HSRC

Developing a National Skills Forecasting Tool for South Africa

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Executive Summary and Key Recommendations

In 2003, the South African Department of Labour, supported by the European Union, commissioned research to investigate the feasibility of developing quantitative forecasting models to help identify future skill needs in South Africa.

The aims of the project were manifold. They included an in-depth review of forecasting models used in other countries, as well as an assessment of the suitability of existing South African forecasting models for identifying future skill needs/requirements. They also included an appraisal of the validity and reliability of data for use in developing a skills forecasting model in South Africa.

The project involved desktop research, reviewing previous work and data availability, as well as fieldwork in South Africa. The latter involved an assessment of the perceptions of a number of key experts in South Africa about the position there.

A consensus emerged that South Africa should adopt international best practice in anticipating changing skill requirements. The review of similar work across the world suggests that best practice, worldwide, usually involves the development of quantitative, national level employment projections. Although other methods and approaches are often adopted, these are generally regarded as complementary rather than substitutes for such projections, which are a cornerstone of most countries' efforts to provide useful labour market information to the various actors and stakeholders in the labour market. This usually entails the use of a multi-sectoral macroeconomic modelling approach, with all the advantages that this brings. While this is not the sole tool required to anticipate future skill needs, it is regarded as an essential part of the armoury in most countries that undertake this kind of activity.

The review suggests that there is modelling capacity in South Africa, upon which a robust, national, multi-sectoral forecasting system for occupational employment forecasting can be developed. Moreover there are some useful data to build such models, although these are not without their limitations. The review suggests that there are very real concerns about the quality of some of the data. However, it is argued that such concerns help to make a case for improvement in the latter rather than pre-empting the development of a new national level employment-forecasting tool.

Specific recommendations as to how to move forward, including the institutional arrangements required to facilitate such an approach are also made here. South Africa already has in place many of the building blocks required to carry out such a project. A number of macroeconomic models exist, some of which have detailed multi-sectoral capabilities. The key data sets providing information on occupational and qualification employment structures exist, although these do have their limitations and need to be further developed and improved if the reliability of this kind of exercise is to match that in other countries.

It is therefore proposed that a regular system for making quantitative employment projections, at national level, be set in place. This should include detailed sectoral, occupational and qualification elements, including estimates of replacement demands. A modular structure is proposed, which can facilitate further development and keep costs down.

The key modules are:
- Module 1: a multi-sectoral macroeconomic model, based around one of the existing models available in South Africa;
- Module 2: an occupational model, building upon previous work undertaken in South Africa, but making full use of the latest data available;
- Module 3: a replacement demand module, recognising the crucial importance of considering not just changing occupational employment levels but also the need to replace those leaving the workforce because of retirement, migration and mortality;
- Module 4: a qualifications module, focusing on the implications for qualification intensities within occupations (demand) rather than the supply side.

While all 4 modules could be developed independently, in practice the data and issues involved in Modules 2-4 are closely inter-related and are probably best undertaken by a single research team.

It is argued that, while there may be some benefits in improving and enhancing the existing data, new primary data collection is not a necessary condition to undertake some useful benchmark projections. These can be produced using existing data. Based on the assumption that no new primary data collection is required, the basic costs of such an exercise are estimated at around R1m. Updating costs, which might be incurred on a 1 or 2 year cycle, could be slightly less. However, there would undoubtedly be considerable scope for continuing development work, so it would be more realistic to regard this as the likely costs of a typical

update.

This should be sufficient to:

- "Buy in" a good set of multi-sectoral projections from an existing model;
- Develop a robust and consistent occupational database and related projection models, including implications for replacement demands and qualifications intensities;
- Produce a good quality report, including methodological details, software and data to enable easy updating

1.   INTRODUCTION

1.1   Background

As part of its National Skills Development Strategy, the Department of Labour commissioned this research project to investigate the feasibility of developing forecasting models and tools, in order to help identify future skill needs in South Africa.

The first phase of the project involved two main elements:

- A review of international best practice, including an assessment of the strengths and weaknesses of different approaches;
- A review of existing data and previous approaches to this topic in South Africa.

In conjunction, these two elements allow an assessment of both what is desirable and feasible in a South African context. The report concludes with some detailed recommendations regarding a methodology for future skills forecasting in South Africa.

1.2   Aims and objectives

The detailed aims and objectives of the project were set out in the Terms of Reference as follows:

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

Anticipating the conclusions of this review, it is clear that "best practice" worldwide, involves the use of large scale, multi-sectoral models to produce a comprehensive overview of how structural economic and technological changes are affecting the demand for skills. The development and use of such models is a very resource intensive process, and it is apparent that this is not a practical objective of the present exercise.

What the present project can do is:

1. Assess the feasibility of using existing macro and sectoral models, already available in South Africa, to drive an overarching set of projections covering all sectors;

2. Explore the strengths and weakness of previous attempts within South Africa to forecast skill needs, including work by:

   - Human Sciences Research Council (HSRC);
   - Bureau of Market Research (BMR);
   - Individual sectoral studies by the SETAs.

3. Assess the availability and reliability of currently available data in South Africa on occupational employment structure by industry;

4. Explore the feasibility of addressing key issues such as the development of estimates of "replacement" demand by occupation, including elements such as:

   - voluntary retirements from the work force;
   - mortality (including the effects of AIDS);
   - migration (including the reliability of official data on emigration rates).

5. Examine the feasibility of extending some of this work to include other aspects/dimensions of skill such as formal educational and training qualifications and key/generic skills.

6. Make recommendations on possible models/approaches for undertaking this work, as well as possible institutional arrangements for carrying out such work.

1.3   Structure of the report

Section 2 begins with a summary of the various methods used across the world to anticipate changing skill needs, with particular emphasis on quantitative occupational employment forecasting. This draws upon an in-depth review, which is contained in two separate Annexures (A and B). All the key approaches are considered, including the national, multi-sectoral, macro-modelling approach. The reasons for favouring the latter approach are set out in detail, along with some of the problems and pitfalls associated with it.

Section 3 reviews previous work on occupational employment forecasting in South Africa. This includes previous work by the Human Sciences Research Council (HSRC) and the Bureau of Market Research (BMR). The discussion provides a critical but constructive review of previous studies, their limitations and scope for improvement.

Section 4 assesses relevant data sources in South Africa, focussing upon their strengths and weaknesses from the point of view of developing a systematic and comprehensive quantitative forecasting tool. This includes issues such as the quality of sectoral employment data (output and productivity, as well as employment) and the problems of mapping between the standard Industrial Classification (SIC) which is used to classify most official data and the "footprints" of the Sector Education and Training Authorities (SETAs), which have been charged with assessing sector skill needs in South Africa. Other issues covered include the availability of occupational employment data (especially industry by occupation employment matrices), the consistency of data over time and the merits of official and alternative / unofficial sources. Data on "replacement demands" by occupation, including rates of outflow due to normal retirement, mortality (including AIDS) and net migration are also assessed. Finally, data on qualifications and key/generic skills by occupation are also considered.

Section 5 begins with an overall assessment of modelling capacity in South Africa, including the availability of macro-modelling capacity. It draws together the key findings from Sections 3 and 4, outlining what types of modelling are feasible given current data and modelling capacity. In the light of all this, it then goes on to draw together the key conclusions from Section 2 and makes detailed recommendations about the best way forward in a South African context. This includes recommendations on the best ways of exploiting existing modelling capacity and data, including how existing models and data can best be adapted and used, providing some examples. This section also includes some recommendations for changes to institutional responsibilities and related arrangements to achieve such ends. Possible longer-term developments involving development of new data sets and/or modelling capacity, as well as the integration of outputs from such an exercise within the SDIS and SPTK, are also covered.

Finally Section 6 concludes, by summarising the key recommendations.

Full details of the various sources and references covered are given in the bibliographies contained in the separate Annexures, which also include details of the key data sources.

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2.   AN OVERVIEW OF OCCUPATIONAL FORECASTING WORLDWIDE

2.1   Key approaches: an assessment of international best practice

There have been a large variety of approaches to anticipating changing skill needs worldwide. These have tended to reflect perceptions of both what is desirable, as well as the practical limitations of what is feasible. Both of these have changed substantially over the past 50 years. From the earliest attempts, those engaged in such work have adopted model based, quantitative methods wherever possible, simply because quantitative results have been seen as a key output required by potential users of the results. The use of formal models has been advocated on various grounds, as detailed below. However, the merit of alternative, more qualitative methods has also been recognised.

Current work in this area is still very much constrained by data limitations. What is feasible in different countries is limited by their "statistical infrastructure". Some countries, such as the USA, have been engaged in this kind of work for over 50 years. The sophisticated analysis conducted there has been based upon very substantial prior investments in statistical surveys and datasets as well as modelling capacity. In contrast, in some other countries, where the same levels of investment have not been undertaken, the data to develop such quantitative models simply do not exist. In such cases alternative approaches have been developed. While these approaches can provide some useful insights, they are generally regarded as useful complements to the more fully-fledged, model based projections, rather than a substitute for them.

Based on an extensive review, covering most of the countries in the world which have undertaken work of this nature, the main approaches adopted include:
- Formal, national level, quantitative, model based projections;
- *Ad hoc* sectoral or occupational studies;
- Surveys of employers or other groups;
- Focus groups/round tables and other Delphi style methods, including setting up "observatories" (these may include some quantitative aspects but are generally more qualitative).

Each of these approaches has its own strengths and weaknesses. These have been compared and contrasted in Annex A, the results of which are summarised in Table 1. This includes the multi-sectoral macro modelling approach, although the pros and cons of this method are discussed in greater detail in the next sub-section.

Even where forecasting is carried out using hard-nosed, quantitative methods, those involved usually stress that such projections should be seen as part of an ongoing process rather than the final word and recognising the importance of incorporating more qualitative insights. None of today's forecasters claim that they can predict the detailed skill needs in different sectors with great quantitative precision. Rather, they suggest that they can provide the various participants in the labour market, as well a policy maker, with useful insights into how labour markets are developing in response to various external influences. It is important to recognise that accurate and precise forecasts are a chimera. The key question to ask is not whether or not such projections are **accurate**, but whether or not they are **useful**. The revealed preferences of national governments from all over the world, who support such activity with substantial funding, suggest that they are regarded as of considerable value. It is also clear that such work is seen as having a wide variety of different audiences and users, including careers guidance, as well as general labour market policy formation and planning education and training programmes. Few, if any, countries now regard such work as resulting in information that can be used to plan the scale and pattern of education and training provision with any precision. Rather it can help to inform all those involved about how economic and other forces are shaping the labour markets and the general implications for those skills that will be required.

Table 1: Comparison of the Pros and Cons of Alternative Approaches to Anticipating Skill Requirements

Alternative approaches	Advantages	Disadvantages
Formal, national level, quantitative, model based projections	Comprehensive Consistent Transparent Quantitative	Data hungry Costly Not everything can be quantified May give a misleading impression of precision
Ad hoc sectoral or occupational studies (using a variety of quantitative (model based) and qualitative tools)	Strong on sectoral specifics	Partial Can be inconsistent across sectors
Surveys of employers or other groups, asking about skill deficiencies and skill gaps	Direct "user/customer" involvement	May be very subjective Inconsistent Can too easily focus on the margins (i.e. current vacancies) rather than skill gaps within the current workforce
Focus groups/round tables and other Delphi style methods	Holistic Direct "user/customer" involvement	Non-systematic Can be inconsistent Can be subjective

2.2   Typical quantitative modelling approaches

The typical quantitative modelling approach involves two key elements. The first key component is a multi-sectoral macroeconomic model of some kind, usually built around a Leontief input-output table, which takes into account the inter-linkages between sectors. Such models are usually estimated using complex and sophisticated econometric methods, although computable general equilibrium models (where parameters are imposed rather than estimated) are also used in a number of countries. The key outcomes as far as the present project is concerned are consistent projections of employment levels by sector. Of course, in addition to providing projections of sectoral employment, such models are used for a wide variety of other purposes. Details of a typical multi-sectoral macroeconomic model are provided in Annex A.

The second key component is a module or set of modules, which translate the outcomes from the multi-sectoral models into implications for the demand for skills. These elements vary considerably across countries. Most commonly, this aspect is much less sophisticated, mainly due to the more limited nature of data available on skills. In most cases, the focus of attention is limited to occupational employment structures within sectors. The trends in such structures are analysed, normally using very simple techniques rather than sophisticated econometric methods. Again the typical approaches used are discussed in more detail in Annexes A and B.

2.3   Reasons for favouring a quantitative modelling approach

The review of international best practice in skills forecasting suggests that this generally involves the use of a multi-sectoral macroeconomic model. Such models are regarded as essential in order to obtain a robust and consistent sectoral employment scenario, which is the starting point for any comprehensive assessment of changing skill needs.

The advantages of such an approach include:
- The sectoral and other detail it provides;
- The fact that it is typically comprehensive, covering the whole economy;
- Logical consistency;
- Imposition of accounting constraints;
- Recognition of economic constraints and influences;
- The fact that it helps make underlying assumptions explicit;
- Consistent scenarios across all sectors.

2.4   Problems and pitfalls in using a modelling approach

Such methods do, of course have some disadvantages and problems. These relate to:

- Data limitations (often data were not collected with modelling in mind);
- Technical limitations within fixed resource limits;
- Resource costs of development and maintenance;
- Limits to current understanding of the way labour markets work;
- The possibly limited relevance of the past (such models being based on an assumption of a continued of past patterns of behaviour).

Quantitative models should not, therefore be seen as a panacea. Nevertheless, in most of the countries that do conduct regular national assessments of future occupational and skill requirements, such models are regarded as an essential cornerstone. Such models are increasingly being adopted in developing, as well as developed, countries as the availability of data and the capacity for model building improves.

3. OCCUPATIONAL EMPLOYMENT FORECASTING IN SOUTH AFRICA

3.1 A critical assessment of modelling capacity and data availability in South Africa

The initial phase of this project involved fieldwork in South Africa. The aim of this phase of work was to assess the perceptions of a number of key experts about the situation in South Africa. Those experts were interviewed to obtain their views on the list of topics set out in Section 1.2.

Although there were many different views, a broad consensus emerged along the following lines:

1) If possible, South Africa should adopt international best practice (i.e. develop national level, quantitative, employment projections, using a multi-sectoral macroeconomic modelling approach, with all the advantages that this brings);

2) There is existing capacity in the area of multi-sectoral forecasting in South Africa which could be used to underlie a skills forecasting model (the use thereof would avoid the need to make substantial investments in building such capacity from scratch);

3) There are various data sources available which would enable occupational projections to be developed, driven by such sectoral forecasts, and it is possible these could build upon earlier work (notably that carried out by HSRC for 1998-2003);

4) However, there are very real concerns about the quality of the data on occupational employment currently available and these need to be carefully addressed in any attempt to produce a national level set of projections;

5) Data concerns are even stronger in relation to issues such as replacement demands and other dimensions of skill, but some data do exist which can be used to highlight the significance of the key issues;

6) Data concerns also exist about alignment between SIC and SETA demarcation, which needs to be carefully sorted out.

Issues relating to data are dealt with in the following section. The remainder of this section focuses upon two issues. Section 3.2 reviews previous attempts to anticipate changing skill need in South Africa. Section 3.3 deals with the availability of multi-sectoral macro modelling capacity needed to drive a typical set of occupational employment projections.

3.2 Previous attempts to anticipate changing skill needs in South Africa

Previous work in this area in South Africa has tended to focus on the second of the two components identified in the previous section, although the discussion in Section 3.3 below, suggests that recent developments in macro modelling mean that this emphasis might now be changing. As far as analysing the implications for trends in occupational employment structures is concerned, there has been one nationwide study in recent years, plus a number of more partial exercises. Together, these various studies provide a useful foundation upon which to build a new and more comprehensive analysis of changing skill needs in the South African economy.

In a review of earlier work, Barker (1999, p 232) states: "Forecasts of expected broad trends, to provide guidelines for education, training and labour market planners, have in the past been made by the National Manpower Commission, … the Institute for Futures Research, ... and the Department of National Education. However, these forecasts were not found to be very helpful." Barker was the Chairperson of the National Manpower Commission during the late 1980s, and this criticism perhaps reflects a view that such projections should deliver precise answers about where investment in education and training provision needs to be made. It is now recognised in most countries that this is not possible in a market economy, where labour market outcomes reflect the combinations of huge numbers of individual decisions. Nevertheless, such information can provide useful information to all these involved, even if it cannot be used to plan as in a command economy.

HSRC (1999)

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 (Whiteford, *et al.* 1999). The study was fairly comprehensive, covering eight of the nine economic sectors of the South African economy. (The agricultural sector was excluded.) Detailed forecasts of future demand were made at sub-sector level of the 68 professional and 10 artisan occupational categories.

The 1999 study commenced with a survey of employers. Information was gathered on current as well as expected employment, skill shortages and possible changes in future skills needs by means of structured questionnaires from 273 randomly selected companies. An integrated

demand forecasting model for 1998 to 2003 was then developed. 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.

Changes in total employment arise from two major contributors: changes in output and changes in labour productivity. Estimates of the change in these two factors and the derived change in total employment in each sub-sector were based on the expectations of persons active in each sector together with the results from independent multi-sectoral macroeconomic forecasts available at the time. In the survey, respondents were asked to estimate the change in output and the change in employment within their sector. From this it was possible to calculate the change in employment relative to the change in output or, more technically, the elasticity of labour demand relative to sector growth.

The 1999 HSRC study concluded that 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 show strong growth. Demand for engineers – especially electrical and chemical – was expected to be robust.

The study estimated replacement demand in a fairly crude fashion. For example, the number of deaths was assumed to be 6.5 per thousand for all occupations. (This was based on mortality rates derived from the 1995 October Household Survey for all persons with degrees, diplomas and certificates.) In the case of migration, it was assumed that the official data from Stats SA underestimated true emigration for 1998 by 50% and that emigration rates remained flat over the forecast period.

BMR (2001)

In 2001, the European Union, the Department of Labour and the Department of Trade and Industry commissioned Carel van Aardt from the Bureau of Market Research to investigate key skills shortages and the fast tracking of skills development (BMR, 2001). The study used a mixture of qualitative (interviews and workshops), quantitative (questionnaire and demographic analysis) and meta-analytical (secondary data) methodologies. This study showed that the

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pool of people in the South African labour market appointed in High-Level Human Resource (HLHR) 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.

Van Aardt's study concluded that the South African higher education sector needs to produce more IT specialists, electronic engineers and specialist managers. The study also argued that the educational system needs to be more closely aligned to the needs of employers, i.e. greater emphasis should be placed on teaching the specific skills that industry requires.

HSRC (2003)

Woolard, Kneebone & Lee (2003) updated the earlier work by Whiteford *et al.* (1999) to provide employment forecasts for specific high-skill occupations over the period 2001-2006. They used a labour demand model to estimate the number of new positions that will arise as the result of sectoral growth and a separate "replacement demand" model to determine demand arising from retirements, emigration and inter-occupational mobility. They find that even in those occupations where employment levels are expected to decline substantially, there is likely to be a need to train new individuals simply to maintain the existing stock of skills at the required level.

The first step was to estimate employment by occupation and sector for 2001. The previous HSRC study had relied on the *Manpower Survey* to obtain the occupational structure of employment within each sector. Unfortunately, the most recent available *Manpower Survey* is for 1995. Consequently, the 2003 study elected to use the data sets from the *Labour Force Surveys* conducted in February and September 2001. These two surveys were based on independent cross-sections, making it possible to pool the two data sets in order to obtain a reasonable sample size.

The second step was to obtain sectoral growth forecasts for the period 2001-2006. These sectoral growth rates are important exogenous variables as they play a large role in driving the model. They relied heavily on ABSA's growth predictions for the forecast period (ABSA, 2001). ABSA forecasts the performance of 37 sectors of the South African economy. The approach used is "top down", meaning that the analysis begins at the macroeconomic level. The various

components of demand are forecast using a Keynesian demand model with a supply-side element that relies in turn on a variety of international and domestic assumptions. The projections of the components of demand then serve as inputs into an input-output based sectoral model. ABSA's sectoral forecasts are thus grounded on a set of consistent underlying assumptions about the macro environment for the next few years.

These sectoral forecasts were then fed through a matrix of elasticities to obtain the changes in occupational demand within each sector. The change in demand for a particular occupation was obtained by multiplying the sectoral forecasts by the elasticities and then adding up the occupational demand across all sectors. This then gave an estimate of the increase in the number of positions available for each occupation.

The elasticities used in the previous HSRC study had been estimated through a complex process that was heavily reliant on the information provided through interviews with companies and industry experts. A repetition of this survey process was beyond the scope and budget of the update, thus the elasticities obtained in the previous study were assumed to still hold for all sectors, with the important exception of IT. In the case of IT, however, the authors were of the opinion that domestic and global circumstances had changed sufficiently to require a re-assessment of the elasticities used in the 1999 study. Interviews were conducted with several of the major IT companies and this information was used to re-calibrate the elasticities for computer-related professionals. In general, it was found that IT companies were far more cautious in their predictions about the demand for IT professionals than they had been three years previously. IT companies indicated that they did not expect their workforce to grow by more than 1% or 2% per annum over the next five years. In addition, they indicated that very few "entry-level" positions were being created. If new positions were being created, these were for experienced staff or specialised programmers.

In addition to the additional ("new") demand for labour, the authors also considered replacement demand arising from retirements, net migration, movement into other occupations and in-service mortality. Indeed, given the relatively low rate of economic growth in South Africa coupled with high mortality, it can be expected that replacement demand will exceed the creation of new positions. Because the data for the model were obtained from a household survey, the authors had the distinct advantage of having detailed information about the demographics of each occupation. This made it possible to estimate specific rates of retirement and mortality for each occupational class.

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SETA Studies

In addition to these general studies, a number of the recently formed SETAs have also undertaken work in this area. These inevitably tend to be partial, focusing upon the areas of concern to a particular SETA. Nevertheless they provide some useful insights. The work done for three of the Sector Education and Training Authorities (SETAs) by the HSRC is discussed here by way of example.

Financial and Accounting Services (FASSET)

The financial and accounting services sector has in recent years been an area of high economic and employment growth, and projections of the future demand for labour in the sector are based on the assumption that it will remain so in the near future. A very crude demand projection model was developed in this study (van Zyl, du Toit and Fourie, 2003). The model takes into account possible scenarios of economic growth, the employment-output elasticity, and mortality in the sector, retirement, emigration and people leaving the sector. Four projection scenarios were developed, ranging from a relatively pessimistic to a very optimistic scenario. All four scenarios, however, assume positive economic growth. The demand projections indicate that under positive economic conditions a total of between 11,000 and 25,000 new employment opportunities may be created in the sector over the period 2002 to 2008. This represents growth in total employment of between 2 % and 4.1 % per annum. This growth is, however, not only dependent on conditions in the rest of the economy, but also on the availability of professionals and skilled workers as job creation in this sector is particularly dependent on their skills.

Chemical Industries Education and Training Authority (CHIETA)

In 2003 the Department of Trade and Industry and the Chemical Industries Education and Training Authority (CHIETA) commissioned the HSRC to conduct a study on skills needs in the chemical industries sector (Erasmus, personal communication).

The findings are summarised in a sector report and nine sub-sector reports. These are the outcome of an analytical study that drew on secondary data sources and also data from surveys. The surveys included a broad telephone survey of employers, in-depth personal interviews with employers, a survey of accredited training providers, and a survey of universities and technikons.

