry) and a labour market extension (used to determine employment by occupation).

According to CoPS (2011) the development of the system has focussed primarily on the demand for labour. However, the concern in recent years of the effects of technological and social change on the structure of the economy and the implications for future labour demand has meant that a complementary supply side forecasting system is needed. Such a supply side forecasting system is currently being prepared.

The CoPS system has been used since 1994 to provide a biannual briefing service to government agencies responsible for vocational education and training in Australia. Although, CoPS has not produced a public report that documents the use of the model to labour market forecasting in Australia in recent years, the publication of such an application was done in 2000 and is sufficient to inform this review.

The study by Adams et al (2000) describes the application of the MONASH CGE model to the labour market forecasting in Australia, an application which supports a commercially viable briefing service for policy analysts. The method used consists of solving a top-down sequence of models that proceeds from a macro scenario to the CGE model to various labour market extensions. The extensions involve ex post processing of the MONASH results based on employment data from the census and a number of large sample surveys. Their purpose is to greatly increase the amount of information furnished by the simulations at modest additional cost and hence to support the use of the system for analysing the efficient allocation of training resources.

Sectoral inputs to the MONASH forecasting system are:

- Macroeconomic forecasts from Syntec Economic Services;
- Forecasts for the agricultural and mining sectors from the Australian Bureau of Agricultural and Resource Economics;
- Forecasts for international tourism from the Bureau of Tourism Research; and
- Scenarios on technical change from extrapolations of recent historical experience.

The overall conclusion from the study suggested the MONASH forecasting system which was designed to address the labour market analysts' requirements for detail, accessibility and transparency, had achieved a reasonable measure of success in that regard. The application of the CGE modelling was able to provide important policy information (on the future distribution of employment) that would not otherwise have been available to Australian policy makers. The information of the forecasting system was very detailed and coherent, that is, all the forecasts conform to a single, plausible scenario for the economy as a whole. The approach also demonstrated the power of using a sequence of models in a top-down hierarchy to conduct detailed policy analysis, especially distributional analysis.

The MONASH forecasting system can be adopted in South Africa since CGE modelling capability is now fairly established in the country. For example, the HSRC and National Treasury are currently

using economy-wide CGE models in various applications which means that these models will still have to be adapted to the task of forming the core of a national skills forecasting tool. This should be done alongside broader collaboration around the data that will be used for the forecasting especially employment data.

2.2.2 New Zealand

The New Zealand, Department of Labour has a number of work programmes devoted to forecasting and analysing the future demand for skills and labour. According to the Department of Labour (2010) one of these work programmes operates under the SkillsInsight brand name. The programme involves a new data analysis tool and an on-going series of occupational employment forecasts for the labour market. These forecasts cover trends in demand for labour over two periods: five year time horizons and ten years.

New Zealand's labour market forecasts also use a "top-down" approach. That is, they extend aggregate economic forecasts about prospects for broader industry groups and produce forecasts for specific occupational groups. The Department's employment projections are presently derived from relatively high level industry growth forecasts generated by the New Zealand Institute of Economic Research (NZIER). NZIER develops these forecasts for their Quarterly Predictions.

Industry and occupational employment forecasts produced by the Department use GDP growth forecasts and productivity assumptions at the industry level to derive employment forecasts for the national accounts level industries. These industry employment forecasts are then combined with the changes in occupational shares of industries extracted from the census to produce occupational employment forecasts across all industries.

The forecasts use the following types of information:

- Industry level economic growth forecasts how much is an industry expected to grow?
- Productivity growth assumptions what level of productivity growth is expected in that industry?
- Trends in occupational shares within an industry is a particular occupation expected to become more or less important within that industry?

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The "top-down", industry demand approach has a number of advantages:

- It provides a consistent forecast methodology that can be used across industries and occupations, permitting comparisons across the industries and occupations covered;
- Updating is possible reasonably quickly in response to the latest available base year data, or changes in economic circumstances.

The disadvantages of this approach are:

- The supply side of labour/skills is not explicitly included;
- Occupational forecasts can be given only at the 3-digit NZSCO level (96 occupations).

Over time, the "top-down" methodology will be benchmarked and tested against "bottom-up" information about demand and supply from relevant sources, including employer groups or industry organisations.

This demand side information will be compared with improved information about the supply of workers – new graduates, immigrants and other people moving into the labour market.