Owing to low response rates, the authors caution that the results of the study should be viewed with circumspection and regard them as qualitative rather than quantitative. No attempt was made to quantify future labour demand. Instead, demand was described in broad terms.

Forest Industries Sector Education and Training Authority

The HSRC was commissioned in 2004 to develop a profile of the forest industries sector in South Africa. This report provides an overview of the quantitative and qualitative data collected on the forest industries sector. This includes a description of the workforce in terms of geographical distribution and company size; the distribution of occupations; and the population group and gender distribution. Training infrastructure, training provision, skills shortages and skills gaps, and drivers of training are discussed. No attempt was made to quantify future labour demand.

3.3   The availability of multi-sectoral macro modelling capacity in South Africa

A wide variety of economic actors have a strong need for information about the future macroeconomic environment and the consequences for production and demand in specific sectors or sub-sectors. Consequently, a large number of macroeconomic and sectoral models already exist in South Africa. The existing South African models can be broadly divided into "econometric" and "general equilibrium" approaches and these are discussed here in turn.

Econometric models have a much richer tradition in South Africa than general equilibrium modelling (van Seventer, 2003). For ease of exposition, within the rubric "econometric models", it is possible to distinguish between two approaches, namely partial equilibrium time series analysis and economy-wide modelling.

- Partial equilibrium models focus on a particular issue, such as economic growth or investment behaviour or money supply, without worrying much about other aspects of economy-wide adjustment. Based on time series data, past behaviour is analysed and policy conclusions are drawn. Single equation econometric modelling is very much complementary to general equilibrium analysis in that the estimated parameters of this kind of analysis provide the necessary elasticities and coefficients needed for successful economy-wide policy modelling.
- Economy-wide econometric modelling entails the comprehensive representation of an economy in which the behavioural relationships are all fully estimated and then often (but not always) re-estimated on a regular basis.

The South African Reserve Bank (SARB) and the National Treasury (NT) both run quarterly economy-wide models that focus on the aggregate macroeconomic variables without going into much sectoral (industrial) detail. The focus of the SARB's model is on forecasting the typical macroeconomic variables (such as output and productivity) as well as the monetary policy variables that the SARB is obviously most interested in. The Treasury on the other hand focuses on the broad macro variables needed for medium-term fiscal budgeting. While these macroeconomic forecasts are published regularly, the detailed specifications of the SARB and NT models are not in the public domain.

Some aspects of the SARB macro econometric model have been made public sporadically. Both the SARB and NT models can be summarized as conventional Keynesian demand-oriented models with explicit supply elements (van Seventer, 2003).

The Bureau for Economic Research (BER) at the University of Stellenbosch has arguably the longest history of econometric forecasting outside of the SARB. Indeed, early versions of the National Treasury model were based loosely on the BER macro model (although the two models have since developed quite separately).

In addition, a range of private sector research companies also maintain large economy-wide models. The best known of these is the Global Insight econometric model, which is used by *inter alia*, ABSA Bank (ABSA, 2003). The Global Insight macro econometric model is not disaggregated to a sectoral level but rather feeds down into a detailed computable general equilibrium model (as discussed below). This is similar to the methodology used by Monash in Australia (as discussed in more detail in Annex B).

Computable General equilibrium (CGE) models are economy-wide models based on a Social Accounting Matrix (SAM). General equilibrium modelling makes it possible to step away from the traditional "holding everything else constant" (*ceteris paribus*) assumptions that are inherent in partial equilibrium models. By doing so, a general equilibrium model helps to represent a much more real world situation, where almost all critical macroeconomic variables have many interactions and feedback cycles in their determination. This ability to model the second round effects and interrelations between different markets greatly enhances the predictive capability of the forecasts.

There is now a well-established tradition of using CGE models in South Africa (see Annex C).

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There are several CGE models currently in use – and regularly maintained – in South Africa. Most notably, James Thurlow at the International Food Policy Research Institute (IFPRI) and Dirk van Seventer at Trade and Industry Policy Strategies (TIPS) have carefully documented a standardised CGE model for South Africa and the model is in the public domain (Thurlow and van Seventer, 2002). Adaptations of this model are in use by a variety of organisations, including the HSRC and the Department of Agriculture. A similar model is in use by National Treasury, who collaborated with the World Bank to extend the standard model to include specific fiscal variables. In the private sector, Global Insight maintains a 36 (industrial) sector CGE model.

From the above it is evident that the capacity exists in South Africa to undertake the multi-sectoral modelling required in adopting the approach outlined in Section 2.2 above. It would not be necessary to build a new multi-sectoral model from scratch as one of the existing models could be used to provide the necessary sectoral employment forecasts.

4. DATA SOURCES IN SOUTH AFRICA: STRENGTHS AND WEAKNESSES

4.1 A critical assessment of data availability in South Africa

4.1.1 General Labour Market Information

The previous studies, which have attempted to anticipate changing skill needs in South Africa, have highlighted a number of areas of concern regarding data availability and data quality. These concerns are echoed in the present report. There can be considerable confusion when employment sources are directly compared and found to be widely divergent. However, this is due to the fact that different surveys measure different things and are thus useful for different purposes. They are not necessarily interchangeable as sources of information about different aspects of employment levels and employment structure. This section reviews the data available from a variety of different sources.

Enterprise Based Surveys

The **Survey of Employment and Earnings (*SEE*)** is a quarterly survey covering a sample of 10,183 private and public enterprises in the formal non-agricultural business sector (those with a VAT turnover exceeding R300,000 per annum). It does, however, exclude certain industries and these are listed in Annex D. Stats SA, in collaboration with the South African Revenue Services and the Departments of Trade and Industry and Labour, have now re-engineered the register of businesses and this now serves as the sampling frame (Stats SA, 2003- See Annex D). This new sample covers all the industries in the formal non-agricultural business sectors as well as those previously excluded. Agriculture, domestic services and firms with a turnover of less than R300,000 (which would include most of the informal sector) remain outside the ambit of the *SEE*.

The **Survey of Average Monthly Earnings (*AME*)** is also a firm based survey and is run in conjunction with the Survey of Earnings and Employment (as discussed above). Its sample frame is similar to that of the *SEE* (prior to 2002) in that it only collects information from businesses in the formal non-agricultural business sector. This survey does not therefore collect any information from those industries mentioned above, (i.e. it excludes the same industries that the *SEE* disregards prior to 2002). In this regard, it would appear that any overall employment estimates from the *AME* would underestimate the true total including those sectors not covered by the survey.

From 1987, Stats SA conducted the **Manpower Survey** on an annual basis. In 1996, the name of this survey changed to the Occupational Survey, which ran through to 1997. In 1998, it was replaced by the Survey of Occupations by Race and Gender, but this survey did not move beyond the initial piloting stage and was discontinued in 1998. The Manpower Survey (*MS*) was an enterprise-based survey covering private and public enterprises in the formal non-agricultural business sector. It was conducted by mail and based on a sample of approximately 8 500 businesses/organizations. Agriculture, private households and the informal sector were excluded from the survey. The *MS* covered enterprises in all eight non-agricultural major industrial groups and could be subdivided into further groups and sub groups according to the Standard Industrial Classification of all Economic Activities (SIC). This firm-based survey thus allowed, in principle, for detailed disaggregation by sector. However, accuracy and reliability of the data will drop as the 8 major industrial groups are examined in more detail. Occupational employment estimates are also available for these industries and are classified according to the International Standard Classification of Occupations (ISCO). This also allows for the desegregation of occupational employment by sector. Again, the more disaggregated the analysis, the more unreliable the data become.

SARS refers to a database collected by the South African Revenue Service (SARS), and it consists of enterprises that are registered for tax purposes. This database is continually updated and downloads are created on a quarterly basis by SARS. This database collects information on both private and some public sector enterprises. The database supplied by SARS, as at February 2003 (the most recent readily available dataset available to the authors at the time of writing), consisted of 274,183 establishments. It can be noted that this database is considered to be the most reliable indicator of the potential sampling frame of businesses that any other firm-level survey should attempt to cover.

Household surveys

As a result of the unemployment debate of the mid-1970s, the Department of Statistics (which later became the Central Statistical Service and then Statistics SA) introduced the monthly Current Population Survey. For various reasons, not least the flaws in the sample design of the survey, this survey fell into disrepute and was abandoned in the late 1980s. After a gap of several years, the annual **October Household Survey (*OHS*)** came into existence in 1993, but excluded the TBVC states in the first year. The *OHS* had a detailed labour market module that covered a wide range of issues relating to formal and informal employment and unemployment. However, in order to fulfil the stringent reporting requirements of the IMF, in

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February 2000 Stats SA introduced a twice-yearly **Labour Force Survey (*LFS*)**. For a more detailed description see Annex D.

There is some debate, however, on the employment figures that the *OHS* and *LFS* have reported. These relate to wide variations or sudden increases or decreases in labour force participation or economic activity. Since 1999, the household surveys (*LFS*) have tightened up methodologically in terms of taking a far broader view of what constitutes "employment" and the questionnaires have probed far more deeply for information on economic activity. As a result, the dramatic increases in measured employment between 1998 and 1999 and again between 1999 and 2000 are at least in part the result of methodological changes. This increase in measured employment also has an effect on the labour force participation rate since some people who would have described themselves as economically inactive in the *OHS* would be classified as working (and thus economically active) in the *LFS*. It cannot be sufficiently overemphasised that the *OHS* total employment figures should not be compared directly with the *LFS* figures.

To date, there have only been two full **Population Censuses** of the whole of South Africa - in 1996 and 2001. These censuses asked a few simple questions about work status. Because only a small number of questions are asked, it is not possible to probe deeply for information about activities that might be regarded as "work" but which the respondent does not regard as such. Consequently the population census might be expected to under estimate employment. Figure 2 in Annex D suggests that far fewer people are classified as employed in the Census compared to the *LFS*.

Private Data Houses

Private organisations such as Quantec and Global Insight produce their own employment series, which attempt to harmonise an array of labour market information sources. It would appear, however, that they rely most heavily on the *SEE* – largely because this is the data series consistent with the National Accounts (thereby avoiding internal inconsistencies with other series produced by these companies). These databases are produced for profit and are not "official" sources of data, but could be the best current time-series data for trend analysis.

Information from the SETAs

The SETAs collect limited information from employers, based on Workplace Skills Plans (WSPs). Only a small minority of employers have submitted WSPs to date. Consequently, this is not currently a useful source of employment information. In addition, some SETAs have conducted employer surveys. The sampling frame for these surveys is typically the SARS database of skills levy-paying firms. It is possible to map the sectoral categories and SETA classifications. (This mapping has been included as an addendum to Annex D.)

4.2   Sectoral data

In order to model labour demand at a sectoral level, adequate sectoral data on, *inter alia*, output, productivity and wages are needed. These data are all heavily dependent on the monthly economic statistics published by Stats SA. In 1996, Stats SA initiated a process of reviewing all its economic statistics. One of the outcomes of this process was a move to update the business register (as discussed above) on the basis of SARS records of VAT-registered businesses. Since the beginning of 2003, Stats SA has been conducting its monthly indicator surveys (manufacturing, wholesale trade, retail trade, motor trade and land freight) using fresh samples of businesses drawn from the new business register. This has, however, been done in parallel with surveys using the old sample. In this way, it should be possible to adjust historical figures in such a way that they can be comparable with the new series.

Results published from the surveys using the new business register as the sampling frame reflect higher levels of economic activity than those using the old register. This is not unexpected and is not in itself a cause for concern. In the case of manufacturing, wholesale and motor trade, the movements in the old and new series are quite similar and thus it is feasible to back cast the new series. In the case of retail trade, however, the old and new series do not track each other sufficiently well for Stats SA to be confident of the historical trend. One of the consequences of this is that Stats SA have opted to discontinue publishing a seasonally adjusted series until they have 36 months of data from which they can create new seasonal adjustment factors (because the old seasonal adjustments do not give a plausible picture).

The change in sampling frame poses a challenge for econometricians, as the time series data for employment (and thus productivity) are discontinuous. For example, total employment in

the third quarter of 2003 ostensibly jumped by 40% from the previous quarter (SARB, 2003, S-136) as a consequence of the broadened sample used for the **Survey of Employment and Earnings (*SEE*).** While adjustments can clearly be made to the data, it cannot be sufficiently emphasised that a great deal of attention will need to be given to data issues in this modelling exercise.

In order that the outputs from the model should be useful to the SETAs, attention will also need to be given to mapping the sectoral results onto the SETA classification. In Annex D a concordance table is provided which indicates how the 3 digit sector codes can be translated into the SETA classification. The modelling however will not be done at this level of desegregation, so a set of plausible assumptions will need to be made in order to translate sectoral projections onto SETA projections. This is not ideal, but in the absence of time series data defined according to the SETA footprints, there is currently no alternative. Only if efforts are made to collect data for such categories (as opposed to the more conventional SIC aggregate groups currently used in official data), will it be possible to resolve this situation. Even if a decision is made to do this it will take many years before a satisfactory time series database can be established, so some kind of mapping exercise from conventional SIC grouping to SETAs for the foreseeable future is likely to be required.

This situation is virtually identical to that in the UK, where the recently formed Sector Skills Councils have been defined with little regard for conventional SIC conventions. In trying to develop projections for such categories, UK analysts have to adopt analogous "maps" showing how SSCs are linked to SICs. In principle, such mappings (which are often based on proportions of employment in SIC categories being allocated to particular SSC categories) may vary across geography, across other dimensions of employment (gender, employment status, race) as well as over time (if such proportions change as time goes by). In the South African case, whole SIC 3 digit categories are allocated to SETAs. So, in principle, such problems need not arise and such "maps" could be relatively straightforward to produce and robust across categories and over time. In practice, things are not quite so simple. If robust data were available at SIC 3 digit level, robust SETA projections would be easy to produce from the SIC versions. If, as seems likely, robust analysis and projections are only possible at the 2 or 1 digit level, then South African analysts will face the same problems as those in the UK. In this case there is no ideal solution and fairly crude mappings based on 1 or 2 digit level SIC data will be the best that can be done. However, although this may affect the detailed employment estimates and projections, it is unlikely to change the general trends in occupational employment structure, which the analysis reveals.

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4.2.1 Data Adequacy for Sectoral Forecasting

Sectoral employment data lie at the heart of any multi-sectoral modelling approach to assessing changing skill needs. There are still concerns on this front, with a number of private organisations spending considerable time and resource to develop consistent time series information based on the various official sources. The latter often display different patterns and further effort is needed to establish a set of sectoral data that all interested parties (Department of Labour, Stats SA, macro modellers, SETAs, etc) can agree upon.

For example, in a comparison between the **Survey of Employment and Earnings (*SEE*)** and the ***OHS/LFS*** surveys, the *SEE* shows a downward trend for formal employment, whereas the household surveys show on average an upward trend. As a result, the *SEE* does show lower levels of total formal employment (see Table 6 in Annex D). These lower levels do not necessarily imply an equivalent increase in unemployment, but rather indicate the limitations of the *SEE* survey, since these other employed individuals could be employed in industries or occupations not covered by the *SEE.* Thus, using the *SEE* survey as it stands up to now (1997 to 2002) to measure ***total employment*** is not a good idea. However, it can provide a useful measure of occupation structure ***within*** those industries that it does cover.

When considering a comparison between the **Manpower Survey (*MS*)** and the ***SEE***, it should be noted that they are not directly comparable. "The *MS* collects information from enterprises in all industrial groups. Therefore an enterprise may have one or more establishments, which may operate in different industries, e.g. mining and quarrying, manufacturing, agriculture and fishing." (Stats SA, 1995).

The ***SARS*** database provides a comprehensive list of entities i.e. enterprises that are disaggregated by sector based on the 5 digit SIC sectoral codes. It does not, however, have any information regarding occupational desegregation with respect to the employees in these registered enterprises. The present analysis of the database indicates that 43% of the firms did not supply any information regarding their number of employees. The *SARS* database will therefore have limited use in verifying sectoral information obtained from the macro model, but might be useful in indicating sectoral *change* because the database is continuously updated.

A comparison between the **Census 2001** and the ***LFS*** for September 2001 reveals lower employment estimates for the Census (see Table 8 in Annex D). In all industries the *LFS* has

higher employment. The shares of different sectors are, however, broadly similar.

SASID, otherwise known as the South African Standard Industry Database, shows sector sizes broadly similar to the sizes obtained by the **LFS** data source. The only differences occur within the Trade, Transport, Finance Services and Community Services sectors, where the sectoral employment estimates are higher in the *LFS*. This is due to the fact that the *LFS* covers these sectors in more depth than *SASID* (*SASID* being based on the *SEE*). With regard to shares of total employment, these values are similar across sectors.

4.3 Occupational employment data

4.3.1 Labour Market Information

All the data sources have been discussed in Section 4.1.1, and this discussion will not be repeated here. The main issue addressed here is which of these data sources is the most reliable for occupational forecasting.

Enterprise Based Surveys

The **Survey of Employment and Earnings (*SEE*)** up until 2002, does not provide for an adequate estimate of occupational employment as many industries and thus occupations have been ignored. With the re-engineering of the registering processes for businesses and the creation of a new sample frame, all previously excluded industries have now been included, which allows for a much wider coverage of occupations within these industries. This of course implies a more detailed and reliable industry by occupation employment matrix, yet obtaining this level of detail prior to 2002 is not possible.

The **Survey of Average Monthly Earnings (*AME*)** is also discussed above as a possible source of labour market information. It is similar to the *SEE*, therefore provides more detail from 2002 onwards. It is important to note, however, that any overall occupational employment estimates from the *AME* would underestimate true employment levels.

The **Manpower Survey (*MS*)** became the Occupations Survey in 1996 and then was discontinued shortly after. This firm based survey allowed for desegregation by industries as well as occupations. These occupational groups are derived from these industries and are classified according to the International Standard Classification of Occupations (ISCO). This

also allows for the desegregation of occupational employment by sector, yet once again the more disaggregated the analysis, the more unreliable the data become.

The *SARS* as discussed above, does not have any information regarding occupational segregation with respect to the employees in registered enterprises. This is due to the fact that 43 percent of firms did not supply information regarding their number of employees (see Table 7 in Annex D).

Household Surveys

The *OHS/LFS* household surveys disaggregate by sector as well as occupation. There are question marks about their reliability and suitability for trend analysis. Annex D deals with these household surveys in detail and concludes that – since the *LFS* has a more in-depth approach to determining employment figures compared to the *OHS* - *OHS* total employment figures should not be compared directly with the *LFS* figures. This poses a problem with regard to analysing employment change over time, whether sectoral or occupational. One way of dealing with the problem of small sample size is to pool the data from more than one round of the survey. This can enable a more detailed occupation by industry employment matrix to be constructed than would otherwise be possible.

Analysis of data from the **Census,** as discussed above, leads to the conclusion that employment is underestimated compared to the *LFS.* There is possible underreporting of employment in the informal and subsistence agriculture sectors, particularly among those who work only a few hours per week. The *LFS* questionnaire includes more prompts to clarify these issues, which is not possible during census enumeration. The UN and ILO thus note that the *LFS* is expected to produce more reliable estimates of general labour market variables than censuses. However, the Census does have considerable advantages when it comes to measuring the structure of employment, not least because of its much large sample size. The concerns about the coverage of the Census in certain areas will obviously need to be taken into account in trying to develop a comprehensive overview of employment structure. Even then, it is clear that the coverage of the informal sector will remain poor for the foreseeable future and that any quantitative projections will be focused on the formal sector.

4.3.2 Data Adequacy for Occupational Forecasting

The *LFS* and the **Census data** were disaggregated by occupation in Table 10 in Annex D. These data were taken from 2001. The percentage shares of total employment in each occupation are also given. Employment levels for all occupations are higher within the *LFS* data set. Focusing on percentage shares of occupations in relation to the total, however, the patterns are broadly similar between these two data sources. Table 10 only shows desegregation by occupation. It is possible to disaggregate even further by looking at an occupation by industry employment matrix showing percentage shares (see Table 11 in Annex D). The data in Table 11 also throw light on whether or not the *LFS* data can be used in conjunction with the Census data in order to provide more accurate employment matrices. There are values within the existing employment matrix that are directly comparable, yet the majority are not. This does not necessarily imply that they are not consistent. Rather, it suggests that the data need cleaning and emphasises that they become more unreliable the greater the level of desegregation.

Another factor to consider with regard to whether or not the Census is the best option for sectoral and occupational forecasting, is what kind of changes have taken place over time within the Census and whether or not these changes are feasible given other time-series data.

Table 12 (Annex D) shows percentage shares of occupations within each sector for **Census 1996**. The values for **Census 2001** are given in Table 11 (Annex D). Over this 5-year period, most of the shedding of employment has occurred in the craft occupations as well as the skilled agricultural occupations. These occupations' shares of total employment by sector have dropped since 1996. The overall share of total employment by sector has stayed broadly similar over this 5-year period.

This discussion of the data available from the various sources leads to the conclusion that, broadly speaking, the Census data are the more robust and as a result, provide the more accurate portrayal of the South African labour market at that particular moment in time. The *LFS* 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 emphasis, of course, is on occupational and qualification employment structures, in aggregate and within industries.

4.4 Data to Estimate Replacement Demands by Occupation

4.4.1 Replacement demand

In addition to changes in overall occupational employment levels it is important to consider replacement demand arising from retirements, net migration, movement into other occupations and in-service mortality. Estimating replacement demand is not straightforward, especially in a country like South Africa where the data on the mortality effects of HIV/AIDS remain uncertain and controversial.

Estimation of replacement demands requires the following information:

- Data on the age and gender structure of occupational employment;
- Data on the rates of outflow due to:
  - Retirement (and other reasons for leaving the workforce);
  - Emigration;
  - Inter-occupational mobility; and
  - Mortality.

Information on the age and gender structure is required because many of the flows, especially retirements and mortality, are age and gender specific. Age structures vary significantly by occupation – for example, a higher proportion of managers than IT professionals are likely to be nearing retirement age. Differences in age structure across occupations will clearly influence exits, with more, older people retiring, but more, younger people changing occupations. Age structure also affects mortality – while older people are more likely to die of non-AIDS causes, younger people are more likely to succumb to AIDS.

From the household survey/population census data, it is possible to analyse the demographic composition of each occupation. This makes it possible to estimate specific rates of retirement and mortality for each occupational class.

4.4.2 Retirements

For the purposes of modelling retirements, it may be helpful to consider the fraction of the occupational class that is aged 55 to 65 (say) in a given year and then to assume that some fraction of this group would retire each year. A fairly wide age category is needed if the occupational since the samples are quite small in most cases. It might also be possible to measure retirement flows over time, although this kind of approach could suffer because of the

sampling errors being too large.

4.4.3 Mortality

To estimate replacement demand arising from deaths in each occupation it is possible to use the race-, age- and gender-specific mortality rates contained in the Actuarial Society of South Africa's "AIDS demographic model 2000". The *ASSA* model was developed by the ASSA AIDS Committee, which was set up in 1987 "to assist the actuarial profession (and later the wider public) in estimating the impact of the AIDS epidemic in South Africa". As part of this work, the Committee has produced various papers and monographs on the epidemic and constructed models (the ASSA500 model released in 1996, the *ASSA600* model released in 1998 and most recently the *ASSA2000* suite of models) to predict the impact of the epidemic at both the national and regional level (ASSA, 2002). A new version of the *ASSA* model – based on the 2001 Census results - will be released in 2004 (Dorrington, personal communication).