Since the New Zealand approach to skills forecasting borrows heavily from the Australian framework the same conclusions also apply in this case. However, the important difference is in the location of the modelling effort. In Australia the main task of skills forecasting is situated at CoPS, Monash University whereas in New Zealand it's located within the Department of Labour. In order to ensure continuity and a cost effective implementation of a national skills forecasting tool, South Africa might want to follow the New Zealand approach. In the case of South Africa this can be located in the Department of Higher Education and Training. As such it will be important for any research that seeks to develop a national skills forecasting tool to integrate a capacity building component that will ensure that skills are transferred to personnel in the department.

2.2.3 Europe

In Europe the European Centre for the Development of Vocational Training (CEDEFOP) work on the early identification of skill needs, which started in 2001/02. CEDEFOP was asked by many stakeholders to extend and coordinate future actions in this field. According to CEDEFOP (2009) in 2004, the Centre established "Skillsnet", an international network of experts working on the early identification of skills needs. Its main aim is to make European activities in this field more transparent and to provide a platform for dialogue and information exchange. In doing so, CEDEFOP follows two strands of research: early identification of new and emerging skills, and anticipation of skill needs and supply. The identification of skill and competence needs in European enterprises and key sectors remains a critical knowledge gap for Skillsnet which is currently being addressed by analysing skill needs in selected key sectors (e.g. green jobs).

In 2008, CEDEFOP published the first pan-European forecast of skill needs, which provides consistent and comprehensive medium-term projections of employment and skill needs across Europe (EU-25 plus Norway and Switzerland) until 2015 and 2020.

CEDEFOP developed the basic database and models, see module outline below, required to produce a comprehensive and consistent set of skill supply projections for all countries in the EU. This study built on previous skill-demand forecast. A modular approach is used to anticipate Europe's future skills. According to CEDEFOP a modular approach aids independent development and improvement of the different parts of the system. In combination, the modules provide a general conceptual framework for producing regular quantitative projections of changing skill needs and skills supply. The conceptual framework has been designed to facilitate further development and customisation. Three new modules were added to the four main modules of the skill-demand forecast (Cedefop,2008)

The following gives a outline of all seven modules;

Module 1: a set of multisectoral macroeconomic forecasts, based on the preferred macroeconomic model;

Module 2: an occupational expansion demand model based on LFS data;

Module 3: a qualifications expansion demand module, based on similar data sources;

Module 4: a replacement demand module;

Module 5: an augmented/extended version of the existing pan-European macroeconomic model (supply component).

Module 6: an analysis of labour force survey (LFS) microdata from Eurostat to predict the probabilities of the population and the labour force achieving different levels of qualification;

Module 7: an analysis of aggregate flow data published by Eurostat/OECD (on enrolment and graduation) to produce a complementary analysis of participation and qualification rates by broadage groups.

The following overall results were found to hold across Europe. All scenarios projected that there will be increases for medium- and high-level qualifications, with the number of people with high-level qualifications projected to increase most. All scenarios project a decline in the total number of people with low-level qualifications. Although the overall results suggest a relatively positive picture, one concern for policy-makers is whether the historical trends identified will continue undisturbed by the recent economic crisis for the period 2008 to 2020.

Consistent with the situation in the South Africa, CEDEFOP notes that there are still many data problems and questions unresolved. The sample sizes in the LFS are often inadequate for providing robust more detailed estimates. Even for many of the larger countries there are problems with the data, which can probably only be resolved through painstaking dialogue between individual country experts and the relevant statistical authorities.

2.3 RESEARCH CHALLENGES

According to CEDEFOP (2009) there are many caveats in skills forecasting and anticipation:

- There is a general belief that current approaches are too focused on economics and neglect the political and behavioural aspects of those involved as well as qualitative or social aspects.
- With respect to the forecasts aggregate results might be too general for concrete policies or educational programmes;
- Another concern is related to forecasts in general; the longer the forecasting period and the more detailed the categories, the less accurate and robust the results.

CEDEFOP warns that these issues have to be taken seriously, which means every forecast has to indicate clearly its assumptions and limitations to prevent misinterpretation. Furthermore, forecasts should not be seen as precise predictions but as one source of information for informed decision making that provides early warning of what might come in the future.