Using the mortality assumptions of the *ASSA* model, one can calculate the risk of dying for each member of an occupational class in the survey data and use this to arrive at the number of people that will be required to replace those dying over the forecast period.

4.4.4 Migration and mobility

The migration of skilled professionals from the country has been an increasing source of concern over the past few years. Skills migration is clearly a reality and must also be taken into account in the modelling, as these losses also impact the supply and demand for higher-level human resources. The official source for skills migration data in South Africa is the annual reports published by Statistics South Africa. These sources are a result of a joint effort between the Department of Home Affairs and Stats SA. It is the Department's responsibility to record who leaves and enters the country via any of the major airports in South Africa. When individuals leave they are required to fill in a departure form, in which they state their reasons for leaving. Stats SA then captures the relevant emigration information from the departure forms. Immigration data are also gathered from records of individuals who have been granted permanent residence in the country (Bailey, 2003). These data are largely incomplete and inaccurate due to the following reasons outlined by Brown, Kaplan & Meyer (2001):

- The completion of departure forms is not always enforced and not all those individuals intending to emigrate permanently indicate as much (Stats SA, 2001);
- Only individuals leaving from the major South African airports are captured;

- Many South Africans leaving the country to travel, and who then stay abroad permanently are not captured;

- The system only recently started capturing disaggregated occupation data, therefore a trend analysis of skills leaving the country is limited at best;

- Stats SA categories have changed over the years, making it difficult to formulate trend analyses.

A study conducted by Meyer, Brown and Kaplan (2000 – See Annex D) illustrated that the receiving countries data reported around three times as many skilled South Africans entering their borders in the decade prior to 1997 than did the Stats SA data. This suggests that the official data are a severe undercount of emigration in South Africa.

4.5   Data on qualifications and key/generic skills by occupation

Occupational employment patterns are only one way of measuring skill. From the point of view of training and especially formal educational planning, the types of qualifications typically required are also important. Some (but not all) countries include a qualification dimension in their quantitative projections. The availability of suitable data in a South African context has therefore been explored.

Another aspect of skill that has received increasing attention in recent years in many countries, moves beyond occupational job titles and formal qualifications to examine the kinds of skills people actually require in order to undertake the main tasks in their work. These include physical skills such as manual dexterity and strength, general intellectual skills (including literacy and numeracy) as well as social skills such as communication, team-working, leadership, etc. These have been various termed key, core and generic skills. Generally attempts are not made to project such skill needs quantitatively, but many countries now devote considerable resource and effort to assessing how such skill needs are changing and their different patterns across sectors and occupations. The availability of such information in South Africa has also been assessed.

The review in Annex D, suggests that it is possible to create employment matrices by occupation cross-classified by qualification from the household / census data. This provides a measure of typical levels of educational attainment for all the different occupations, albeit rather crude. No such general information exists in South Africa for key/generic skills (although a few SETA's have begun to explore such issues. Without significant new data collection, it will

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not be feasible to add such elements into the main forecasting model.

Even with only weak data for qualifications it is probably worth developing some extension to the "replacement demand" module, which allows some inferences to be made about implications for qualifications. Alternatively some supplementary information on "typical" qualification structures in particular occupation might be provided to enable users of such results to draw their own conclusions about what this might mean for the demand for formal qualifications.

5. THE WAY FORWARD

5.1 Overall Assessment of Existing Modelling Capacity in South Africa

This section draws together the key findings from the discussion in Sections 3 and 4, presenting a critical assessment of what has been done previously in South Africa and how this might be improved, given the data and capacity currently available.

Subsequent sub-sections then deal with the following:

* Recommendations on the best ways of exploiting existing modelling capacity and data;

* Complementary activities, providing some illustrative examples of how the outputs from such a process might be complemented and enhanced by other approaches to anticipating future skill needs;

* Recommendations for changes to institutional responsibilities and related arrangements;

* Possible longer-term developments, involving development of new data sets and/or modelling capacity;

* Integration of the outputs from such an exercise with the Skills Development Information System (SDIS) and the Skill Planning Tool Kit (SPTK).

Previous attempts to anticipate changing skill needs in South Africa have been heavily criticised but provide a useful starting point for developing new projections. Much of the criticism has been gratuitous, in the sense that those who undertook the work were themselves all too well aware of the problems with the data that they had to work with, as well as some of the more general limitations of this kind of exercise. In some respects things have not improved in recent years, with the demise of a number of key surveys. Nevertheless, some progress is possible given data currently available.

5.2 Recommendations on the best ways of exploiting existing modelling capacity and data

It is possible to provide a detailed "blueprint" or technical specification of how existing models and data can be exploited to provide the kind of forecasting tool required. It is also possible to illustrate examples of the kind of outputs that such a tool can deliver, based on:

- International best practice;
- Existing modelling capacity in South Africa;
- Availability of suitable data in South Africa.

A modular approach

Essentially, a modular approach is proposed with the following structure and broad elements (see Figure 1).

Module 1 requires a multi-sectoral macroeconomic model. Given the substantial investments required to develop such a model it is proposed that this should be based on one of the models already being used for such work in South Africa, rather than trying to develop something specifically for this purpose.

The present review suggests that the Global Insights and IFPRI/TIPS models (amongst others) would be suitable for this purpose.

Module 2 is a new occupational model, which would need to be to be developed as part of this new system. It would be based on various existing sources of data. This module will work out the implications for occupational employment of the projected sectoral employment levels developed from Module 1.

It is suggested that this module should, as far as possible, build on previous HSRC work (in order to take advantage of the substantial amount of work already done on historical trends). However, there are a number of ways in which any new module would need to diverge from the HSRC approach, given changes in data availability and the increased emphasis on the informal economy as a source of employment. The discussion in Section 4, as well as the more detailed reviews in the associated Annexes, presents various examples of the kinds of data that can be used, and their limitations. It also provides some suggestions as to how the latter might be addressed, including possible new data collection that would help to improve such analysis over the longer term.

Module 3 is another new module, to be developed based on a variety of existing data sources. It will be driven by the occupational employment levels projected from Module 2, in combination with information on expected outflows from employment due to retirements, mortality and migration. It is likely given existing data that this part of the exercise would be fairly crude but this is equally true of the position in most other countries. The important point is

to recognise the importance of replacement demand issues and to take them into account in assessing likely future skill needs.

Module 4 is the most speculative because of concerns about data availability and quality. In principle, it could be driven either by the outputs from Modules 2 or 3 but it would require additional data on occupational employment cross-classified by qualification and/or key generic skills.

It seems likely that something on qualifications could be put in place immediately, based on existing data from the Census and/or the LFS on average qualifications levels by occupation. However the limitations of these data sets at a disaggregated sectoral level would need to be recognised. Such analysis could be improved by refining the data collected on these matters, possibly for specific sectors (although the advantages of a consistent treatment across all sectors should not be lightly dismissed).

With regard to key and generic skills, although some relevant data do exist, there are huge gaps. At present it is clear that the available data are not adequate to build such a model at a national level in South Africa. However, the examples identified for particular sectors (most notably the Financial and Accounting sector) suggest that, in the longer term, such modelling might be feasible if certain data gaps can be filled by new primary data collection.

Figure 1: Modular Approach to Skills Forecasting
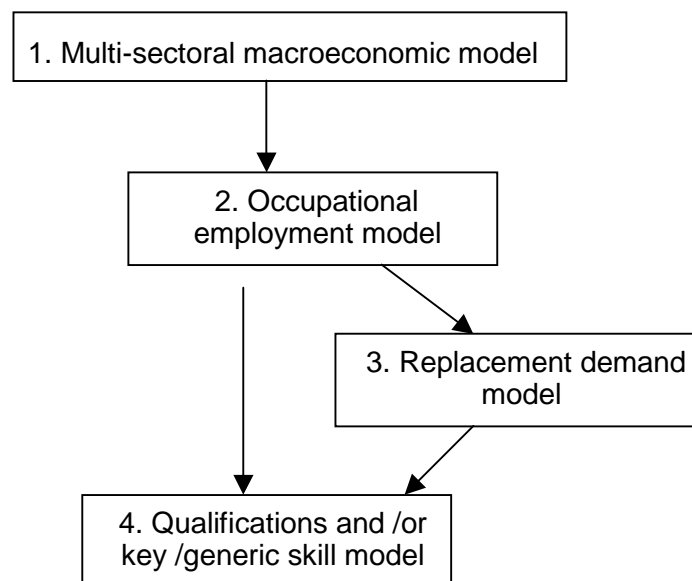
5.3   The Value of Complementary activities

It is clear from the general review of methods of anticipating changing skill needs across the world, that formal, quantitative projections are just one amongst a number of important weapons in the armoury. The outputs from the kind of quantitative process described in Sections 5.1 and 5.2 can be complemented and enhanced by other approaches to anticipating future skill needs. Based on the experience and practices adopted in other countries, these can include:

- The use of detailed employer surveys;
- Scenario development;
- Other more qualitative methods.

A brief overview of the advantages and limitations of such approaches has already been given in Table 1 above. Suffice it to say here that, each approach has its strengths and weaknesses and that the ideal is to triangulate the problem by using a variety of methods and allowing them to inform and support each other, rather than seeing them as mutually exclusive alternatives. No approach has the monopoly on "truth" and no one approach on its own can provide a full and complete picture.

Large-scale employer skill surveys can provide very useful information. However, they should not be seen as a panacea. They do need to be quite large to provide detailed sectoral as well as occupational information. This means that they can be very costly. They also need careful design (both in terms of the sampling frame and the questionnaire) to ensure that the results produced are useful. Poorly designed employer skill surveys can be a very expensive and ineffective response to the demand for some way of anticipating changing skill needs. Effective prior consultation with both key stakeholders (customers), and survey companies and statistical experts (providers) is advisable before going down this route. Extensive piloting, including follow-ups to explore how fieldwork is conducted and how the respondents interpret questions, is also highly recommended.

5.4 Recommendations for changes to institutional responsibilities

What is proposed in Section 5.1 and 5.2 can be achieved using existing data and within the existing institutional framework. However, it is clear that there is scope for further extensions and improvements.

A major concern is the quality of information available on current occupational structure, and ongoing trends, within sectors. This could be improved by carrying out larger and more consistent surveys. Although there maybe some merit in getting SETAs involved in this process, there are substantial advantages in centralising this process. These advantages include economies of scale as well as consistency across sectors. Ways of expanding the coverage to include the informal sector, without sacrificing data quality also need to be found if a comprehensive picture is to be drawn.

Surveys of Employers (enterprises/establishments) and surveys of Households (Labour Force Surveys) both have their own advantages and disadvantages for this purpose. In most countries Household surveys have become the norm for obtaining overall measures of occupational employment structure. However, a substantial increase in sample size of the South African LFS would be needed to deliver robust statistics at a detailed sectoral and occupational level.

Information about generic /key skills is currently not generally available in South Africa. Obtaining such information in a robust manner is technically difficult and would require new surveys.

5.5 Possible longer-term developments involving development of new data sets and or modelling capacity

A number of general improvements can be envisaged in both the data on occupational employment and qualification levels and the methods used to analyse them. In addition there are two further areas where further development might take place. These involve extending and improving the treatment of the demand for and supply of qualifications (especially on the supply side) and the treatment of generic skills.

Regarding the basic databases and models discussed in Sections 5.1 and 5.2, the main improvements would relate to:

- Sectoral employment and related data, including extension to cover the informal sector;
- Data on occupational employment structure within sectors;
- Information required for estimating replacement demands (age structure, outflows from employment);
- Qualification structures within occupations;
- More sophisticated modelling, including incorporation of relative wage effects.

Such improvements are likely to be both expensive and long-term, involving detailed substantial input from other government agencies, especially Stats SA.

As far as modelling the demand for and supply of qualifications is concerned, this is likely to be an even longer-term project, requiring much improvement to existing data and the filling of many gaps, as well as substantial investments in modelling activity.

Much the same is true for the treatment of generic/key skills. Substantial investment in new primary data collection is the key requisite here.

In terms of modelling labour supply, existing demographic models would need to be applied to the specific issues pertaining to the growth in the size of the working age population and some new work would be required to investigate the trajectory of the labour force participation rates.

5.6   Integration of Outputs with the SDIS and SPTK

The Skills Development Information System (SDIS) is an overarching web-based portal designed to support the National Skills Development Strategy (NSDS). It is intended to provide a "one-stop" location for all those with an interest in skills, especially key stakeholders, including the SETAs.[1] Within the SDIS is the Skills Planning Tool Kit (SPTK). This sub-site provides a range of labour market information (LMI) relating to the South African labour market. It is currently organised into 4 modules:

1.   The economy (economic trends and South Africa's position in the global economy);
2.   The labour market (demographic, employment and unemployment trends);
3.   Education and training supply; and
4.   Scarce skills (priority areas for skills development).

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[1] Full details of the SDIS can be found in Department of Labour (2004) Skills Development Information system: Overview and Documentation, Department of Labour Pretoria.

The first module includes historical, primarily macro level, information about global economic trends, foreign direct investment, gross domestic fixed capital formation, gross domestic product by sector, imports and exports, and labour productivity. These are of course the kind of indicators covered by most macroeconomic models. The use of such a model to generate projections of such indicators would therefore fall naturally into the SDIS/SPTK framework, providing a forward look to complement the current retrospective view of historical trends. In particular, it should deliver projections of output, productivity and employment by sector.

The second module concentrates upon demography, employment and unemployment. The supply of labour is covered by measures such as population by ethnic group, age and gender, as well as labour market participation rates. Employment is broken down by sector and occupation (broad groups). Indicators of market pressure (supply demand balance) such as pay and unemployment rates are also included. Again, at present this is retrospective, focussing on past developments. The kinds of projections produced by the typical modelling process proposed here would produce corresponding forward-looking trends for most of these indicators.[2] In particular, the projections would include forecasts of employment levels by occupation as well as replacement demands. The forecasting model could also be extended to cover some aspects of labour supply, although this might be best left for future developments.

The third module focuses upon education and training supply, including employment by highest qualification held, as well as various indicators of general education and training enrolment. The system of projections proposed here could produce some new forward-looking trends of the qualifications intensity of employment. In principle, it would also be possible to model and project future enrolments and flows of those obtaining qualifications by level and subject. However, such work is technically demanding, resource intensive and heavily reliant on good quality data. It is not recommended that this should be an immediate priority.

The final module of the SPTK relates to scarce skills. This includes information from a variety of sources, including work by the BMR (2001)[3], the Skills Development Planning Unit (2003)[4] and various SETA Sector Skills Plans. The information provided is of both a quantitative and qualitative nature, covering occupational trends as well as more generic skills. The proposed projections would provide a more systematic analysis of skill trends, including a forward view. This would however be at a fairly broad brush level, at least in the short-term, given concerns about the quality of some of the more detailed occupational data. It is also unlikely to include

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[2] Few if any such models attempt to make predictions about pay levels.
[3] Bureau of Market Research, (2001) "Key skills Shortages and the fast Tracking of Skills Development", Bureau of Market Research, University of Southern Africa, December.
[4] Skills Development Planning Unit (2003) Survey of Public Sector Skill Needs.

implications for generic skills, given the lack of robust historical data. Such insights could be added at a later date given suitable investment (i.e. in new primary data collection to obtain a good historical benchmark of the importance of such skills).

5.7   Costs

The experience of other countries suggests that the development of such models and systems for anticipating skill needs at a national level is a major undertaking. Typically, it involves large investments in data, analysis and modelling of many person years of research.

By way of an example, the most recent exercise of this kind undertaken in the UK (Wilson *et al.*, 2004) cost over R2m, and this was based to a large extent on existing models and data bases). These models and datasets have taken many years to develop, involving similar costs in previous forecasting rounds stretching back over 25 years. The cost of the programme of forecasting work undertaken by the Bureau of Labour Statistics in the USA is measured in millions of dollars per annum. Other countries also invest similar substantial sums of money in these kinds of activities.

The overall costs of such work vary enormously depending upon:
- The level of sophistication of the modelling work;
- The level of detail (including the various dimensions of employment covered);
- The extent to which primary data collection is required.

However, it is possible to do something at a more modest level, building upon the lessons and experience of other countries. In particular, costs can be kept down by:
- Making maximum use of existing models and databases;
- By avoiding unnecessary detail (e.g. NOT adding a spatial dimension which multiplies the data required by the number of spatial areas to be covered, or including modules to deal with qualifications or key/generic skills as a prime focus of attention);
- Using existing data and not collecting new information specifically for the purpose.

Based on the assumption that no new primary data collection is required, and ignoring any costs of additional activity to disseminate and obtain feedback on the results, it is estimated that the basic costs could be restricted to a figure of around R1m.

This should be sufficient to:

- "Buy in" a good set of multi-sectoral employment projections from an existing model (Module 1);
- Develop a robust and consistent database of occupational employment across sectors, based on a variety of sources (Module 2);
- Develop a set of procedures to link such data to the multi-sectoral model outputs and produce projections of occupational employment levels (Module 2);
- Establish a robust set of data relating to replacements demands (Module 3);
- Develop a module to translate from the occupational employment projections to the implications for replacement demands (Module 3);
- Establish data and a modelling procedure to work out implications for qualifications requirements (Module 4);
- Produce a good quality *Results Report* presenting the main findings plus a *Technical Report* describing the data and models in sufficient detail to enable easy updating.

All data and any new models/ modules/ software developed should be the property of the Department of Labour.

6. CONCLUSIONS AND KEY RECOMMENDATIONS

Key Recommendations

Based upon the discussion above, a number of specific recommendations can be made. These include recommendations relating to the overall approach to be adopted as well as more specific thoughts regarding data sources and methods.

Overall Approach to anticipating future skill needs

The review of best practice worldwide suggests the following:

- The use of nationwide, multi-sectoral modelling methods, to provide a comprehensive, national overview of the changing demand for skills should be the cornerstone of the approach;

- More basic methods should be used for modelling occupational structure within sectors, recognising the limitations of existing data but making recommendations for further improvements in data collection;

- It is important to include an explicit treatment of replacement demands, although recognising the limitations of existing data;

- Some limited analysis of the implications for other aspects of skill such as qualifications might be undertaken;

- A satisfactory treatment of key/generic skills is best left to more qualitative approaches for the foreseeable future.

A modular approach is therefore proposed involving:
- **Module 1:** a multi-sectoral macroeconomic model;
- **Module 2:** an occupational model;
- **Module 3:** a replacement demand module;
- **Module 4:** a qualifications module, focussing on demand implications.

The advantages of a modular approach are that it facilitates the independent development and improvement of parts of the system. It is also a relatively low cost option.

Module 1 would be based around one of the existing multi-sectoral macroeconomic models available in South Africa. While there might be some advantages in building a new model specifically for his purpose, it is likely to be a costly exercise and the marginal benefits compared with using an existing model are likely to be modest. The important thing is to have a set of consistent sectoral projections, which are transparent in terms of the assumptions they are making about the external influences on the South African economy (including technological change and the impact of global competition). A range of alternative scenarios, to demonstrate the sensitivity of the outcomes to different assumptions would also be useful.

Module 2 would be new, although it could usefully build upon the previous work by HSRC, BMR and others. The relevant data sets have been reviewed in detail here. These have their limitations and inconsistencies. A key part of the work needed will be concerned with trying to reconcile these inconsistencies and reach a "consensus" view on current and likely future changes in occupational structures within sectors. This should also involve taking on board more qualitative as well as "hard" quantitative data.

Module 3 would again be new, but could build to some extent on previous efforts. Data on various aspects of replacement demands are in many respects even weaker than that on occupational employment structure. Nevertheless, the review of available data suggests that sufficient information exists to provide at least a broad indication of the likely scale of replacement demands as opposed to the projections of expansion or contraction in employment levels.

Finally **Module 4** would focus upon the implications for formal qualifications. As with replacement demands, the data review suggests that there are many gaps and problems with the existing data. Nevertheless it is felt that these are sufficiently robust to enable the production of useful benchmark projections of trends in qualifications intensities. It is not proposed that such work would focus upon the supply of qualifications at this stage.

In principle, all these modules could be undertaken independently. In practice, the data and issues involved in Modules 2-4 are closely inter-related and are probably best undertaken by a single research team.

Data sources and methods

The review of existing data suggests that although there are many problems, given some further work on data cleaning and refinement, the existing data are adequate to produce some benchmark projections of changing occupational structure, together with implications for replacement demands and qualifications.

However, if such analysis is to match the quality of those conducted elsewhere across the world- over the longer term, steps need to be taken to improve the quality of:

- Sectoral employment and related data, including extension to cover the informal sector;
- Data on occupational employment structure within sectors;
- Information required for estimating replacement demands.

Costs and resource implications

Assuming that no new primary data collection is required immediately, the costs of developing the basic projections could be restricted to a figure of around R1m.

This should be sufficient to:

- "Buy in" a good set of multi-sectoral projections from an existing model;
- Develop a robust and consistent occupational database based on existing data and to produce the related projection models;
- Produce a good quality report, including methodological details, software and data to enable easy updating.

Costs of updating are likely to be similar, since there is considerable scope for further development and improvement. An annual updating cycle is probably optimal although some countries have decided to update once every two years.

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Separate annexes

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.

B: Labour Market Projections: A Review of International Best Practice (with complete Bibliography).

C: A Critical Review of Previous Work on Employment Projections in South Africa.

D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

Developing a National Skills Forecasting Tool for South Africa

Annex A: Rationale for Conducting National Occupational Projections and how they are Typically Undertaken

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1.   WHY FORECAST?

Before embarking on a major investment in data collection and model building it is useful to rehearse the reasons why so many countries have chose to go down the route of undertaking regular large scale employment projections.

This can be discussed under a series of headings:

- Why Forecast? - The distinction between Projections and Forecasts;
- Aims & objectives of typical projections - Audiences and their different interests;
- Practical limitations - What is actually projected?
- Method - How skill needs are projected?

Based on the dictionary definition, to Forecast is defined as: *To predict, estimate or calculate beforehand; calculation or estimation of something future.*

Further related definitions are:

- To guess, defined as: *To estimate without calculation or estimation;*
- To predict*: To foretell an event*;
- To foretell: *To tell of an event before it takes place.*

In contrast,

- To project is defined as: *To plan or extrapolate to a future time (forecast),* which brings us full circle.

Most of those involved in Forecasting and Projection work emphasise that they do not possess a crystal ball, in which they can see the future precisely laid out. Rather, they stress that what is typically done is to map out the implications of certain assumptions (about patterns of behaviour and other factors) from which some inferences about possible futures can be made.

A distinction is often made between Forecasts, Projection and Scenarios. The former is a very precise prediction about certain events. A projection is a quantitative assessment of what might occur, given certain conditions, while scenarios are more qualitative assessments of what the future might look like. However, the boundary between these elements is often blurred.

Various analogies have been used to describe the process of conducting forecasts or projections. These include:

The idea of *Clearing mists*, in which the analyst's aim is to disperse the mists and reveal the future. However, this is in many ways rather passive and it implicitly assumes that the future is in some sense predetermined and fixed.

A more useful analogy is the idea of *Avoidance of problems.* Thus if the analysis does reveal that, for example, the Titanic is heading for an iceberg ahead, it is not inevitable that ship and obstacle must collide. The information from the projection can be used to change behaviour (i.e. alter the course of the vessel, in order to avoid a collision).

This emphasises that societies and economies face *multiple paths,* with alternatives and choices to be made. It also highlights a key problem in evaluating such projections, in that they may result in changes of behaviour that are explicitly aimed at avoiding the prediction coming to pass.

Even this view may be too mechanistic; the *Growing tree* analogy can be helpful. What forecasting and projection work can help to illustrate is that from little acorns great oak trees can grow, with very complex branches, and that economies and societies are in many respects more akin to organic beings than to engineering structures.

Figure 1 illustrates the key distinction between some types of forecasting, which tend to be closed, and scenario development which is more open-ended. However, much scenario development now involves a quantitative forecasting element, while few "forecasters" believe that they are producing a precise and unique prediction of the future.

Figure 1: Forecasts and Scenarios

FORECASTING AND SCENARIOS

Forecasting   *Uncertainty*
Delphi/Quantitative modelling   ***Scenarios***
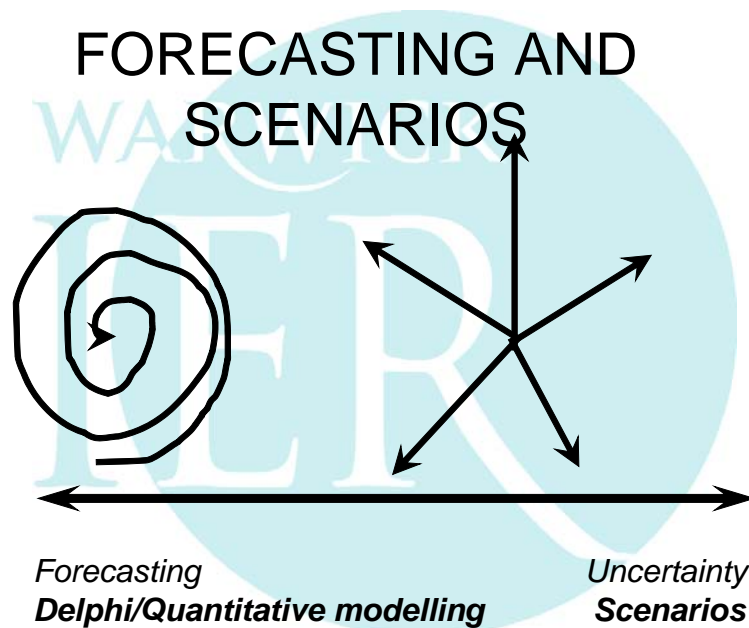
The reasons typically given for undertaking some kind of forecasting or projection work are numerous. They include:

- Uncertainty - the world is a rapidly changing & uncertain place;
- There are long lead times on many investment decisions, and this is especially true for many education, training and skill development choices;
- Anticipation: everyone has to plan to avoid problems & optimise outcomes –this includes government, educational institutions, employers and individuals;
- Often there is also a need for a counterfactual to assess the impact of policy interventions – what would have happened in the absence of the policy change.

The only real issue is **How** this should be done - there is a need for a cool, logical and systematic assessment of future prospects.

Various people have argued that forecasting is not necessary. It is helpful to consider the reasons that they have advanced for this view and why those conducting projections believe that they are mistaken. The main reasons advanced fall under three headings:

- Forecasting is impossible;
- Forecasting is unnecessary;
- Forecasts are inaccurate and based on invalid assumptions.

Why forecasting is possible

Forecasting in the social sciences is, in a literal sense, clearly impossible. Nobody can **predict** the future with certainty. However, everybody can prepare or **plan** for the future. To do this involves some element of forecasting or projection, either **implicitly** or **explicitly.** In this sense not only is forecasting possible it is also **inevitable**. The only meaningful questions are **how**, by **whom** and with **what end** in mind?

Why forecasting is necessary

Many have argued that forecasting or projection work is unnecessary in a market economy, since market forces can be relied upon to generate optimal outcomes. Even if labour and product markets did operate in the manner assumed in classical economic textbooks, this would not remove the need to anticipate future change, threats and opportunities. Many organisations in the private sector spend considerable resources on systematically trying to anticipate the future.

Moreover, there is considerable evidence that, left to their own devices, market forces will not necessarily provide optimal outcomes. Market prices (wages in the case of labour markets) may not provide adequate or useful signals in a complex and uncertain world, with long lead times on investment in education and training. There is also much evidence of market failure.

In addition, in a policy evaluation context, some kind of projection is often essential to provide a counterfactual (i.e. what would have happened had the policy change NOT been introduced). In the absence of such an assessment it is difficult, if not impossible to gauge the impact of any policy intervention, since observed changes

may have happened anyway. A "forecast" based on what might have occurred had the policy not been introduced can help to fill that gap.

Accuracy and validity

Some have argued that forecasting in the social sciences is both inaccurate and invalid for a number of reasons. This raises a whole host of issues (not all of which will be pursued in depth here). For example, should we expect accuracy in social science forecasting? This raises the question of what precisely is the purpose of such forecasts or projections. Those involved in such activities have typically responded with the following aims and objectives:

- Setting out options to policy makers;
- To influence and change behaviour generally, including the actions of policy makers;
- Providing key actors such as education and training providers with relevant information to help them make rational choices;
- Guiding individual career decisions and highlighting alternatives;
- Making technical information digestible for a lay audience.

From the first two of these at least, it is clear that outcomes are often expected to be different from the forecasts or projections. In such circumstances asking about **accuracy** is rather pointless. The crucial question is whether or not the projection is **useful** and **informative**. Nevertheless, most employment forecasting is concerned with projecting general trends in employment structure. In these circumstances the question of accuracy is more pertinent, although even then there is some element of wishing to prevent major surpluses or shortages by influencing behaviour, so measuring accuracy is far from straightforward. Reviewing the work that has been undertaken in many countries over the past 30 years, it is clear that methods are improving but margins of error remain uncertain. They are probably quite large but no more so than in other types of forecasting. The key point is that such projections do not necessarily have to be precise and accurate in order to be *useful*.

2. BRIEF HISTORY OF LABOUR MARKET PROJECTIONS

2.1 Introduction

Labour market projections have been carried out on a systematic basis for over 50 years. The Bureau of Labor Statistics, in the USA was a pioneer, developing projections of changing employment structure as part of a programme to find employment for GIs returning from war.

The OECD Mediterranean Project also experimented with such projections as part of post-war redevelopment in Southern Europe.

In other countries, such as France, there is long a history of Indicative Planning by the State. Initially this attempted to establish formal links between education and training and the economy, although this has been replaced more recently with less mechanistic methods. In the UK, the Government has adopted a more arms length approach, commissioning others since the mid 1970s to undertake regular but more general labour market assessments.

Most of the other developed economies of the world have followed a similar course although the degree of direct involvement of the State has varied considerably. In the past decade many countries have introduced innovative new approaches, but these often involve considerable investment in data collection and monitoring. In all cases such work has been primarily State funded. In recent years a number of developing countries have also begun to engage in such activity, including China, South Korea and Singapore. Not much of this work has been published in English, but personal correspondence with the author suggests that such work has followed a similar approach to that already outlined for other countries. Their experience in terms of the use of such results ranges from command economy, indicative type manpower planning, to more general labour market assessments, characteristic of market economies.

The review of this now very large body of work, across such a wide range of countries, has highlighted the benefits of using a formal model (as set out in more detail in the next section) and the value of developing benchmark projections.

2.2   Aims & objectives

The aims and objectives of this work have been manifold:

- Understanding past trends;
- Provision of useful LMI on future occupational employment prospects;
    - ➢ numbers employed;
    - ➢ job openings;
    - ➢ qualifications needed.

A number of caveats have been expressed by those carrying out such work, although these are frequently ignored. These warnings include:

- Details about the implicit assumptions about the labour market;
- That such projections should not be regarded as mechanistic manpower planning;
- That the role of such projections should be seen as part of an ongoing *iterative process.*

2.3   The audience

It is important to recognise that there are many different audiences for such information generally and that their specific and detailed needs for labour market information (LMI) may be very different.

The main audiences include:

- Government at National and Regional level;
- Local Bodies;
- Industry Training Organizations and Employers;
- Education and Training Institutions;
- Careers Guidance and Individuals making occupational choices.

The interests of the different audiences include:

- Occupational demand - future employment levels by occupation/skill;
- Replacement demands - job openings (recognising the need to replace those leaving);
- Education and training requirements - qualifications typically needed;
- Supply/demand balances;
- Terms and conditions of employment (pay).

2.4   What is usually projected

There is usually a gap between the ideal LMI requirements and what is actually produced. This reflects data limitations as well as technical and conceptual difficulties in modelling and projecting everything audiences would like. The typical set of employment projections includes:

- "Outcomes" - employment levels by occupation (usually interpreted as demand);
- "Outcomes" - employment levels by qualification;
- Total requirements (replacement demand).

The key dimensions cover:

- Sectors;
- Occupations;
- Qualifications;
- Regions.

Only rarely do such projections cover balances/imbalances, earnings or other aspects of skill. This reflects lack of data as well as conceptual and technical difficulties in modelling aspects of supply.

There are various constraints on what can be projected. These include data constraints such as:

- Suitability for purpose;
- Availability of key indicators;
- Reliability.

Other constraints relate to the current state of knowledge (or lack or it). This includes:

- Areas of dispute in the literature (social scientists' understanding of the way that labour markets work remains imperfect);
- Acts of God – things that social scientist just cannot hope to predict, such as earthquakes and other natural disasters or wars.

3. HOW TO MAKE PROJECTIONS

3.1 Approaches and methods

The methods used to undertake labour market projections are numerous and varied. They differ significantly according to the purpose, the audience and the data available.

Such work has become progressively more scientific and quantitative as methods, tools and data have improved (not least as a consequence of the benefits of Information Technology).

General approaches
The different approaches can be grouped under 4 main headings:

- Ask employers (employer skill surveys);
- Sectoral studies;
- Qualitative (non-quantitative) methods;
- Quantitative methods and formal models;

Ask Employers
In many ways, it seems that the most natural approach to finding out about future skill needs is to **ask employers**. This can involve questions about:

- Current skill deficiencies;
- Anticipated future change.

At one time, this approach was a popular technique. However, it soon became apparent that employers are often not very well placed to provide robust answers to such questions. Their responses are more often than not inconsistent and misleading, especially when concerned with the future. More recently, greater emphasis has been placed on using employer surveys to assess current skill problems rather than anticipated future requirements.

Sectoral studies
Such information has often formed the cornerstone of *sectoral assessments*. These involve a range of different methodologies and actors, in order to "triangulate" a view of the key problems and likely future developments from various different perspectives. Such assessments have in recent years often also had a strong

geographical focus, with the setting up in many countries of *regional observatories* and the like to monitor changing skill needs at a more local level.

Qualitative methods

This type of approach often also involves a range of *non-quantitative* methods. Such qualitative techniques include the use of in depth interviews with key stakeholders including employers, in-depth case studies (especially of particular sectors). These are often combined with focus groups, round table discussions and similar mechanisms, to enable "soft" qualitative data to be incorporated into thinking about such issues alongside the "harder" statistical information upon which most quantitative analysis is based.

Quantitative modelling

The basic methods adopted for quantitative modelling can be classified under the following headings:

- Extrapolation of past trends;
- More complex time series methods;
- Introducing behavioural content.

Extrapolative techniques are often used, especially where only very limited time series information is available. In many cases, only one or two observations are available on occupational structure and this clearly limits the sophistication of what can be done. Where more time series observations are available, much more sophisticated analysis is possible, which attempts to find replicable patterns in a time series that can be used to predict its future path. Such approaches are widely used in the business and financial world, although they are much better at predicting short-term change than longer-term patterns. Unfortunately, history suggests that most linear (or more complex) trend patterns eventually come to an end and that they should therefore not be relied upon for medium to long-term forecasting. Behavioural analysis is an attempt to move beyond patterns in observed time series data and to provide some understanding of how it is that these patterns have arisen and more importantly, why they may change in the future. Such behavioural analysis draws upon disciplines such as economics and sociology for an understanding of what influences the behaviour of the key actors in the economy and how this is reflected in the key economic and social indicators that can be measured.

Such understanding finds representation in so-called computerised "models", which take the form of algebraic equations linking key variables. A model is an attempt to provide a simplified representation of reality that can help understanding of the phenomenon of interest (in this case changing patterns of the demand for skills in the labour market). Most are familiar with the idea of engineers building models in order to test out their ideas. For example, testing model aircraft in wind tunnels. Models in the social sciences are rather more like a biological analogy than an engineering one, where for example, scientists have built models of dinosaurs in order to try to understand how they could fly. Social systems are much more akin to the biological than the engineering model. Social scientists attempting to understand how societies and economies work face problems such as:

- Lack of fixed laboratory conditions;
- Lack of good experimental data (they can only observe outcomes).

Social science models are typically built, using quite sophisticated statistical and econometric techniques and using data drawn from largely official, sources, including National Accounts and related estimates of employment based on surveys of employers and of households.

3.2 What projections can and cannot do

Having built such models and used them to make projections, it is important to recognise what they can and cannot do. On the positive side, projections can:

- Help to Make Assumptions about the Future **Explicit** and **Transparent;**
- Help to Enforce **Systematic** and **Logical** Thinking;
- Act as a **Focus** for intelligent **Debate;**
- Provide a useful **counterfactual** to assess policy impacts (i.e. what would have happened in the absence of the policy intervention).

But they cannot provide:

- Mechanistic manpower planning;
- Precise indications of education and training requirements.

3.3   The use of multi-sectoral macro-models

The review in Annex B suggests that the most common approach to assessing future skill needs in most developed economies is to use a multi-sectoral macroeconomic model. This is a formal, quantitative methodology, which adopts an essentially behavioural approach (although typically some elements rely upon more simple minded extrapolative methods).

The advantages of such an approach include:

- The sectoral and other detail it provides;
- The fact that it is typically comprehensive, covering the whole economy;
- Logical consistency;
- Imposition of accounting constraints;
- Recognition of economic constraints and influences;
- Explicit assumptions;
- Consistent scenarios.

Such methods do, of course have some disadvantages and problems. These relate to:

- Data limitations (often data were not collected with modelling in mind);
- Technical limitations within fixed resource limits;
- Resource costs of development and maintenance;
- Limits to current understanding of the way labour markets work;
- The possibly limited relevance of the past (such models being based on an assumption of a continued of past patterns of behaviour).

There are various elements in a typical set of employment projections. These include:

- Behavioural Models (Econometrics);
- Exogenous factors, which typically include:
  - Demographics;
  - Government policy;
  - What is happening in the rest of the world;
- Judgement.

The behavioural content is encapsulated in the multi-sectoral macroeconomic model. It is helpful to describe a typical example. The following is a description of the Multi-sectoral Dynamic macroeconomic Model (MDM) developed by Cambridge Econometrics, which has been used by the Warwick Institute for Employment Research to produce the main national and regional level employment projections for the UK Government over the past 25 years.

MDM can be briefly described as follows:
- It is a computerised macroeconomic model, in the Keynesian/Leontief tradition;
- It is multi-sectoral, providing a detailed analysis by sector (& occupation);
- It is dynamic, providing a full time series profile, including adjustment lags;
- It has a transparent, well documented methodology;
- It is consistency with official UK statistics;
- It adopts up to date data & classifications;
- It has a regular 6-monthly cycle of updates.

Figure 2 provides a diagrammatic overview. The outer rectangle (shaded in blue) represents the world. Within that, the next rectangle (purple) represents the home (UK) economy. The small (yellow) boxes represent blocks of key economic or labour market variables or indicators. The darker shaded boxes are variables that the model does not attempt to explain. These are termed *exogenous*. Values of the variables within them are set by assumption. The other variables are all *endogenous*, that is they are explained within the model by the various behavioural and technical relationships embedded within it. These relationships are represented by the arrows joining the boxes.

The key function of the typical macroeconomic model in the present context is to deliver a prediction of output and employment by industry and to a lesser extent to say something about labour supply and unemployment.

At the centre of the diagram is the box labelled the ***Total demand for UK goods and services***. This is at the heart of the model. It contains estimates of the demand for a vast range of goods and services ranging from agricultural produce, minerals, manufactured goods of all kinds, business and consumer services and public services including heath and education.

Demand for these goods and services depends upon various factors as represented by the other boxes and the arrows linking them to the **Total demand for UK goods and services** box. For example, a key component of demand is **Consumers expenditure**. Consumers demand food, clothing, cars, haircuts, holidays, schooling, public services, etc. This is not the sole source of demand. Various consumption functions in the model represent these behavioural links.

Other producers also demand goods and services as part of their investment, in building plant and machinery, or as intermediate inputs in producing their own goods and services. This is represented by the box labelled **GDFCF, Intermediate Inputs**.[1] In the model such demands are based around a Leontief input-output table and various behavioural equations, which model investment demand.

Other demands come from Government (both in the form of current consumption and investment spending) and from the rest of the world. The former is dealt with in the box labelled **Government**, the latter by that labelled **Exports**. The latter is in turn driven by what is happening to **World Economic Activity and Prices.** Of course, not all UK demand is met by domestic producers. This is reflected in the box labelled **Imports** that is also linked to **World Economic Activity and Prices.**

Together these elements determine the total level of **UK output**, (essentially, UK demand less imports). This is broken down into around to different sectoral categories. Output in each of these sectors is the prime driver of **Employment** levels in the sector.[2] Employment is one of the key factors influencing **Incomes**. This in turn is the key driver of **Consumers expenditure** thus completing one of the main feedback loops in the model. Another important loop relates to the link from employment though labour supply (**Occupations**) to **Unemployment** and **Incomes**. Labour supply is driven by demography (the **Working Population**).

Government spending, **World Economic Activity and Prices,** and demography **(Working Population)** are regarded as *exogenous* in the model. All the other variables are determined within the model itself (i.e. *endogenous*). There are many other feedback loops and behavioural relationships not represented explicitly in this diagram. Nevertheless, it provides a bird's eye view of a typical model of this kind.

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[1] GDFCF is Gross Domestic Fixed Capital Formation or investment.
[2] The behavioural equations also allow for sensitivity to factor prices, technological developments (affecting labour productivity, and adjustment lags).

Figure 2: Typical Multi-sectoral macroeconomic model MDM
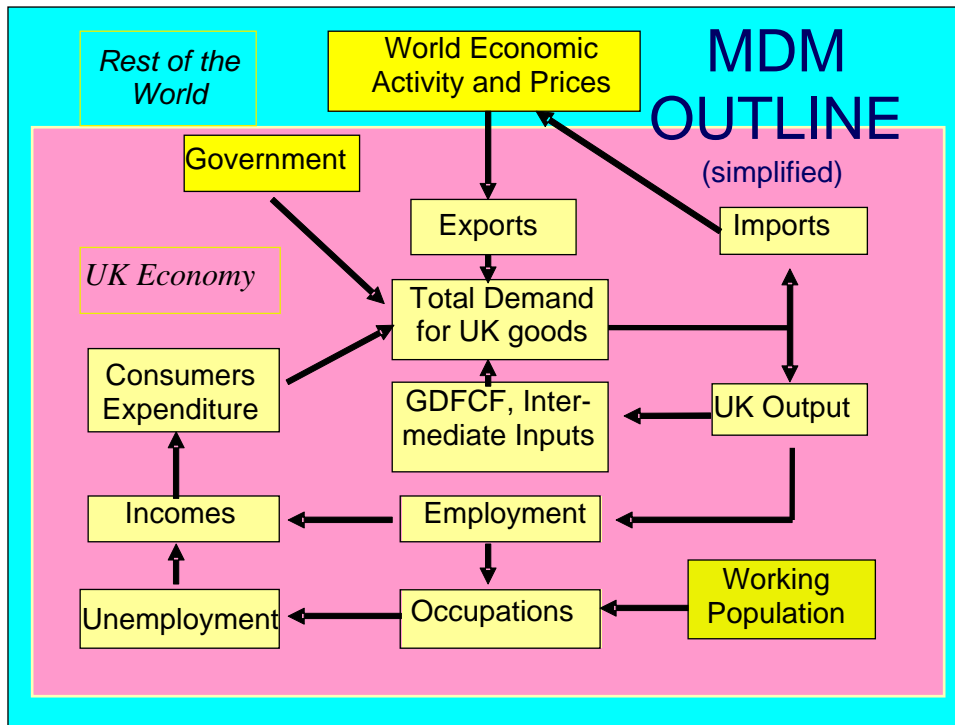
The quantitative, econometric models, are usually moderated by qualitative evidence. The sectoral analysis involves quite sophisticated econometric analysis including error-correction type methods based annual time series data. The occupational aspect of the analysis is generally more basic. Simple extrapolative methods are normally used where data are weak (i.e. often only 2 or 3 time series observations available, precluding anything more sophisticated). Further details of sources and methods can be found in the discussion of UK models in Annex B

Sub-models for employment structure by gender, status, occupations and qualification, therefore typically use methods as summarised in Figure 3.

This shows a typical procedure for projecting the occupational employment share within a sector. Data from the Census of Population (CoP) are plotted for the years available possible complemented by data from less reliable sources such as a Labour Force Survey (LFS). The latter may be used to moderate an extrapolated trend from the limited Census (CoP) historical observations as shown.

Figure 3: Methods used for projection of occupational structure

EXTRAPOLATIVE TECHNIQUES FOR OCCUPATIONAL SHARES
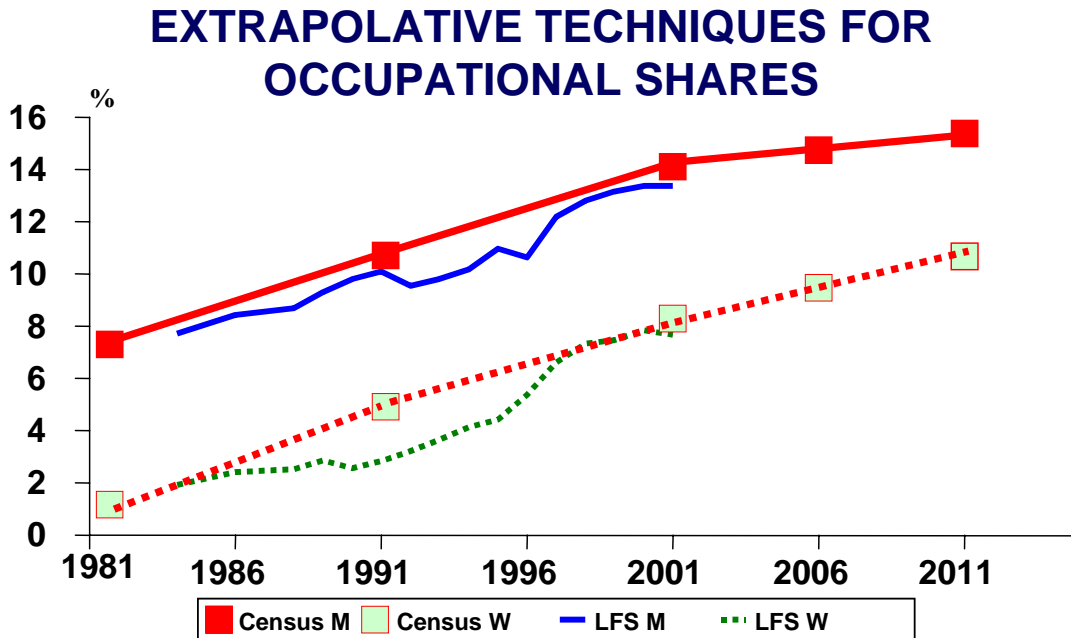
In recent years the boosting of the sample sizes of the LFS have enabled more sophisticated time series analysis more analogous to the treatment of other equations in macroeconomic model. Briscoe and Wilson (2003) provide an example of how the methodology can be extended and refined. However, the reliability of data means that this is still not feasible at the same level of sectoral detail as the main projection is conducted.