2.3.1 Data issues

Data for forecasting is not readily available. However, it is important to try and get this data because it allows for quantitative forecasts which tend to have an advantage over non quantitative forecasts. Quantitative forecasts tend to have accounting and logistical constraints, are explicit on the assumptions made, tend to be very comprehensive covering many sectors and allow for different scenarios. Further, models used for such forecasts can be verified and allow for sensitivity analysis, all of which add to the credibility and reliability of these models. However, data constraints tend to be one of the most important problems in quantitative forecasting models

Indeed, some of the main problems in skills forecasting exercises are hinged on data. Data on the macro-economy and on the employment structures in the economy are crucial. The former is generally fairly available in reasonable quality. However data on gender, employment status, different occupations and qualifications is not so readily available, and where available, may be in poor quality. Efforts must thus be made to acquire as good data as possible.

One main problem is that data is not collected with the forecasting needs in consideration; hence modellers have to extract data and to make some assumptions to make it work. Further, if there is not enough labour market information in terms of how markets function, model assumptions are also a possible source of problems. If these assumptions are based on old data, this could create unreliable forecasts.

This review basically echoes the same issues in terms of data as those discussed by Wilson *et al* (2004). We can categorise the official different Data sets in South Africa as in **Table 1** below based on Wilson *et al* (2004).

Name of Survey since	y since Characteristic Type of information		Frequency
2000			
Survey of Employment and	Partial excludes agriculture,	Labour market data	Quarterly
Earnings (SEE)	domestic services and small		
	firms		
Survey of Average Monthly	Partial excludesagriculture,	Labour market data	Quarterly
Earnings (AME)	domestic servicesand small		
	firms		
South African Revenue	Very comprehensive as it	Labour market data and other	Quarterly
Service (SARS)	includes all registered	sectoral information	
	companies		
Labour Force Survey	Very comprehensive and is the	Labour market data	Quarterly
	source of employment		
	statistics in the economy		
Income and Expenditure	Main purpose is for income	Some labour market statistics plus	Every 5 years
Survey	and expenditure so not fully	other household income and	
	comprehensive on labour	expenditure information	
	market statistics		
Population census	This comes once every ten	Some labour market statistics but	Every 10 years
	years and the next in due	no comprehensive labour market	
	2012/2013	intelligence	
StatsSA monthly indicator	Covers most of the major	Provide crucial sectoral information	Monthly
surveys	sectors		

Table 1:Data Sources

Source: Compiled by author

2.4 PROBLEMS OF DATA IN SOUTH AFRICA

One major problem of data in South Africa is that they are often not comparable. Indeed there are instances when different data have shown the opposite in terms of trend, Wilson (2004). There are also problems with linking the classifications on sectoral/industrial basis with the various data sets. In other cases the sectoral sizes are also different in different datasets.

Comparing labour force survey data and censuses for example, does not give the same employment data. This is seen when one looks at the household data sets and the census for example. As explained by Wilson *et al* (2004), the census data is normally assumed the more accurate of the two and the LFS used to provide additional detail.

For demand side estimation, data on retirement, emigration, migration, mobility between occupations and on mortality is vital. Although there are various sources with bits of information on some of these variables, the data is not always reliable. Reliable data on deaths and migration and emigration is especially difficult to find in full.

However, there are few comparable countries to South Africa that have the same wealth of information. The fact that a few attempts have already been made in South Africa to come up with Skills forecast, (Wilson *et al* 2004, Bureau of Market Research 2001, Individual studies by SETAs e.g. Umhlaba Skills Services 2009) means that such an exercise is not only possible, but also very urgent.

RECOMMENDATIONS

The situation in South Africa is such that although there have been a number of attempts that have been made with respect to skills forecasting, none of them ever reached the level that is required for a standardised and comprehensive national skills forecasting model. Although SETA skills forecasting has been done for some sectors this work is insufficient to begin to address the needs of a national tool.

In so far as the initial work that was done by the HSRC, that assessed what was needed to develop a national skills forecasting tool, is the most comprehensive body of knowledge on the issue. It goes without saying that, that work needs to be undated to take into account changes in information and data availability that has happened of the past eight years. This will entail conducting a survey of South African experts to assess the situation in the country regarding skills forecasting, availability of data and capacity.

The process of updating the HSRC review would also be responsible for choosing the right conceptual and methodological framework that will be used for national skills forecasting. However, it would suffice to say two approaches reviewed above would be highly recommended for South Africa. The Australian approach, whose attraction as a benchmark arises from the fact that skills forecasting at CoPS is one of the most established in the world. The benefit of the EU approach is that its modular approach allows for the different aspects of the overall modelling framework to be developed concurrently.

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