3.4 Replacement demands

A key limitation of early projections was their emphasis on employment levels and changes by occupation rather than replacement demands. Such projections tend to focus upon the *expansion (or contraction) demand* arising from growth or decline in occupational employment. This is only part of the demand that needs to be met if employers are to maintain their operations. In order to do this they need to replace those members of their staff who leave.

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In principle, four components of replacement demands can be separately identified:

- Losses due to retirement from the workforce, which require positive replacement;[3]

- Losses due to mortality (including AIDS);

- Net occupational mobility, which, when outward, positively adds to replacement demand; if inward, it reduces such replacement demand;

- Geographical mobility, which, when outward, adds to replacement demand;

Total replacement demand is the sum of these four elements. When this total replacement demand is added to *expansion demand,* an estimate of expected **net requirements** for each occupation is obtained. This measure provides an indication of the number of newly qualified entrants likely to be required in each occupational group over a period of time.

The data used to estimate both the age structure of the workforce and the various flows are usually based upon very limited information, typically from Labour Force Surveys. The estimates of replacement demands should therefore, be regarded as indicative rather than precise. Detailed data on net migration are also usually not readily available, so this is often set equal to zero by assumption. Similarly, net occupational mobility measures based on turnover of those who change occupations within a 12-month period is often ignored.

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3 These include losses at all ages, such as women leaving work during family formations, not just retirement for reasons of old age.

4. CONCLUSIONS: BENEFITS AND LIMITATIONS OF FORECASTING

A number of important conclusions can be drawn from this brief review.

The first is that forecasting is not a crystal ball. There is no technique that can predict precisely what shape the future labour market will take, what skills will be required and the scale of investment in different kinds of education and training that will be needed. Mechanistic manpower planning is not a practical possibility.

Labour market forecasting remains an art as much as a science, with a considerable element involved of judgement.

It should not therefore be seen as an end in itself, rather as part of an ongoing process of trying to articulate to key actors in the labour market what is going on, how this might affect them and what action they might need to take. In this respect, it can provide very valuable information for both policy makers and individual actors in the labour market.

It should not be a one-way path. It is very important that the views of these key actors find their way back to those undertaking the projections so that the projections can gradually be refined and improved in the light of outcomes. Such quantitative projections can therefore act as a focal point for debate, which can help to form a foundation and framework within which softer more qualitative information can be incorporated and exploited.

Quantitative projections are one important element in such a systematic approach to trying to anticipate future skill needs. In combination with other methods, such as employer surveys and more qualitative techniques, they can help to establish a virtuous circle between intervention and outcomes.

Regarding methods, a number of techniques have been adopted in various countries throughout the world. These tend to be shaped by the data available more than any other factor.

Wherever the data permit, detailed quantitative projections of occupational employment are produced on a regular basis, usually based around forecasts from a multi-sectoral macro economic model.

As well as projecting numbers employed in various occupations another key element in most forecasts is to assess the implications of replacement needs to fill the gaps left by those leaving the current work force because of retirement or other reasons.

Various other methods are also used to anticipate changing skill needs. These include regular employer surveys as well as more qualitative techniques. While these tend to be most prominently used in those countries where quantitative employment projections are not feasible, they also form an important part of the armoury of those countries that do undertake such projections. These methods and approaches should be seen as complementary rather than substitutes, enabling a richer and subtler picture of changing employment patterns to be produced.

REFERENCE

Briscoe, G, and R.A. Wilson, R. A. (2003). "Modelling UK Occupational Employment", *International Journal of Manpower.* 24, 5, 568-589.

Separate annexes and reports connected to the present document

Main Report:

Wilson, R. A, I. Woolard and D. Lee (2004). *Developing a National Skills Forecasting Tool for South Africa.* IER/HSRC/Department of Labour.

Separate Annexes:

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.

B: Labour Market Projections: A Review of International Best Practice

C: A Critical Review of Previous Work on Employment Projections in South Africa.

D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

Developing a National Skills Forecasting Tool for South Africa

Annex B: Labour Market Projections: A Review of International Best Practice

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1.   INTRODUCTION

This document presents an up to date review of work on skill forecasting worldwide. It builds upon an earlier review of work in this area conducted on behalf of CEDEFOP, Wilson (2001). The latter surveyed what work had been completed across the developed world in this area. The present document extends this, highlighting the latest developments in a number of countries. It is part of a series of documents reviewing these issues for the South African Department of Labour. These include:

Main Report:

Wilson, R. A, I. Woolard and D. Lee (2004). *Developing a National Skills Forecasting Tool for South Africa.* IER/HSRC/Department of Labour.

Separate Annexes:

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.

B: Labour Market Projections: A Review of International Best Practice (the present document)

C: A Critical Review of Previous Work on Employment Projections in South Africa.

D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

A web-based search of the key organisations has been undertaken, coupled with more conventional academic search tools. The results are presented as a series of notes on the main activities being undertaken, structured according to a rough standard template. This includes:

1)   Coverage of the projections (geography, sectors, occupations (including replacement demands), qualifications, other aspects such as generic skills);

2)   Methodological approach adopted (types of models used, emphasis on econometrics as opposed to other techniques);

3)   Data sources and issues.

A general synthesis of the material covered is presented in a separate document (Annex A).

The review covers amongst others:

- USA (Bureau of Labour Statistics);
- Canada (COPS);
- Australia (including the MONASH general equilibrium model approach);
- Japan;
- European Union Countries, including:
  - France;
  - Germany;
  - Ireland;
  - Netherlands;
  - Spain;
  - Sweden;
  - UK;
  - Other Countries.

Section 2 sets out a few general issues regarding the rationale, problems and pitfalls in undertaking national level employment projections. Section 3 goes on to provide an overview of different approaches to anticipating future skill needs. Section 4 summarises the way the State has contributed to this by building a "statistical infrastructure". The remainder of the document (Section 5) sets out the key points, country by country.

2. OVERVIEW OF EMPLOYMENT PROJECTIONS

It is important to recognise at the start that there are significant differences between countries in their approaches to these issues (especially anticipation of future skill requirements). These differences reflect both different cultural, historical and institutional backgrounds, (which influence the general approach to such problems), as well as more specific differences related to data availability (which can constrain what is technically feasible). Some knowledge of the institutional framework within which such work has taken place, is very important for a proper understanding of the

key issues. In most cases this has been attempted in only a most cursory fashion although a bit more is made of the UK case, purely as an example.

2.1 The rationale for employment projections: Mission Impossible?

Employment forecasts or projections have been undertaken in various countries across the world for over 50 years. Over this period there has been a continuous and ongoing debate about whether such work is necessary or even feasible. Despite such concerns, most countries continue to devote considerable resources to such activity on a regular basis. These "revealed preferences" suggest that such work has real value and should continue to be supported. However, there remains a lively debate about precisely what is needed and what can usefully be provided. This document is part of a more general report which aims to contribute to this ongoing dialogue, with specific reference to the situation in South Africa and what is the best way forward for anticipating future skills needs in that country.

2.2 Review of general approaches and issues in employment forecasting and projection

The review of such work across the world highlights a number of key issues:

- the many different audiences for employment projections and their different needs, aims and objectives;

- widespread misunderstandings about what is feasible and practicable in terms of projections, including confusions about what can be projected and what cannot;

- the general focus upon occupational employment levels and replacement demands as the main measure of skill needs and what this constraint implies;

- the lack of a rigid one to one link from demand for goods and services to the demand for specific skills and qualifications, and the need to recognise the importance of:

  o Substitution (switching between skills depending on their cost);

  o Screening (use of qualifications as a signal rather than as a measure of improved productivity).

- Misunderstandings about what is meant by the term skill: Occupation is not equal to skill and most occupational categories are NOT homogeneous with respect to skill or qualification (Stevens (2003); Wilson *et al.* (2003a and b);

- Various other issues with regard to measuring occupational structure, including the use of household versus employer surveys, and residence versus workplace issues;

- The other methods and approaches that have been adopted to anticipate changing skill needs, including the need to complement quantitative projections with other material such as :

    o Employer surveys;

    o Detailed case studies.

- The use of time series methods, recognising the limitations, of projection without behavioural content, especially for longer horizons;

- The constraints imposed by the statistical infrastructure (available data) in each country;

- Spatial aspects, including the importance of international trade and other influences upon locational decisions.

Each of these points is dealt with in greater detail in the discussion below.

3. APPROACHES TO ANTICIPATING FUTURE SKILL NEEDS

An enormous number of different methods and approaches have been used to anticipate education and training needs. No attempt is made here to provide a comprehensive review of all these studies; rather the emphasis is on providing some key insights, with detailed examples.[1] The discussion includes the use of both quantitative methods and qualitative approaches. It also highlights various improvements in modelling techniques that have been facilitated by the availability of better data as well as increased computing power. The discussion also considers the

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[1] For further detailed discussion, see Wilson (2001 and 2002).

improvements in the technical means of support for anticipating skill needs offered by the State, and in particular its statistical agencies.

The main approaches can be characterised as follows:

Quantitative methods

- Mechanistic/extrapolative techniques
- More complex time series models
- Behavioural/econometric models
- Survey of employers' opinions
- Skills audits

Qualitative approaches

- Delphi techniques (consultation of expert opinion)
- Case studies
- Focus groups
- Holistic modelling approaches
- Scenario planning

Quantitative modelling

For many years the dominant technique has been quantitative modelling, typically using a combination of behavioural/econometric models and more basic extrapolative techniques (the latter where the data are inadequate to apply more sophisticated methods).

A detailed description of the general methodological approach is given in Wilson (1994). At the heart of the method is the use of a multi-sectoral, dynamic macroeconomic model (MDM). In most cases this has a Keynesian structure, incorporating Leontief input-output system and concentrates on the determination of changes in the real sector of the economy. The level of desegregation of commodities and industries is considerable. More recently the use of computerised general equilibrium (CGE) models has been popularised by advocates such as Monash University (Meagher *et al*, 2000). From an early stage such analyses have also included a spatial dimension, with detailed analysis of constituent regions.

The advantages of the detailed desegregation by industry and commodity in such models accrue not only from the greater accuracy achieved in the simulation of aggregate economic quantities, such as GDP and its main components, but also through the value of the additional detail itself. One of the great strengths of these disaggregated models is their ability to simulate interaction between different industries and between them and the rest of the economy. A further advantage concerns the potential that such detail provides for the development of sub-models concerned with other dimensions of employment such as occupation and region. These sub-models can exploit the link with developments in industrial structure, and are a key element in any attempt to anticipate changing skill needs.

There are of course disadvantages of desegregation. These relate not only to the increase in the amount of data preparation and estimation required, but also to the fact that this involves pushing disaggregated analysis to the limits of the reliability of the data. A second main practical disadvantage of desegregation is that it normally increases the number of exogenous inputs required to run the model. Not only are there difficulties in obtaining past estimates of these variables, but also a greater degree of judgement must be exercised in projecting their values into the future.

The approaches to generating national projections have gradually been refined and improved in parallel with the development of economic modelling more generally. These improvements have resulted from:

- Significant investments in methodological advances;
- Improvements in techniques and understanding;
- Huge increases in the ability to handle and process data;
- Improvements in the availability and accessibility of data.

Many of these elements are interconnected and related to the general effects of the IT revolution. Improvements in modelling techniques resulted from the investments made in many countries the 1970s-1990s, as well as from the more general advance in economic scientific methods over this period. The latter has been facilitated by the IT revolution's impact on the ability of analysts to handle increasingly complex statistical problems, with increasingly less effort. Statistical and econometric modelling techniques have been particular beneficiaries. In addition, the general

process of scientific advance (which has benefited from the massive expansion of investment in education and research and development world wide) has had a major impact. The availability and accessibility of labour market data has also steadily improved in most countries since the early 1970s, again linked to the IT revolution.

Improvements made to the main macroeconomic model and sectoral components of such models have been more substantial than those to the occupational sub-models, mainly because of the better quality of data available. A key problem has been the lack of reliable and detailed time series data on occupational structure within sectors. This has meant that in many countries analysis has focused on quite broad occupational categories. A notable exception is the case of the USA, where the Bureau of Labour Statistics produces much more detailed occupational forecasts. This is possible because of its regular and comprehensive survey of establishments, which collects data on occupational employment on an annual basis. In most other countries the costs of such surveys are regarded as prohibitive.

There have been considerable advances in the economic analysis of time series data in recent years. Two main new approaches may be identified. The first is the technique of co-integration that has been developed by a number of econometricians but is closely identified with the work of Engle and Granger (1987). The second is a methodology for developing parsimonious and robust time-series models in a comprehensive and efficient manner. This approach was initially developed by David Hendry (1985) and has been neatly summarised by Harrison (1995). Such approaches have been used in developing sectoral labour demand equations currently used in many macroeconomic models (see for example, Briscoe and Wilson (1991 and 1992). Such procedures are also beginning to be used in the analysis of occupational structure although such attempts to develop the analyses along these lines remain experimental due to data limitations (Briscoe and Wilson (2003)).

In theory it would be desirable to develop a complete model of supply and demand for different occupations in order to take into account the various behavioural relationships that will determine future changes in the labour market. In practice, severe limitations of the data available, as well as some conceptual problems (especially what the supply of labour for an occupation means), still preclude such an

ambitious approach and most forecasts are based on simplistic extrapolation of past trends, focussing primarily on the demand side (i.e. on employment).[2]

The approach developed adopted in most countries, involves two stages:

- First, projections of the likely changes in industrial employment are made using an MDM or CGE model.
- Second, projections of the occupational structure of employment within each industry are made using material from the Censuses of Population or similar surveys (usually fairly simple extrapolations of past trends).

These occupational coefficients are then combined with the projected levels of industrial employment to obtain projected levels of employment by occupation.

The occupational employment projections are therefore based on a sub-model, which takes as input the industrial/sectoral employment projections produced by the macroeconomic model. It is a 'top-down' approach. The overall changes in aggregate occupational structure arise through a combination of shifting patterns of industrial employment structure and the changing occupational composition of employment within industries. The former can be regarded as primarily a reflection of the way in which the changing pattern of demands for commodities by consumers and companies impinges on occupational structure, while the latter is more a reflection of technological and organisational changes affecting the manner in which goods and services are provided. The level of employment in a particular occupation can, therefore, change for two main reasons; either because the industries in which it is concentrated grow or decline, or because of changes in occupational composition within industries. The former may be termed the *industrial* effect, the latter the *occupational* effect.

The main developments to this approach in recent years have been to add further elements to translate the projections of changing levels into implications for flows or *replacements demands*. These recognise that, in addition to dealing with any projected increase in occupational employment levels, there is also a need to replace

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[2] Of course employment is the result of both demand and supply factors, but in most models the treatment of supply is rudimentary and generally very aggregate, focusing just upon economic activity rates by age and gender rather than the supply of suitable qualified and /or trained people into occupations

those leaving an occupation for because of retirement or other reasons. In some models an effort is also made to assess the need for particular types of qualifications. Again, these developments have been constrained due to limitations in the existing data sets.

Quantitative surveys

To many, the obvious way of assessing employers' future skill needs is to go out and ask them directly. This approach was quite popular in many countries, including the UK, in the late 1960s and early 1970s. It was subject to severe criticism as having no firm theoretical foundation, and for often being based on inconsistent and conflicting assumptions. It fell into disrepute when the projections produced based on this method turned out to be highly misleading. Lack of consistency in the underlying assumptions adopted by the respondents, and in particular conflicting views about future market share, resulted in very inaccurate projections. Since then, the general consensus has been that such surveys can only provide useful indications for a very short period ahead. There has been something of a revival of interest in this approach in recent years. However, these surveys are concerned with a range of issues and rarely attempt to obtain hard quantitative data on future skill demands.

An influential study to adopt this type of approach at national level was by Rajan and Pearson (1986). This was a major survey of companies at national level. It was as much concerned with reviewing current trends and their causes as making predictions for the future. It also took a more qualitative than quantitative emphasis than many of the previous survey studies, in many ways having more in common with "Delphi" type approaches as discussed below. This suggests that such approaches can provide some useful information but that they should not be used without considerable care.

The danger is that such surveys can be of a very *ad hoc* nature and produce data of dubious quality. When conducted in a very structured and thoughtful manner they can avoid the worst pitfalls of such approaches and provide valuable insights. A good example of the latter is the London TEC's *Employer Survey* (London TEC Council, 1998). This generated a range of information on current structure and performance and immediate future prospects. The results focus on size of firm as a key issue but also move well beyond simple issues of quantitative changes, attempting to discern

what is driving the observed changes. Issues of location of plant and inward investment were a key focus.

Most recently, a number of studies have begun to use quantitative *Skills Surveys* in combination with other methods to focus on questions related to generic skills. See for example Felstead *et al* (2002). These studies focus on skills such as numeracy, literacy, and social skills, that can be easily transferred across jobs, surveying both individuals and their employers. Employers have laid great stress on such issues in recent years. All such surveys are however quite expensive and require considerable technical expertise to execute successfully. Large-scale employer surveys have become increasingly popular as part of the attempt to assess current a future skill needs. This kind of instrument has been part of the armoury of the US Bureau of Labour Statistics for many years. It has also been adopted in the UK since 1999, following the recommendations of a National Skills Task Force set up by the incoming Government in 1997. The extensive 1999 survey of 27,000 establishments was repeated in 2001 (and on a much smaller scale in 2002, (just 4000 interviews)). They have spawned a number of detailed reports and analyses.[3] The results of such research have made a major contribution to the evidence base on skill deficiencies, their causes and consequences in the UK. In 2003 the newly formed Learning and Skills Council (LSC) commissioned a further round of employer skills surveys at both national and local level, involving an overall sample of around 68,000 establishments in England. Such surveys are however extremely expensive and the jury remains out on how effective they are.

Skills Audits are another form of quantitative survey, which has also been widely used in recent years to establish the stock of skills available in a local area. These are surveys of households and are primarily concerned with the supply rather than the demand side of the labour market. However, such surveys can play a useful part in obtaining a complete overview of the supply demand balance (see for example the studies for Merseyside by Cambridge Econometrics, 1994)).

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[3] See Bosworth *et al* (2000 & 2001) and Hogarth and Wilson (2001a and b).

Qualitative methods

In many other countries, which are less well served in terms of statistical infrastructure, a variety of different types of more qualitative approaches to assessing changing skill needs have been adopted. They share in common the fact that they are not concerned with obtaining precise or comprehensive quantitative measures of employer's skill requirements but rather a broad-brush qualitative assessment of current trends and future possibilities. At the same time such studies often involve a very detailed analysis of the particular circumstances affecting the sectors or occupations under review. They also often involve explicit engagement with the key actors (including employers and education and training providers).

Delphi studies, focus groups, round tables

The so-called Delphi approach to forecasting involves pooling the opinions of a number of people (possibly experts of some kind) in order to try to identify the key issues. This can be done in a variety of different ways. The classic method is to bring the experts together in a suitable forum (focus group, workshop or conference) to exchange views and hopefully to develop some form of consensus.

A related method, which has become increasingly popular, is to arrange "focus groups" or "round tables" involving key stakeholders and interested parties. Discussion of the topic of interest is the arranged, possibly based around material submitted in advance and possibly involving some kind of facilitator to prompt and structure the discussion. This type of approach is a feature of the EMTA ADAPT project in the UK Engineering industry (EMTA, 2001) and also been used in many other studies including many with a local/regional focus, such as the Merseyside Economic Assessment (Cambridge Econometrics, 1994). This kind of approach has been very popular in many Southern European countries where the statistical infrastructure to do more quantitative modelling does not exist.

Another approach is to interview people (such as employers, education and training providers and other stakeholders) to discuss the issues in depth, possibly in a structured fashion. This can be used to develop "case studies", which can have some general messages. In this case the researcher/interviewer is the only one to hear all the views expressed. They have to make sense of all this, sometimes conflicting, information. The National Institute for Economic and Social Research in the UK has

established a long and distinguished track record of such work (see the various articles by Mason, Prais and Steedman in the bibliography). Such studies tend to focus primarily on the current situation. Anticipation of future change is generally very qualitative. Nevertheless this can add important insights that can complement and support the results of more quantitative projections.

Non Traditional Modelling

Some analysts have attempted to develop less quantitative, more holistic approaches for assessing long-term futures. Such work is often focused on the notion of sustainable development and social cohesion. The Henley Centre study of the Future of Work in London is a good example (Henley Centre, 2001).

Local Competitiveness is viewed as a function of social cultural and environmental factors as well as purely economic ones. Both long and short-term drivers of competitiveness, thus broadly defined, are distinguished. These are proxied by around 50 different indicators to operationalise the concept. The model does not deliver precise predictions of changes in levels of economic activity. Rather it represents a policy tool for exploring long range issues, developing various scenarios and strategies. Applying the model to London has enabled the different challenges facing each of its 33 boroughs to be identified and appropriate policy responses to be developed, including implications for skills.

Scenario planning

The scenarios methodology, as a form of modelling, is attracting increasing attention as policy makers seek to compensate for the limitations of forecasting in the longer term, and in situations of uncertainty as to how key drivers will shape the future (Leney *et al*, forthcoming).

Scenario planning is not a quantitative scientific method comparable to the statistical techniques used in forecasting. However, it is systematic in that it develops scenarios that are wholly based on evidence and analysis and goes on to test strategies rigorously, openly and consistently within these scenarios. Scenario's thinking is used as a practical tool to aid decision making in complex contexts and when future circumstances are uncertain - it complements quantitative scientific models rather than replaces them.

The scenarios methodology involves the development of plausible scenarios for 10 or 20 years hence, then the testing of strategies for achieving objectives in the context of these scenarios. The scenarios can be seen as a kind of lens or 'wind tunnel' through which to explore the potential and detail of different strategies. It is not a convergent tool that provides a best guess for a single, inevitable future, nor does it provide a 'best possible strategic approach', nor is it a derivative of forecasting. As a planning tool, scenarios are often considered alongside tools, such as more traditional forms of forecasting. The distinctiveness of the scenarios method lies in the way it tackles uncertainty, the richness of the data it generates for discussion and its capacity to facilitate 'out of the box' thinking.

Building scenarios helps to clarify relationships between elements of complex systems and encourages stakeholders in a planning process to think and discuss their work within a longer-term perspective. At best, the method generates a so-called "strategic conversation".

Scenario planning may be optimally positioned in the medium/longer term where the number of uncertain outcomes are roughly the same in number as the number of predictable outcomes. For shorter planning periods, traditional forecast methods will be most effective.

4.   TECHNICAL SUPPORT FROM THE STATE

In addition to investment in general economic modelling techniques, national governments have also provided technical support for anticipating skill needs in a number of ways. The key elements here have been:

- The development of standard systems of classification;

- The introduction of regular national surveys of households and employers;

- The development of means of access to these datasets electronically.

4.1 Classification of Occupations and Qualifications

A standard system of classifying occupations, both over time and across different data sources is essential to any systematic attempt to assess future skill needs. For a variety of reasons, until relatively recently, this has not been a top priority in most countries. However, things have improved, making more systematic approaches feasible. In most countries there is a gradual move towards harmonisation with the international standards set by the ILO.

Attempts have also been made to standardise the classification and treatment of qualifications. This has generally made less progress and in most countries there remain serious difficulties of comparison within their own borders over time, let alone between countries.

4.2 Development of Regular National Surveys of Employers: Censuses of Employment

Sectoral information lies at the heart of the multi-sectoral models used in employment projections. Good sectoral information (especially output and employment is therefore essential. In many countries, such as the USA, UK and much of northern Europe, the State conducts good quality censuses or surveys of economic activity, which form the basis of such information. These form a key input into the National Accounts. In other countries such data are of much lower quality and reliability (if they exist at all on a regular basis). This constrains very significantly the ability of such counties (which include many southern European countries), to develop very sophisticated models.

Note that such information is different from that obtained in Employer Skills Surveys, which are concerned primarily with the pattern of skill needs and deficiencies rather than the scale of economic activity.

4.3 Surveys of Households (Censuses of Population, Labour Force Surveys)

Most countries conduct regular but infrequent Censuses of their Population. For many years this was the only source of detailed information on the occupational structure of the employed workforce. Such data sets remain a cornerstone for any analysis of changing occupational structure.

More recently Labour Force Surveys (LFS) have become much more commonplace. These are effectively mini-censuses although usually being completed voluntarily rather than as a legal obligation. The LFS has been a key survey in Europe- member states being obliged to carry one out on a regular basis and with a fairly standard set of questions. The gradual improvement in the LFS, and in particular its recent increase in sample size, mean that it is now the prime source of data on occupational employment in the UK. However, it is still limited in its ability to provide accurate data for small geographical areas. Compared to the huge survey of establishments conducted on a regular basis by the Bureau of Labour Statistics (BLS) for the USA, the LFS provides a very fuzzy and erratic picture of trends in occupational structure. However, as always considerations of cost are crucial and few other countries have been prepared to devote as much resource to such data collection as the USA.

4.4 Other Surveys and Databases

Most countries have a range of other surveys conducted on a fairly regular basis, which contain relevant data. These include surveys of earnings as well as various aspects of employment labour supply. This has improved the ability of researchers to monitor trends. However, with one or two exceptions (such as the Netherlands), these surveys still remain inadequate compared to the much larger surveys conducted by the BLS in the USA, which provide a much more accurate picture of skill mix within sectors.

The vast improvements in IT have also resulted in an explosion in the development of databases and primary data collection exercises at local level. Many of these are

intended to assess current positions but many also look forward into the future. These include major **Skills Audits** of local areas to supplement and update the information from official sources, as well as **Surveys of Employers**, intended to assess their skill needs. Often such work is subcontracted to specialist survey companies and labour market consultancies. Although this increase in availability of relevant LMI is to be applauded, there are many problems related to inconsistencies in methodology and definitions, which make it much less useful than it might otherwise be. There is a strong case for a more coordinated approach that would gain from economies of scale and benefit from synergy and cross-fertilization.

5. COUNTRY SECTIONS (ALPHABETICAL)

5.1 Australia

In Australia, employment projections have been carried out by the Centre of Policy Studies at Monash University (CoPS) for many years. CoPS forecasts are conducted within an economy-wide framework, which integrates a macro model (to determine aggregate employment), an applied dynamic general equilibrium model (MONASH, to determine employment by industry) and a labour market extension (to determine employment by occupation). The **MONASH** model evolved from an earlier model called *ORANI.* Meagher and Parmenter (1995) describe the model in some detail focusing on implications for occupations. This was updated in Meagher *et al* (2000).

Like ORANI, *MONASH* has a high level of microeconomic detail. Unlike ORANI, it has a strong forecasting capability. This is due to:

- a more detailed specification of intertemporal (i.e. dynamic) relationships;

- greater use of up-to-date data; and

- enhancements which allow the model to take on information from specialist forecasting organisations and from recent historic trends.

Thus while ORANI was limited to answering comparative static questions such as: *MONASH* can provide forecasts corresponding to alternative scenarios. *MONASH* can analyse issues such as labour market dislocation or adjustment costs, which other CGE models that do not produce a base case forecast, are unable to address.

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.

MMRF is a full "bottom-up" multi-regional model with similar structure and notation to *MONASH*, used to model the Australian states and territories in more detail. Consistent forecasts are produced for 113 industries, 56 regions and up to 341 occupations.

The occupational forecasts project the demand for skills (i.e. occupational employment) that are likely to be required in the Australian workforce, with a horizon of 10 years. In the 1995 version of the model, this was based on a shift-share approach in which the occupational shares within detailed sectoral categories were assumed fixed. Subsequently this was extended to allow for variations in occupational shares within industries.

The CoPS team take the view that the key to generating believable forecasts is to use detailed information available from expert groups specializing in the analysis of different aspects of the economy. *MONASH* forecasts incorporate a wide variety of information including:

- Macro forecasts from the Treasury and other macro analysts;

- Export volume and price forecasts from the Australian Bureau of Agricultural and Resource Economics;

- Forecasts of tourist numbers from Bureau of Tourism Research;

- Forecasts of tariff rates from the Productivity Commission; and

- Forecasts of changes in technology and consumer tastes derived from trends calculated at CoPS.

The initial applications of *MONASH* were made for State and Commonwealth government departments requiring detailed employment forecasts. The model continues to be used for this purpose. However, more recently the main enhancements to the model have been directed at policy analysis. These include:

- The effects of changes in tariffs on different sectors;

- The effects of various sector specific changes on the economy more generally;

- The effects of external events on local industries.

Labour Market Forecasts

CoPS has a major ongoing research program on labour market forecasting. This is intended to provide a useful guide for the allocation of training resources. The employment forecasts are for detailed industries and occupations which, when the disaggregated forecasts are added together, are consistent with a plausible scenario for the macro economy.

So far the development of the system has focussed primarily on the demand for labour. A particular concern has been the effect in recent years of technological and social change on the structure of the economy and the implications for future labour demand. A complementary supply side forecasting system is in preparation.

The CoPS system has been used since 1994 to provide a bi-annual briefing service to various government agencies responsible for vocational education and training in Australia. These are subscribers to the service, which helps to fund CoPS activities.

CGE Models for Other Countries

ORANI-G is an applied general equilibrium model, which has been developed at Monash for use in other countries. It is descended from the ORANI GE model of the Australian economy, which has been used extensively for policy analysis in Australia for nearly two decades. ORANI-G (the 'G' stands for 'generic') is designed both for teaching purposes and to serve as a basis from which to construct new models. Adaptations exist for many countries, including South Africa. CoPS runs an annual GE training course, which is based around the ORANI-G model, and also offers consulting services to assist or accelerate development of similar models worldwide.

Internet sites

Australia: Monash University

Website: *http://www.monash.edu.au*

More technical details about the model are available at:

http://www.monash.edu/policy/techdoc.htm

5.2   Austria

Various labour market forecasting activities have been carried out in Austria for many years under the auspices of the former Ministry for Science and Research and the Austrian Labour Market Service (ALMS). The work has been primarily conducted by academic research institutes such as the Austrian Academy of Science (primarily focused upon the education system and labour supply), the Austrian Institute for Economic Research (WIFO) and the Institute for Advanced Studies (HIS), focusing more upon the economy and the demand side.

Macroeconomic projections are conducted at an aggregate level on a quarterly basis but these do not contain much sectoral detail. Medium term forecasts are conducted yearly which include greater detail. The work by WIFO incorporates expert views in a qualitative fashion into this process. The ALMS has also conducted a micro-prognosis of the labour market since the mod 1990s, focusing upon the behaviour of individuals and enterprises. It also produces annual projections of the apprenticeship market. These are all reviewed in Lassnig (2002).

Occupational and qualification projections have only been conducted infrequently usually linked to the availability of data from major data sources such as the Census of Population. Thus, the OECD undertook a major study in 1967 (see Steindl (1967). This was in the manpower requirements tradition, applying US patterns of occupational structure rather mechanically to Austrian data. A second study in the 1970s by Clement *et al* (1980) adopted a methodology involving both supply and demand side elements. More recent approaches (Lassnig and Prenner (1997 and

Lassnig (1998) have adopted more conventional methods, applying a shift share analysis of changing occupational structure within sectors to a sectoral forecast based on a CGE approach (as adopted in Australia).

The procedures also take account of replacement demands and the implications for educational requirements.

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5.3   Canada

In Canada, employment projections are carried out by the **Human Resource Development Canada** (HRDC) (formerly known as Employment and Immigration Canada). This is done using the **Canadian Occupational Projection System** (COPS). The COPS Model has evolved from a demand-focused methodology, concentrating upon expected changes in labour demand, to a more general analysis of labour market conditions for different skill categories. The focus upon occupational requirements has also developed from a fixed coefficient approach to the use of a more sophisticated econometric method, allowing for some sensitivity to cyclical factors. The latest approach also formally includes elements of a more qualitative or Delphi approach, introducing qualitative judgments into forecasts. According to Hensen and Newton (1995), along with the Netherlands, Canada has one of the most sophisticated systems for projecting employment in the world. Archambault (1999) provides a more up to date assessment.

The COPS model is used to develop different scenarios and provide projections of demand for approximately 500 occupational categories and 67 industry categories. The projections are available at a national and provincial level. The base time series data for the model are national census data. In addition, Labour Force Survey industry time series data are used for inter–census periods.

The components of the Demand Model are various. First, estimates of industry employment are produced through simulation in a macro-economic model and checked through a consultative process with sectoral experts. The second step is the production of industry employment estimates, cross-classified by detailed occupational categories. This is done by estimating each occupation's share of a given industry's employment by using a coefficient matrix. Columns represent industry and rows occupations.

The Occupational Demand Model uses alternatively two matrix approaches. These are:

- A fixed coefficient matrix; and

- A variable or curvilinear coefficient matrix.

The second one has been developed using more sophisticated econometric methods in recent years. This is described in more detail in COPS (2002). The sum of all the occupations by industry coefficients for each column equals one, regardless of the matrix used. While assuring model consistency, the resulting matrices are subject to 'bottom up' amendments through a consultative process that reviews the detailed occupational projections. This enables more qualitative insights about key trends to be built into the econometric and mechanical forecasts and projections.

Once the "expansion demand" level for each occupation has been determined, the estimates for attrition by occupation are needed. Attrition (or replacement demand) is the number of openings that arise due to people leaving the labour force for reasons such as retirement, changing occupations, or mortality. The estimates of attrition are obtained from an occupation and age distribution model. This is similar to that developed by ROA for the Netherlands.

The HRDC staff responsible for the COPS models consult with industry, provincial governments as well as HRDC's own regional offices. The first round of consultations ensures that input numbers reflect a broad consensus on the economic outlook. Once the macroeconomic scenario is set, participants comment on occupational projections and adjustments may be made to the coefficient matrices.

COPS have also developed a supply side component to their modeling, which allows them to say something more general about the supply demand balances for different skills (Boothby, 1995).

There has been a debate in Canada about the most appropriate level of disaggregation to undertake occupational projections. There is a trade-off to be assessed between the demand from users for greater detail and the reliability and robustness of data for surveys such as the Canadian LFS with limited sample size. The review by Archambault (1999) suggests that statistical noise can bias projections unless an appropriately high enough level of aggregation is chosen.

Canada: Human Resources Development Canada

Website: *http://www.hrdc-drhc.gc.ca*

5.4   Cyprus

Cyprus is another country that has conducted employment forecasts for the first time in the last few years. The organization responsible for this work is the **Human Resource Development Authority** of Cyprus. The forecasting methodology developed in Cyprus is based on approaches that have been developed and used in European countries and the United States. However, the two methodologies that have been mainly adopted are those developed in the UK by the Warwick Institute for Employment Research and in Ireland by FAS/ESRI.

The employment forecasts in Cyprus refer to 27 sectors of economic activity and 36 occupational groups. The data for the projections are taken from the Census of the Cyprus Statistical Service (conducted every five years and covers all sectors except Agriculture and Fishing) and the Labour Force Survey. Further details can be found in: *Employment Forecasts in Cyprus 2000-2010.*

Internet site

Cyprus: Human Resource Development Authority of Cyprus

Website: http://www.hrdauth.org.cy/

5.5   Czech Republic, Poland and Slovenia

Forecasting activities in three 'pre-accession'- countries

A two-year survey and analysis project was recently funded by the European Commission (under the Leonardo da Vinci programme) in order to develop labour market forecasting tools for pre-accession countries, about to join the European

Union. The project aimed at the investigation of labour market information systems and methods used by four EU members states, France, Germany, Ireland and the Netherlands, as well as some other countries, for forecasting education and training needs and compared them to the data and the methods available in three pre-accession countries (Czech Republic, Poland and Slovenia).

Czech Republic: Occupational forecasting models used in the Netherlands (ROA) and Ireland (ESRI) were adapted to the needs of the Czech Republic. Limited time series for the period 1993-1999 were used in order to provide forecasts for the period 2000-2004 for 50 occupation groups and 59 educational categories for expansion demand, replacement demand and job openings.

For more details see *Regular forecasting and training needs: Quantitative methods for the Czech Republic in Forecasting Skill Needs: Methodology, Elaboration and Testing*, NO-NTF, Prague 2001

Poland: Different databases were brought together in order to provide projections for the demand of labour one year ahead, five years ahead and ten years ahead. The approaches used by the Polish were closer in spirit to those used by the United States and Australia. The forecasts were made at national and regional level.

For more details see the *Polish report in Forecasting Skill Needs: Methodology Elaboration and Testing*, NO-NTF, Prague 2001

Finally, teams from the Czech Republic, Slovenia and France worked in parallel on the elaboration and testing of qualitative research tools for anticipation of labour market needs at regional and sectoral level. This built on French experience of regional and sectoral prospective studies. The approach was also enriched by attempting to combine semi- qualitative and 'soft' qualitative methods.

For more information see *The Cross Country Summary of Results in Forecasting Skill Needs: Methodology Elaboration and Testing*, NO-NTF, Prague 2001.

Internet site

Czech Republic: National Observatory of Employment and Training

Website: http://www.nvf.cz/observatory/gb/info_gb.htm

5.6   France

France has a long history of employment forecasting stretching back to the indicative manpower planning carried out in the 1950s and 1960s. More recently, this has been replaced by more broad brush and less mechanistic techniques, although the Statistical and Economic Research Department of the French Ministry of Employment and Solidarity continues to produce quantitative employment projections. These include a general outlook for the French economy as part of the Commissariat General au Plan under the Occupation and Qualification Projection Group (PMQ).

It is not now believed in France that educational provision can be planned in precise detail using such methods. However, the monitoring of the changing skill needs of the labour market, and the provision of useful information to all labour market participants about these developments to aid them to make rational choices, is still regarded as useful.

Employment forecasts in France are currently carried out at national, sectoral and local level, with different bodies being responsible for the forecasting activity in each case. Both quantitative and qualitative methods of analysis are used. At the national level, the Institute of Economic Forecasting (**BIPE**) carries out forecasts of occupational employment for the Ministry of Education.

At the sectoral level, the results are based on a multi-sectoral macroeconomic model that is used to generate projections for some 75 sectors and for some 22 occupations or professional branches. This was originally developed from the Hermes model that was built for the European Commission as a tool for making macro forecasts across all member states. It is a Keynesian model with an input-output structure at its heart.

BIPE now also uses a range of other models.[4] The main macroeconomic model (DIVA) focuses upon employment levels for each sector branch. The CALIFE model analyses employment level for each professional category. Finally, GESPER is a geographic and professional mobility model of working population that estimates the hiring needs for each professional category.

BIPE makes forecasts for 22 broad occupational groups (aggregated from some 455 more detailed occupational categories). This uses a model called FLIP-FAP[5] for calculating recruitment needs according to professional categories. At its most detailed level the model now distinguishes 75 occupations or professions in its final projections. The projections use econometric techniques to analyse trends in LFS and other data on occupational employment within sectors. However, data limitations restrict the sophistication of what can be done, so effectively the results are not much more than trend extrapolations. Different methods are also used in the public sector, including use of expert views on changing occupational structures within areas such as education and health.

Implications for replacement demands are regarded as essential (Topiol 2001b). The procedures also work out implications for qualifications/educational requirements.

In addition to Censuses and Labour Force Surveys, the data used, are taken from regular surveys such as:

- Employment Surveys and the Vocational Training Qualification Survey carried out by the National Institute of Statistics and Economic Studies (INSEE);

- The Centre for Research on Training, Employment and Qualifications (CEREQ) on young people starting their working life (irregular surveys); and

- Continuing vocational training in companies (annual and compulsory surveys);

- Irregular surveys of companies and qualitative data, such as assessment of existing studies from professional organizations, research centers, experts or firms.

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[4] For more details about these models see www.bipe.fr/us_frameset_base.html
[5] Inter-professional flows by families of professional activities.

At sectoral level, forecasts are also carried out by using existing data and combining them with more qualitative information. Knowledge of each sector, professional category and the working population are combined and each profession is analysed using qualitative as well as quantitative analysis.

At a local level the responsibility for projections falls to the Regional Employment and Training Observatories (**OREF**). At local level, OREF first links the jobs, the sectors and the qualifications. Then regular surveys on trainee integration are used in order to provide a diagnosis that is followed by an analysis of the explanation factors of the change, the identification of development factors and their probability of continuation or cessation, and the provision of recommendations. OREF uses data concerning employment, demography, training, unemployment, integration. These include population censuses (every 8 years), and regular surveys of employment structure and staff turnover, trainee population statistics, statistics on job seeking and new entrants statistics.

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Internet sites

<u>**France:**</u>

Website: *http://www.bipe.fr/frameset_base.html*

www.bipe.fr

5.7   Germany

Germany also has a long tradition of undertaking employment projections. These have generally been provided for policy analysts rather than trying to provide useful information for those making career choices. Although the role of such work has been hotly debated, the government continues to support such activity.

In Germany, there are three main research institutions involved in forecasting activity. These are: the **Institute for Labour Market and Vocational Research** (IAB), the **Federal Institute of Employment**, which provides quantitative forecasting and the **Federal Institute for Vocational Training** (BiBB) which conducts more qualitative research.

The main organization providing forecasts for the labour market in Germany is the IAB. It has used a number of different approaches to anticipating changing skill needs. These have been mainly concerned with the demand side of the labour market. They include:

- Educational Accounting System (BGR).

- Comprehensive Forecasts of Employment to 2010.

- Early Recognition System of Qualification and Training Needs in the German Economy.

- IAB Establishment Panel.

- Training as a dominant Active Labour Market Policy in the Eastern German Transformation Process.

Only the second will be discussed in detail here.

The statistical data used for forecasting are used mainly provided by the Federal Statistical Office. These data are complement by a number of individual surveys.

The most important databases used are:

- Microcensus (destatis.de)

- Socio-economic panel (diw.de)

- Employment statistics

- IAB Company-related Survey Panel (www.infratest-sofo.de, www.iab.de)

- Labour Landscape 2010 and the IAB/INFORGE Model

- Labour Market Monitor for the new Lander (www.infratest-sofo.de)

- BiBB/IAB surveys

- Total Education Accounting

- Reporting Trends and Structures

- Report on Qualification Structures (www.wz-berlin.de)

- Report on vocational education and training (www.bmbf.de)

- Reporting System on CVET (www.bmbf.de)

- Atlas of Occupations (www.pallas.iab.de)

Educational Accounting System: this system follows the stocks and flows of people in the education and training system, in employment, in unemployment, the number of people outside the labour force as well as the transitions between these

areas. This is done by using a method called ENTOR. An outcome of this approach is the ability to follow the skill level unemployment rate using time series.

Early Recognition System for Qualification and Training Needs: this method uses job advertisements in dominant newspapers and fills a databank with the relevant information. This method is thought to provide useful indicators of demand.

IAB Establishment Panel: this is a reporting system that monitors the structures and developments of the demand side of the labour market on the basis of surveys of employers. The IAB Establishment Panel includes questions concerning future needs for personal capacity and motives for rejecting candidates.

Long Term Labour Force Projections: this approach focuses upon measures of the labour supply. It tracks the number of employed persons plus the number of (registered) unemployment in Germany.

Comprehensive Forecasts of Employment to 2010:

The forecasts of occupational employment date back to 1975 when the IAB made its first projections in collaboration with the Battelle Institute. Projections are made for 17 economic sectors and 34 occupational tasks. Three variations are calculated, based around a low trend, a medium trend and a high trend in employment change.

The demand for skill levels also distinguishes 11 skill levels. An ex-post analysis investigates a range of influencing factors (technological, economic, social and other) and their impact on occupational tasks. Qualitative issues are described and their impact is classified as positive (increase of employment in this occupation) or negative (decrease of employment in this occupation). These impacts are a result of empirical analysis of the past and are estimated for the future. They are standardized and transformed from cardinal to ordinal status. For each occupational task more or less qualitative impacts are selected. The transformation from cardinal to ordinal status is then made, leading to a variation around the quantitative trend extrapolation.

In 2002, a new long-term employment forecast model, the IAB/INFORGE Model was used for the first time. This is a part of the international GLODYM network and operates with a bottom up construction of some 600 variables for each of 59 economic sectors. The IAB/INFORGE Model is a quantitative tool with qualitative backups, which take into consideration employment and occupational shifts between sectors and between individual occupations. The approach covers analysis of the development of the economy and the labour market as well as on the development of the structure of jobs.

The IAB/PROGNOS long-term assessment procedure is based on an **open econometric model** that includes a **modified trend extrapolation** of some aspects of employment structure supported by qualitative expert ratings and quantitative scenario techniques. The results are evaluated in three alternative scenarios, each of which is developed under the different framework conditions, documented and portrayed as orientation aids.

The main data sources used are again:

- National census;

- Microcencus;

- Additional data by the Federal Office of Statistics;

- Data on national accounting;

- Expert interviews.

Reference

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Internet sites

Website: *http://iab.de/iab/default.htm*

www.iab.de

www.bibb.de

5.8 Ireland

The Irish occupational forecasting model has been developed by the Economic and Social Research Institute (ESRI) on behalf of Foras Aiseanna Saothar (FAS, – the Training and Employment Authority). Employment forecasting activity was initiated in Ireland in 1989 when the Minister of Labour requested the Training and Employment Authority to make available information upon which its plans for future vocational education and training could be based.

The projections are based on the use of a multi-sectoral macroeconomic model run and maintained by ESRI. This model, which is part of the Hermes family developed for forecasting in the member states of the European Commission, covers all sectors of production- primary, secondary and tertiary. Its industrial classification consists of 13 major groups and 29 sub-groups. The industrial classification provides more details for the service sector than agriculture or manufacturing, since the service sector has been the main source of employment growth during the past decades.

The occupational data used for the ESRI forecasting models are taken from the Census of Population that is conducted in every five years, and the Labour Force Survey (LFS, Now referred to as the Quarterly National Household Survey). Some 45 occupations are distinguished (aggregated from more detailed categories to obtain more statistically robust data).

The FAS/ESRI occupational forecasting model produces forecasts of employment by occupation based upon the forecasts of employment by sector taken from the ESRI medium- term macroeconomic model. The forecasting procedure has two main parts. In the first stage, the ESRI medium-term model's employment forecasts for 11 sectors are desegregated into 29 sub-sectors by projecting the trend of each sub-sector's share of employment within each sector. In the second stage, the trends in the share of each occupation in each sub-sector (based primarily on LFS data) are examined and projected to a target year. The latter is done using linear, logarithmic and semi-logarithmic equations (as well as some judgment to select the projection

which appears more reasonable in the light of what is expected about labour market developments during the projection period).

The results of the forecasts of the number expected to be employed in each sub-sector in the target year and of each occupational sub-group's share in each sub-sector in the target year are multiplied together and summed to provide forecasts of the number expected to be employed in the target year in each occupational sub group. In addition, a gender sub model is used to project the female share of employment in each occupational sub group. Implications for replacement demands are also assessed using flow data from the LFS.

An overview of the work conducted can be found in Sexton (2002). The latest work of ESRI is *Occupational Employment Forecasts by region for 2010: FAS/ESRI Manpower Forecasting Studies Report no. 11,* which is part of a long running series.

The quantitative work on changing skill needs in Ireland has also been complemented by more Qualitative approaches, including the setting up of an Expert Group on Skills Needs.

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Internet site
Ireland: Economic and Social Research Institute

Website: *http://www.esri.ie*

5.9   Japan

Labour market projections are undertaken by various organisations in Japan. The most representative and authoritative are those produced by the Ministry of Labour (MOL).[6] This serves as a corner stone of the government's *Basic Employment Measures Plan* that has been undertaken every 5 years since 1967.

The projections are based around forecast from a multi-sectoral macro model, including both supply and demand blocks. The demand block is essentially Keynesian, with a Leontief input output structure. Quite sophisticated econometric techniques are used and here is a quite detailed sectoral desegregation.

The supply side focuses upon aggregate labour supply by age and gender. A supply –demand adjustment block incorporates aggregate wage/ unemployment feedback mechanisms.

The occupational implications are developed using information on occupational employment structures within sectors. Results can be found in MOL (1999) and in an overview by Suzuki (2002).

In the MOL model this is only quite aggregate. For more detailed implications the Japan Institute of Labour (JIL) produces a breakdown to some 283 occupations (Watanabe, 2001). JIL is affiliated with the MOL.

The projections are widely used by government and in tripartite situations, involving social partners. They are institutionalized, which has the advantage of meaning that they become a common background for discussion. There are however disadvantages in that political considerations can sometimes cloud scientific judgments about the results.

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[6] From 2001 the MOL was integrated with the Ministry of Health and Welfare (MHW) into the Ministry of Health, Labour and Welfare (MHLW).

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http://www.jil.go.jp/buletin/year/2001/vol40-01/

5.10 Netherlands

The Dutch Government has a legal responsibility to provide adequate education for all labour market participants. This implies a need to anticipate changing skill needs.

Early projections by the Central Planning Bureau were based on a manpower requirement type approach. In the mid 1980s the Research Centre for Education and the Labour Market in Maastricht University (ROA) was commissioned to develop a more comprehensive system, aimed primarily at helping to guide career choices.

The forecasting model for the Dutch labour market developed by ROA is used to produce projections every two years. These are limited to the medium term, which is a period of about five years. ROA provides forecasts not only for occupational groups but also forecasts by type of education. Particularly, 104 types of education, 127 occupational groups and 34 economic sectors are examined.

The forecasts are provided by matching labour demand and labour supply. Labour demand consists of expansion and replacement demand. The forecasts of expansion demand are based on the employment level forecasts for economic sectors that are produced by the Dutch CPB Netherlands Bureau for Economics. On the other hand, supply consists of the future flow of school-leavers entering the labour market and the outflow from training courses after and outside the regular education system plus the supply of short-term unemployed persons waiting to enter the market at the start of the period. It is assumed that long-term unemployed do not constitute serious competition for school leavers. The flow of school leavers that enter the labour market correspond to the Reference Forecasts that are compiled by the Ministry of Education, Culture and Science for regular education courses in the educational system. These forecasts are desegregated by ROA and supplementary data are used to estimate the flows from non-regular education.

The matching of labour demand and supply provides various indicators. The first and most important is a general indicator of the future labour market. Other indicators are: future risks of labour recruitment problems; a risk indicator that shows the opportunities for school leavers to switch occupations; a risk indicator which reflects the opportunities for school leavers to switch economic sectors; and a risk indicator which measures the sensitivity of employment to cyclical fluctuations. All these indicators are translated into a qualitative characterization of the expected labour market prospects on a 5-point scale: very good, good, reasonable, moderate and poor prospects.

ROA uses quantitative databases but qualitative judgments are made on the reliability of extreme and/or intuitively unexpected developments. The major data source is the Dutch Labour Force Survey (EBB) collected by Statistics Netherlands.

Other data sources apart from the external forecasts outlined above are data from Statistics Netherlands (which are used to estimate the effects of continuing vocational education on the educational backgrounds of the labour force) and follow-up surveys of school leavers conducted by ROA (which are used for desegregated data on the extent to which graduates of the various types of educational flow onto the labour market). For the supply side, the numbers of short-term unemployed by educational background (from registered data or surveys on unemployment that include information on the educational qualifications of the unemployed) are also used.

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Heike, H (ed) (1994). Forecasting the Labour Market by Occupation and Education Boston, Dordrecht and London: Kluwer Academic Publishers.

Internet sites

The Netherlands: ROA (Research Centre for Education and the Labour Market), Maastricht University

http://www.fdewb.unimaas.nl/roa/

5.11 Spain

In Spain, there is a wide range of agents involved in the anticipation of training needs, acting at national, regional and local level. With a few exceptions, as noted below, these have been largely of a qualitative nature, reflecting the lack of good quality data ideally required for quantitative projections.

At the level of central government there are currently two main initiatives. These are: the National's Institute of Employment (INEM) Occupational Observatory and the National Institute of Qualifications Observatory.

As far as the first is concerned, its main aims are:

- To obtain information on the labour market and specifically on its evolution, as well as the factors determining this behaviour;

- To provide information on changes arising in the content of occupations and anticipate their likely impact on job offers; and

- To perform regular analyses of the training and employment needs arising out of social changes, technological innovation and the development of new forms of work and business organization and management.

The data for the above actions include:

- Institutional INEM data in the areas of employment supply and demand, placement, unemployment benefits, administration of active employment policies, occupational training, etc;

- Studies carried out on its own behalf involving press advertisements, consultation with employment intermediaries and companies, consultation with specialists and the examination of data concerning the economic situation and investment projects;

Studies prepared by other government agents and research centres.

INEM prepares basically three types of reports. These are:

- Regular labour market studies in different areas;

- Specific monograph studies concerning different occupations, economic activities and groups of interest in employment terms; and

- Monitoring studies of Occupational Training and Training Workshops and Craft Centres.

The second initiative is the National Institute of Qualifications Observatory (OBINCUAL). This observatory aims to provide information concerning the evolution of supply and demand for professions, occupations and profiles in the labour market.

OBINCUAL 's main activities are;

- The construction of an overarching network of existing observatories.

- The design and implementation of cooperation principles for the construction of an observatory network.

- Analysis of supply and demand for qualifications; this mainly involves research into the social and employment evolution of the required qualifications in collaboration with employer's associations and trade unions organizations on the basis of the supply and demand for professions, occupations and profiles in the labour and vocational training markets.

- Research into the relationship between the need for qualifications and training provision/ demand.

- Preparation of information on the supply/demand for and evolution of qualifications.

In addition to the national level, the autonomous communities of Spain have created labour market observation and monitoring systems. Namely;

- The Basque Vocational Training System Observatory;

- The Canary Islands Employment and Vocational Training Observatory;

- Qualifications Institute of Galicia Occupational Observatory.

Some attempts have been made to undertake quantitative projection, although in the absence of good data for building macroeconomic models these efforts have been less advanced than in many other countries. Garrido (1991), Garrido and Toharia (1991), Fina *et al* (2000), and Mane and Oliver-Alonso (2002) present increasingly sophisticated attempts to build up such a capability.

Garrido published some of the earliest projections, using essentially a manpower requirements type approach, although this was complemented by some more sophisticated analysis, especially of the supply side. Garrido and Toharia (1991) extended this to consider alternative scenarios. Fina *et al.*(2000), presented the most comprehensive set of projections in Spain to date. Mane and Oliver-Alonso (2002) emulate Fina *et al's* approach, building up a macroeconomic and then sectoral picture from various sources, before then drawing out implications for occupations. Their approach also includes extensions to cover replacement demands and implications for qualifications. They recognise that the lack of a full multi-sectoral model to provide the main economic scenario for the projections is a major weakness

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Garrido, L. and L. Toharia (1991). 2Cambio ocupacional y necesidades de formacion en Esapana, 1985-19952. Economia industrial, 277 (enero-febrero, 159-79).

Fina, L.L, L. Toharia, C Garcia, and F mane (2000). "Cambio ocupacional y necesidadas educativas de la economia Espanola", in Saez, F. (ed.) Formacion y Empleo. Madrid: fundacion Argetaria

Mane, F. and J. Oliver-Alonso (2002). Projecting labour market developments in Spain through 2010: From massive unemployment to skill gaps and labour shortages?

5.12 South Africa

Previous work in South Africa is covered in Annex D.

Internet site
South Africa: Human Sciences Research Council (HSRC)

Website: http://www.hsrc.ac.za/about/mission/index.html

5.13 Sweden

In Sweden, there are various different actors involved in labour market forecasting activity, including two major institutes, namely Statistics Sweden (SCB) and the National Labour Market Administration (AMV).

Starting with the first, Statistics Sweden, has carried out forecasts of supply and demand of qualification, by type of education, since the 1960s. For that purpose two models of forecasting are used. These are the Trends and Forecasts model and the Education and Demand for labour model. The former provides information about the demand for labour within different industry sectors whereas the latter calculates labour market flows, with the objective of comparing new supply with estimated recruitment need.

On the other hand, the National Labour Market Administration conducts both short-term and long-term forecasts. The Country Labour Boards and the local employment services carry out the short-term forecasts regularly. These are developed on the basis of data collected from questionnaires whereas the findings are published in a report series called 'where is the jobs'. The long-term forecasts, which are not regularly conducted, concern the demand for labour and especially the expected leavers into retirement.

Finally, forecasts are also conducted by a number of other actors such as the Swedish Business Development Agency, the Confederation of Swedish Enterprise and the National Agency for Education.

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Lindskog, M. (2004) Labour market forecasts and their use- policies in the Scandinavian countries, WZB Discussion Paper (forthcoming).

Internet sites

http://www.wz-berlin.de/ars/ab/qb/publikationen/publikationen.en.htm

www.ams.se

www.hsv.se

www.scb.se

5.14 United Kingdom

The UK Context: Institutional and Legal Background

As noted in the introduction, the context within which work on anticipating skill needs takes place is of crucial import in shaping the form it takes. The situation in the UK is described here in some detail, not because this is regarded as "best practice" but more to illustrate such factors that may constrain what is done. There are a number of parallels with the situation in South Africa.

The 1980s saw significant changes in the UK's approach to VET, marked by an emphasis on developing a national system for defining and certificating occupational

competencies, and based upon the use of qualifications policy and funding mechanisms as the main drivers for change. These changes were presented as a demand-led approach, driven by the needs of employers.

In recent years the UK has been moving towards a more decentralised system of government, with the establishment of devolved administrations in Scotland, Wales and Northern Ireland. The systems described in detail are mainly those of England.

The rationale for the recent changes was based upon the need for:

- Greater international competitiveness;

- Improved workforce performance through an emphasis on world-class standards;

- A rationalised, simplified and transparent system of qualifications to raise the esteem of vocational education;

- An emphasis on breaking down unnecessary barriers to transfer; and

- Progression, to support greater workforce flexibility and mobility.

It is important to recognise that there are significant differences between countries in the approaches to these issues (especially anticipation of future skill requirements). These differences reflect both different cultural, historical and institutional backgrounds, (which influence the general approach to such problems), as well as more specific differences related to data availability (which can constrain what is technically feasible). Generally speaking, the UK is relatively well served in the terms of the quality of local labour market data, although specialists will always be arguing the case for further improvements. However, some knowledge of the institutional framework within which such work has taken place is, very important for a proper understanding of the key issues. Further discussion about the role of the various actors is provided below.

Until the mid-1990s, responsibility for education and training in England was divided between two government departments: the Department for Education (formerly the Department of Education and Science); and the Employment Department (which absorbed the Training Agency, formerly the Manpower Services Commission in the

early 1990s). The two departments were merged in 1995 to create the Department for Education and Employment (DfEE), but most employment functions were transferred in 2001 to a new Department of Work and Pensions (DWP), leaving responsibility for education and training with a re-named Department for Education and Skills (DfES). Although the DfES is the lead department for education and training policy in England, Wales and Northern Ireland, responsibility for education in Wales and for education and training in Scotland and Northern Ireland are devolved, with both countries having their own education ministers and administrations.

In the late 1990s, the issue of anticipating skill needs in the UK was put under the spotlight by the National Skills Task Force (NSTF). This was a national body set up by the Secretary of State for Employment in 1998 to assess the UK's future skill needs It had members from a broad range of companies and other bodies although it was not intended to be representative.

The DfES is the national government department responsible for labour market and related issues. It is responsible for collecting and analysing labour market data as well as carrying out various other evaluations of specific training programmes and policy initiatives.[7] The DfES itself carries out some of this analysis itself but it has a long history of commissioning research on the labour market from external bodies such as IER. This includes, in particular, formal assessments of future skills needs.

With the introduction of the 70 (or so) Training and Enterprise Councils (TECs) in England and Wales and the 22 Local Enterprise Councils (LECs) in Scotland, after 1988 the responsibility for delivering government training programmes for young people and the unemployed passed to the local level. These organisations often conducted their own surveys of employer's labour and training needs in order to get a local perspective. Many also commissioned forecasts from organisations like the IER, Cambridge Econometrics, or Business Strategies Ltd. These organisations estimated local labour market trends on the basis of analysis of the Labour Force Survey and other national data sets. Various software packages were developed to exploit the data collected by DfEE.

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[7] The LFS, in common with other official surveys, is organised by the Office for National Statistics (ONS). The DfES also commissions its own surveys which are conducted by commercial survey companies.

In April 2001, the TECs in England were replaced by 47 Local Learning and Skills Councils (LLSCs). These are local arms of a national body set up to overview educations and training provision post 16 (excluding University). This is the national Learning and Skills Council (LSC). Other arrangements apply in the newly devolved Wales, Scotland and Northern Ireland.

Originally, TECs and LECs were set up to pursue the interests of employers as far as education, training and skill provision was concerned. This had already begun to change in the late 1990s, with many TECs and LECs engaging in partnerships with other local organisations, including Chambers of Commerce as well as broadening their membership, scope and objectives.

The new LLSCs are arms of a national quasi-governmental body (Quango), with strong representation from employers but also from social partners and education and training providers. The national LSC is primarily focussed on England. The newly devolved administrations in Scotland, Wales and Northern Ireland are each developing their own institutions and structures for dealing with these matters. These include national bodies such as Future Skills Scotland.

Careers guidance companies have also recently been privatised (previously they were part of local government). They are now taking an active interest in anticipating future labour market conditions on behalf of the clients they advise. They also operate at a local level. Moreover, education and learning suppliers (colleges, universities, etc.) have been charged with the responsibility of ensuring that the courses they provide are relevant to future labour market needs.

There has also been change in the institutions charged with taking a responsibility for sectoral interests. Between 1964-1988 the UK had a system of sector-based industrial training boards (ITBs). These had statutory powers to raise a training levy on the companies defined as being 'in scope' to them, which was based on the number of employees in each company. The ITBs collected data on the occupational structure and the volume of training undertaken, since this was linked to the analysis of their administrative returns. One of their duties was to forecast future training needs and to ensure that sufficient training was available to meet these needs. ITBs

were set up for a wide range of sectors. Probably the most important of these were the Construction Industry Training Board (CITB) and the Engineering Industry Training Board (EITB). The ITBs were largely disbanded by the Conservative Government when the TECs were established in the late 1980s. However, a few of the larger ones such as the Construction Industry Training Board and SEMTA (which is responsible for Engineering) have survived (EITB was succeeded by the Engineering and Marine Training Authority (EMTA) and subsequently by SEMTA which has an additional remit to cover Science and Technology across all sectors). As a result, with these few exceptions, these valuable sources of data no longer exist. Both CITB and EITB (and, more recently, SEMTA) have actively pursued the development of tools to enable them to anticipate future skill needs. These are discussed in more detail below.

Numerous other sectoral bodies primarily set up to reflect employers' views, continue in existence. In the late 1990s, a new series of National Training Organisations (NTOs) were set up, operating at national level under the auspices of a National Council (NC). These included CITB, which was the NTO for construction and EMTA, which was responsible for engineering. Others covered areas such as Agriculture, Distribution, Rail Transport and Security Services. In total, there were well over 100 such bodies, most of which had a very specific sectoral remit.

From April 2002, these bodies were replaced by a series of new Sector Skills Councils (SSCs), operating under the auspices of a national Sector Skills Development Agency (SSDA). This new body is charged with providing a voice for employers about their skill and training needs at national level. The SSDA is responsible for organising the work of the SSCs. So far 5 "Trailblazer" SSCs have been set up and more are planned but nowhere near as many as the 100 plus NTOs that the NC had to cope with. Many of these new SSCs cut across traditional industry boundaries, reflecting the interests of their members, which often run along "supply chain" lines rather than within SIC boundaries.

Many employers' organisations, including the Confederation of British Industry (CBI) and also many of the sectoral organisations just described, conduct their own surveys of members, particularly of their perceptions of skill shortages. It is important to note, however, that there is often an element of social construction in claimed

levels of skill shortages. It is often the case that there are qualified workers who could be recruited but the employer is not willing to pay the appropriate wage. Some also conduct detailed assessments involving the use of quite sophisticated tools and methods. However, these remain the exceptions.

From 1986-97, the national accreditation agency specifically responsible for overseeing the development, implementation and quality assurance of NVQs throughout the labour market was the National Council for Vocational Qualifications (NCVQ). NCVQ was established in October 1986 following a government white paper in July 1986[8]. Although a public body, its legal basis was as a (non-profit making) "company limited by guarantee", with a board appointed by the Secretary of State for Employment in consultation with those for Wales and Northern Ireland. In October 1997, under arrangements set out in the Education Act 1997[9], NCVQ was wound up and its responsibilities were merged with those of the School Curriculum and Assessment Authority (SCAA)[10] within a new statutory agency, the Qualifications and Curriculum Authority (QCA).

QCA's statutory functions span both general and vocational education and include policy advice to the Secretary of State for Education and Employment and regulation of: 0-5 early years education; the 5-16 National Curriculum, statutory tests and publicly funded qualifications; all 16+ general and vocational qualifications (with the exception of university qualifications). QCA regulates external qualifications – those qualifications that are awarded by a body other than the institution in which they are offered. Accreditation by QCA indicates that a qualification has been approved for inclusion in the National Framework of Qualifications and, as such, has met exacting criteria. Statutory regulation is used to safeguard the public interest where other mechanisms – including awarding bodies' own quality assurance arrangements – would not be sufficient to ensure proper maintenance of consistent standards across awarding bodies and over time. Although NCVQ's role was confined initially to providing a national system of accreditation and facilitating the development of qualifications by industry, the establishment of QCA consolidated a trend (evident

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[8] *Working Together – Education and Training*: White Paper presented to Parliament by the Secretary of State for Employment and the Secretary of State for Education and Science, supported by the Secretaries of State for Scotland, Wales and Trade and Industry and the Paymaster General, HMSO July 1986

[9] *Education Act 1997:* http://www.hmso.gov.uk/acts/acts1997/1997044.htm

[10] SCAA was responsible for the school curriculum and national assessment within the general education system.

since the early 1990s) towards greater regulation of all aspects of qualifications design, quality assurance and also, to an increasing extent, delivery.

The Secretary of State for Education and Skills, acting on the advice of QCA, has responsibility for approving qualifications that may be offered within the public education system of England (under the provisions of the Education Act 1997 as amended by the Learning and Skills Act 2000[11]). Similar provisions apply for Wales and Northern Ireland. These provisions apply to any qualification provision supported through public funds. All approved qualifications must be accredited by QCA within the NQF, and the DfES publishes the list of approved qualifications.

It should be noted that, at higher education level, the NQF overlaps with the framework of university qualifications regulated by the Quality Assurance Agency (QAA).

In 1999, following recommendations from the NSTF, a new series of projections were produced. These were carried out by the IER and published in a series of documents called *Projections of Occupations and Qualifications*. These results were made available via the Internet as well as more conventional means.[12]

The most recent UK national projections were commissioned by the Sector Skills Development Agency (SSDA) in partnership with the LSC. They are representing the broader interests of UK national government, as well as regional bodies. These latest projections include an unprecedented amount of detail, with consistent results for almost 70 industries down to the geographical level of 47 LLSC areas. These new projections were published in autumn of 2003 (Wilson *et al.* (2004).

As outlined below, there is therefore a variety of well-established mechanisms within the UK that have been used for analysing, identifying and forecasting labour market trends and skill needs. However, the reliability of estimates based on some of the national surveys (often adjusted to reflect regional conditions) may be questioned. Moreover, the fragmentation of the TEC/LEC system meant that the quality of

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[11] *Learning and Skills Act 2000:* http://www.hmso.gov.uk/acts/acts2000/20000021.htm

information often varied from one locality to another. With the setting up of the LSC and SSDA things have again become somewhat more centralised, with the aim of benefiting from economies of scale and use of common approaches.

However, a key question in the UK context is the extent to which this information is used effectively to plan training provision. The way in which funding has been distributed recently is on the basis of trainees achieving National Vocational Qualifications. The incentive has been for the TECs/LECs and now LSCs to support those that are cheapest in terms of unit costs. Although they have some scope for allocating their funding as they see fit, the dominant rationale is that of achieving completed National Vocational Qualifications (NVQs). Therefore the issue here is less the quality of data and analysis, but the fact that the system is very fragmented and that decision-making processes are not transparent.

Various actors have an interest in and play a crucial role in the anticipation of education and training needs. These include the following:

- The State/Government (at national and local level);

- Quasi governmental bodies (including regulatory & awarding institutions);

- Employers;

- Unions;

- Education & training providers;

- Individuals (who actually receive the education and training) & households.

Approaches to Anticipating Changing Skill Requirements in the UK

The Department for Education and Skills (DfES) (and its predecessor DfEE) is the UK government department responsible for labour market and related issues. It has for many years collected and analysed labour market data, based on a range of different sources (unemployment statistics, estimates of employment vacancies, pay and other key labour market indicators. These are collated and published in *Labour Market Trends* (formerly *The Employment Gazette*) and related publications. In

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[12] See the DfES Skillsbase site at : http://skillsbase.dfee.gov.uk/

addition, the DfES is responsible for commissioning the Labour Force Survey (LFS) as well as various other evaluations of specific training programmes and policy initiatives.[13]

The DfES has carried out some of the analysis of such data, but it also commissions research on the labour market by other organisations. This work includes forecasts of future labour demand. Academics and commercial consultants have usually undertaken such work.

During the 1970s and 1980s the UK Government invested heavily in macroeconomic model development. This included major programme grants (via the Economic and Social Research Council and its predecessors) to various organisations for the development of general macroeconomic models, as well as the DfEE's own support for work specifically concerned with the labour market. This was substantially reduced in the 1980s and the 1990s due to cut backs in public expenditure.

Pioneering work in the labour market area was conducted for the Engineering Industry training Board (EITB). This was published in Wabe *et al* 1975). Building upon this foundation, the Institute for Employment Research (IER) has received support for developing and running a sophisticated econometric forecasting model of the national economy over many years. This resulted in the production by the IER of an annual *Review of the Economy and Employment,* which looked at future trends in the labour market.[14] This was followed by the development of national models covering all sectors (Lindley, 1978 & 1980).

The National Employment Projections for the UK produced by the Institute for Employment Research (IER) were for many years the only source of detailed skill forecasts available in the UK. The Institute has been at the forefront of developments in this area since the late 1970s. These projections have been widely used and quoted, not just within the government department that sponsored the original work,

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[13] The LFS, in common with other official surveys, is organised by the Office for National Statistics (ONS). The DfES also commissions its own surveys which are conducted by commercial survey companies.
[14] For a short period in the late 1990s this work was undertaken by a commercial consultancy, Business Strategies Ltd. (BSL).

but across a broad range of different users including TECs, Local Authorities and other bodies. They have therefore had considerable influence on opinion.

There are many different approaches to the anticipation of future skill needs in the UK. The main approaches have included both quantitative and qualitative methods. For many years the dominant approach has been quantitative modelling, based around the use of a multi-sectoral macroeconomic model. The prime focus was on projecting occupational employment levels. The most recent studies have laid increased emphasis on modelling replacement demands, and the need for qualifications and generic skills (see Wilson 2000 & 2001 and Wilson *et al* 2004).

The macroeconomic model used in most of the work carried out in the UK is described in detail in Barker and Peterson (1987) and Barker (1989). It has a Keynesian structure incorporating Leontieff input-output system and concentrates on the determination of changes in the real sector of the economy. The level of desegregation of commodities and industries is considerable, some 50 sectors being distinguished.

From an early stage the UK analyses also included a spatial dimension, with detailed analysis of the Standard Regions of the UK (which include Wales, Scotland and Northern Ireland as well as the 9 regions of England. However, the regional projections only covered sector and not occupation until the early 1990s. The introduction of occupational projections at regional level reflected the shift in emphasis towards local provision of education and training programmes. More recently this has led to the further narrowing of the geographical scope to a focus on the areas covered by local bodies responsible for training.

Improvements made to the main macroeconomic model (MDM) have been more substantial than those to the occupational sub-model in recent years, mainly because of the better quality of data available. A key problem has been the lack of detailed data on occupational structure within sectors. This has meant that most analysis has focused on quite broad occupational categories. This is in marked contrast to the USA, where the Bureau of Labour Statistics produces much more detailed forecasts.

This is possible because of its regular and comprehensive survey of establishments, which collects data on occupational employment on an annual basis.

The approach used in developing the set of sectoral labour demand equations currently used in the macroeconomic model implements the principles of co-integration. The procedures are also used in most of the other behavioural equations, but not in the analysis of occupational structure although some initial attempts to develop the analyses along these lines have now been conducted (Briscoe and Wilson (2003)).

The occupational employment projections conducted as part of the IER's assessment exercise are therefore based on a sub-model which takes as input the industrial projections produced by the macroeconomic model. It is a 'top-down' approach, the industrial employment projections being disaggregated into the 25 occupational categories for each industry.

Following the recommendations of the NSTF, a new programme of regular projections was set up. This delivered detailed analyses and data, which have been made widely available using conventional publications and the Internet (see Wilson 2000 & 2001).

Most recently the SSDA, acting as a representative of more general government interests (including in particular the LSC), commissioned a new round of projections from IER. These were published in the autumn of 2003 (Wilson *et al.* (2004).

Local focus

As noted above, during the late 1980s and early 1990s, emphasis switched to a more local focus. In part this was supply driven. Improved access to local data, combined with ever increasing computing power, made development of local projections, linked to a national macroeconomic forecast, both easier to conduct and cheap. At the same time reforms in the system of education and training provision, with the introduction of TECs, led to a much greater interest in such projections.

Initially, such local projections were fairly rudimentary but rapid advances in computer technology and software, including the adoption of Microsoft Windows as a virtual standard, facilitated the development of a much more sophisticated approach. In a joint operation with Cambridge Econometrics (CE), the IER developed the first version of the Local Economy Forecasting Model in 1993 (for a detailed description see Wilson *et al* (1995)). LEFM provides a detailed desegregated database, covering all of the usual economic and labour market indicators for the locality. These are all linked by the same kinds of technical and behavioural linkages which one would expect to find in a national model, including a full input output matrix. Corresponding data are also provided within the package for the region within which the local area sits and for the whole of the UK. Links between the local area and the rest of the world are dealt with by modelling the flow of goods and services and of people across the local boundary.

LEFMs have been set up for over a hundred local areas since the model was first developed. The main clientele has been TECs. However, the package has also been supplied to Local Authorities, Careers Guidance Companies and a variety of other clients. It has been used to produce the economic and labour market forecasts, which lie at the heart of very many "Local Labour Market Assessments" and related reports. A version of LEFM has also been set up for countries outside the UK. Similar models have been developed in the USA by Treyz and Treyz (2001).

Use of Surveys and other instruments

In 1998 the Secretary of State for Employment set up a National Skills Task Force (NSTF) to advise him and the UK Government about the changing pattern of skill needs in the UK economy. The remit of the NSTF required it to "provide advice on the nature, extent and pattern" of skill needs and problems and "how these are likely to change in the future and what can be done to ease such problems". DfEE commissioned a programme of research intended to examine "The Extent, Causes and Implications of Skill Deficiencies" (ECISD). The primary stimulus for the ECISD research was the requirement of the NSTF for reliable and comprehensive information on skill needs and skill deficiencies. An additional stimulus for the ECISD project was the need to provide information on the geographical pattern of skill needs and problems for the newly established Regional Development Agencies (RDAs).

Previously, DfEE's main historical source of skills information was the Skill Needs in Britain (SNIB) survey. A major limitation of SNIB was that this survey relied on relatively simple measures of employer perceptions and responses to questions asking if they have recruitment difficulties and skills problems. This presupposes that employers can fully assess and articulate their skill needs, but it is known from other research that this is not always the case. Also, SNIB's limited sample size meant it could only provide simple analyses of skills problems by region. It was not able, for example, to give a breakdown by industry in each region.

The ECISD research programme comprised four major elements: a series of case studies, intensive (face to face) and extensive (telephone) employer surveys and a detailed econometric analysis of the results from the two surveys.

The extensive survey was repeated in 2001 and on a much smaller scale in 2002 (just 4000 interviews). These surveys have been renamed as the Employers Skills Surveys (ESS). They have spawned a number of detailed reports and analyses. The results of the ECISD and ESS research have made a major contribution to the evidence base on skill deficiencies, their causes and consequences in the UK. In 2003 the LSC commissioned a further round of employer skills surveys at both national and local level, involving an overall sample of around 68,000 establishments in England.

Skills Dialogues, forums that brought together government, academics and researchers, education and training providers and representatives from both sides of industry were also introduced. These focused on skill needs in different sectors. They were based around the data collected and created from the quantitative projections, the large national skills surveys and many others sources. These events were used as a means of dissemination for this labour market information and intelligence as well as a mechanism for drawing in opinions and views of a more qualitative nature from interested parties.

Internet sites

http://skillsbase.dfes.gov.uk/

http://www2.warwick.ac.uk/fac/soc/ier/

http://www.ssda.org.uk/

http://www.ssda.org.uk//pdfs/wf-national.pdf(Working Futures)

5.15 USA

The organization responsible for labour market projections in the USA is the **Bureau of Labour Statistics** (BLS). The BLS has been examining the future job prospects for over 50 years. Initially, the aim was to help World War 2 veterans return to the world of work. Ii is now used by a wide variety of organisations and individuals interested in changing employment structure and the implications for skill needs.

Since its beginnings, the methodology used has steadily evolved. In particular, the simple descriptive material about numbers employed by occupation has grown to a model based approach, which develops projections of the macro economy, the labour force, industry output and employment, and occupational employment growth.

The BLS also produces projections of labour supply Fullerton (2003). These focus upon aggregate labour market participation rates by gender, age and ethnic group but they do not have an occupational dimension. The projections are based on the Census Bureau of Population numbers (based on historical trends). Labour force numbers and labour market participation rates are projected for 136 age, sex and race or ethnicity groups.

Regarding labour demand, the long-term view of the US economy, on which the occupational projections are founded, is based on a scenario of a full-employment economy, in which labour markets clear. The growth in the macro economy is translated into the levels of final demand for the output of each industry, including levels of intermediate inputs that are purchased by each industry to produce the output. A detailed multi-sectoral macroeconomic model is used to project indicators of economic activity and growth including the annual rate of growth of productivity as well as general labour market indicators such as the unemployment rate. The model develops projections of four different categories of expenditures, namely, personal consumption, investment, government and foreign trade. These projections provide the key input to the industry output and employment projections, which in turn form the basis for the occupational projections. Occupational structure within industries is analysed using trend extrapolative methods. The above detailed data are coupled with expert assessment of likely trends to produce employment projections.

Based upon this the number of jobs needed to support the level of economic growth in each sector are estimated. In addition, job openings (replacement demands) are calculated by projecting both net employment growth and net employment needs.

The projections concern the primary, secondary and tertiary sectors of production and are broken down in 11 main occupational groups and 725 detailed occupations.

The projections of the industry flows of inputs and outputs make use of the 2002 North American Industrial Classification System (NAICS). The occupational staffing patterns needed are projected by using data from the Occupational Employment Survey (OES). Detailed occupational employment information is available from the OES for each of the NAICS-based industries.

The latest work of the BLS is reported in *Employment outlook 2002-12*, in the *Monthly Labor Review*, (Horrigan (2004) and Hecker (2004)).

Considerable efforts have been placed on measuring generic skills in the USA in recent years, including the development of the O*NET system. This is probably the most sophisticated (and complicated) system for measuring and assessing such developments anywhere in the world. Barnow (2002) provides a useful summary. At present this system does not include any forward-looking element.

There are a large number of more localized projects involved in labour market projections in the USA. For example: the ***Occupational Forecasting Conference: State of Louisiana US.*** The occupational Forecasting Conference was created by statute to develop official information on long term job growth and demand. The aim of the conference is to develop and approve occupational forecasts, discuss and approve methodology and examine issues relevant to occupational forecasting in the State of Louisiana.

For more information go to: http://www.laworkforce.net/ofc/index.htm

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Internet site

USA: Bureau of Labor Statistics

http://stats.bls.gov/

http://www.onetcenter.org.data Structure.htm

http://www.laworkforce.net/ofc/index.htm

6.   OTHER GENERAL STUDIES

6.1   Anticipation of skill needs (ATheNet)

The AThENet Project

AThENet (Anticipation of Training Needs for a European Network) was a project organised within the context of the European Union's Leonardo da Vinci programme and involving a partnership of organisations from Italy, France, Germany, Spain and the United Kingdom. The project's aim was to build a network for the permanent exchange of information. The aim was to provide the participating countries with a comprehensive comparative understanding and common conceptual overview of:

- Labour market demand;

- The identification of future skill needs;

- Their utilisation in active labour market policies; and

- The identification of training and qualification needs at a European level.

The UK was represented in the project by the Institute for Employment Research (IER), University of Warwick, and the Qualifications and Curriculum Authority (QCA).

6.2   Early identification of skill needs in Europe:

6.2.1 European Conference, Berlin, 30/31 May 2002:

The German Ministry of Education and Research, and Cedefop organized the conference. The aim of the conference was to explore the question of how future oriented skills and competencies can be identified early and how education and training should be shaped to meet future trends. Particularly, were discussed a wide range of activities and approaches on how to identify new skills emerging at national, sectoral and regional level.

Spanish contribution: Jordi Planas addressed the development of forecasting tools and the development of a 'skills observatory' that will collect and evaluate skill needs.

Italian contribution: Mario Gatti presented an Italian survey network for new skills.

6.2.2 European Conference, Thessaloniki, Greece, 22/23 May 2003.

This was the second expert meeting for identification of skills in Europe. The conference took place in Thessalonica in the occasion of the Greek Presidency.

Note: The proceedings of the conferences have been published by CEDEFOP (English version) and BMBF (German version). For more info go to:

http://www.cedefop.eu.int/mt_conference/mt_conf4en.html

6.3   Other Country Websites

Denmark: Danish Institute of Border region Studies (?)

Website: *http://www.ifg.dk/en/about_us.html*

New Zealand: Institute of Economic Research

Website: *http://www.nzier.org.nz*

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Separate annexes and reports connected to the present document

Main Report:

Wilson, R. A., I. Woolard and D. Lee (2004). *Developing a National Skills Forecasting Tool for South Africa.* IER/HSRC/Department of Labour.

Separate Annexes:

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.

B: Labour Market Projections: A Review of International Best Practice

C: A Critical Review of Previous Work on Employment Projections in South Africa.

D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

Developing a National Skills Forecasting Tool for South Africa

Annex C: A Critical Review of Sectoral Forecasting and Employment Projections in South Africa

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1. BACKGROUND

In Annex A and B, a "top down" methodology for employment forecasting is set out, in which sectoral forecasts are fed down into an occupational model. This Annex documents some of the existing sectoral modelling work already in existence in South Africa and assesses to what extent these models could be used or adapted to meet the specific requirements of the occupational forecasting envisaged.

In addition, this Annex discusses some of the recent work that has been done on employment forecasting in South Africa, namely the work of Whiteford *et al.* (1999), van Aardt (2001) and Woolard *et al.* (2003).

2. SECTORAL MACROECONOMIC MODELLING

A wide variety of economic actors – most obviously private sector firms, government and labour – have a strong need for information about the future macroeconomic environment and the consequences for production and demand in specific sectors or sub-sectors. Consequently, a large number of macroeconomic and sectoral models already exist in South Africa.

The existing South African models can be broadly divided into "econometric" and "general equilibrium" approaches and these are discussed here in turn. "Econometric" modelling is used here to refer to models in which the parameters are estimated using standard econometric techniques. These are typically time series models where data over a reasonably long period are required in order to provide parameter estimates. In "general equilibrium" modelling, on the other hand, the parameters are often obtained by calibrating rather than estimating.

2.1 Econometric models

Econometric models have a much richer tradition in South Africa than general equilibrium modelling (van Seventer, 2003). For ease of exposition, within the rubric "econometric models" it is possible to distinguish (rather artificially) between two approaches, namely partial equilibrium time series analysis and economy-wide modelling.

2.1.1. Single equation and partial equilibrium time series analysis

Partial equilibrium models focus on a particular issue, such as economic growth or investment behaviour or money supply, without worrying much about other aspects of economy-wide adjustment. Based on time series data, past behaviour is analysed and policy conclusions are drawn. For example, Fedderke, Shin & Vaze (2003) investigated the relationship between trade and labour usage in South Africa and found that the "growth of real wage rates are a plausible explanation of the high and sustained levels of unemployment in South African labour markets". From this, one might conclude that the appropriate policy response to the unemployment crisis would be to deregulate the labour market and abandon minimum wages. These recommendations might, however, impose side effects, which may or may not counter-balance the reduction in unemployment anticipated by the lowering of wages. These general equilibrium feedback effects are typically ignored in partial equilibrium analysis.

This type of analysis remains imperative, however, since it can describe the behaviour of important economic variables, such as pricing, wage setting, import and export behaviour, substitution in production, household consumption and others. Moreover, single equation econometric modelling is very much complementary to general equilibrium analysis in that the estimated parameters of this kind of analysis provide the necessary elasticities and coefficients needed for successful economy-wide policy modelling.

2.1.2. Economy-wide econometric modelling

Economy-wide econometric modelling entails the comprehensive representation of an economy in which the behavioural relationships are all fully estimated and then often (but not always) re-estimated on a regular basis.

The South African Reserve Bank (SARB) and the National Treasury (NT) both run quarterly models that focus on the aggregate macroeconomic variables without going into much sectoral (industrial) detail. The focus of the SARB's model is on forecasting the typical macroeconomic variables (such as output and productivity) as well as the monetary policy variables that the SARB is obviously most interested in. The Treasury on the other hand focuses on the broad macro variables needed for medium-term fiscal budgeting. While these macroeconomic forecasts are published

regularly, the detailed specifications of the SARB and NT models are not in the public domain.

Some aspects of the SARB macro econometric model have been made public sporadically (e.g. Pretorius & Smal, 1994; Pretorius & Knox, 1995; Pretorius, 1998; Smith & van den Heever, 1995; Smal, 1995 & 1996 and de Jager 1998). Both the SARB and NT models can be summarized as conventional Keynesian demand-oriented model with explicit supply elements (van Seventer, 2003). These supply elements consist of a measure of potential output which, in conjunction with the expenditure-determined actual output, provides an estimate of economy-wide capacity utilization. This also generates an estimate of the potential rate of growth. The latter then serves as a variable supply constraint in the determination of imports, investment, prices and wages. Cyclical movements are captured for a range of macroeconomic variables up to 5 years ahead.

The Bureau for Economic Research (BER) at the University of Stellenbosch has arguably the longest history of econometric forecasting outside of the SARB. Indeed, early versions of the National Treasury model were based loosely on the BER macro model (although the two models have since developed quite separately).

In addition, a range of private sector research companies also maintains large economy-wide models. The best known of these is the Global Insight econometric model, which is used by, *inter alia*, ABSA Bank (ABSA, 2004). The Global Insight macro econometric model is not desegregated to a sectoral level but rather feeds down into a detailed general equilibrium model (discussed in section 2.3 below). This is similar to the methodology used by Monash (as discussed in Appendix B).

2.2   General equilibrium modelling in South Africa

General equilibrium modelling allows one to step away from the traditional "holding everything else constant" (*ceteris paribus*) assumptions that are inherent in partial equilibrium models. By doing so, a general equilibrium model helps to represent a much more real world situation, where almost all critical macroeconomic variables have many interactions and feedback cycles in their determination. This ability to model the second round effects and interrelations between different markets greatly enhances the predictive capability of the forecasts.

Computable General equilibrium (CGE) models are economy-wide models based on a Social Accounting Matrix (SAM). A SAM is "… the presentation of SNA [System of

National accounts] accounts in a matrix which elaborates the linkages between Supply and Use tables and institutional sector accounts" (SNA, 1993). The input-output framework is a widely used matrix framework to provide detailed and coherently arranged information on the flow of goods and services and on the structure of production costs.

Desegregated linkages between the accounts for goods and services, the production and generation of income are further developed in the 1993 SNA's Supply and Use (SU-) tables, through a specification of output of categories of goods and services by industry. However, those matrices do not incorporate the interrelationships between value added and final expenditures. By extending SU-tables to show the entire circular flow of income at a meso-level, one captures an essential feature of a social accounting matrix (SAM). In many instances SAMs have been applied to an analysis of interrelationships between structural features of an economy and the distribution of income and expenditure among household groups. Evidently, SAMs are closely related to national accounts, in that their typical focus on the role of people in the economy is reflected by, among other things, extra breakdowns of the household sector and a desegregated representation of labour markets e.g., distinguishing various categories of employed persons. On the other hand, SAMs usually encompass somewhat less detailed SU-tables. The design and construction method of SAMs are not standardised according to the SNA, in order to give countries the flexibility to design a SAM according to their specific situations.

Although Input-Output tables are available from Stats SA for selected years going back as far as the early 1970s, the SAM history in South Africa is more recent. SAMs have been compiled on an *ad hoc* basis for South Africa starting with an effort by the former Central Economic Advisory Service (CEAS, 1986) for the year 1978, van Seventer et al (1992), Central Statistical Services (CSS, 1992 & 1993) for the year 1998, van der Merwe & van Seventer (1995) for the year 1993 and WEFA (1997, 1999) for the years 1995 and 1997 respectively.

The most recent offering is a SAM for the year 2000 compiled by Thurlow & van Seventer (2002), which is based on a Supply-Use Table for 1998 and institutional details from the WEFA (1999) SAM for 1997. This SAM incorporates the latest input-output and household income and expenditure available and is tailored to the specific needs of an economy-wide modelling framework.

2.2.1 First generation SAM based modelling

First generation SAM-based modelling attempts to quantify the backward linkages of any impulse or shock to the economy. Such first generation models only focus on demand-side effects and assume that production technologies as well as prices remain constant.

An important assumption of first-generation SAM based modelling is that the production structure remains constant. Thus, this kind of analysis is comparative static by nature and ignores any dynamic effects, such as substitution between production factors (labour and capital) and between domestic and imported intermediates. This kind of SAM-based modelling therefore has relatively modest aims, in that it can answer "what if" type questions while holding all other economic conditions constant.

Like standard input-output analysis, SAM analysis also assumes that there is sufficient capacity available in the backward linkages to satisfy the demand of the stimulus at hand and that prices will therefore remain constant. This may be true for most secondary and tertiary sectors, but not necessarily for primary sectors. For example, it is possible that agriculture or the coal sector will *not* expand their production to meet additional demand for those products that are directly or indirectly related to, say, a public sector infrastructure investment or any other injection into the economy. It is conceivable that those sectors will, for example, divert exports to an expanding domestic market. This can be addressed by imposing supply side constraints on the multipliers (Lewis & Thorbecke, 1992: 887). In a SAM modelling context, the same principle can be expanded to apply to all endogenous variables.

A number of first-generation SAM based modelling applications have been undertaken in the South African context (see for example Dryer & Brand (1986), van Seventer (1987), Wang & Mullins (1988), Roukens de Lange (1989) and McDonald & Punt (2002)). In general, these applications have focused on the economy-wide impact of exogenous shocks, macro-policies and income redistribution.

2.2.2 Second generation SAM based models in South Africa

Although the behavioural specifications in a first-generation SAM based multiplier model emphasize important linkages in the economy, the models are demand driven and are awkward in dealing with issues such as resource allocation, productivity and

price changes and factor utilization. Fixed coefficients mean that substitution possibilities in consumption, production, imports and exports are ignored as well as supply-demand interactions of institutions operating across markets in response to shifts in market signals. Various macroeconomic adjustments or "closure rules" allow for different macro theoretical perspectives or major macro policy levers to be identified as the drivers of the economy. The most contentious one is whether the South African economy is savings or investment driven.

Neoclassical economists would argue that it is *prior saving* that matters for investment. The policy recommendations are then clear-cut: efforts should be focused on maintaining high levels of national saving to finance investment spending. Specifically, fiscal policy should actively promote national saving through cuts in government spending and subsequent increases in government saving while monetary policy should keep real interest rates positive and high to encourage saving through the financial sector

By contrast, Keynesian or Post-Keynesian economists would argue that investment causes saving and thus cuts in government spending and high real interest rates suppress investment output and therefore investment growth. The Keynesian policy prescriptions focus on the incentives to invest and how government policies can create a favourable environment for sustained increases in private investment expenditure and income and therefore savings. A recurrent policy prescription in Keynesian writings is the emphasis on the complementary relationship between public investment and private investment (the so called "crowding-in" effect), and how low real interest rates impact positively on private investment by lowering the cost of capital.

2.3   CGE Modelling in South Africa

There is now a well-established tradition of using CGE models in South Africa. Gelb, Gibson, Taylor and van Seventer (1992) developed the first dynamic one sector computable general equilibrium (CGE) model of the South African economy, based on an aggregate SAM extended with financial variables for the year 1990.

Naudé and Brixen (1993), using a modelling template previously developed at the World Bank, examined the impact of an increase in government expenditure, export demand, world price and a lowering of import tariffs under various sets of "closure rules".

Tarp & Brixen (1996) took the IMF's financial programming model and the World Bank revised minimum standard model and applied it to the South African economy. With this framework they then investigated exchange rate devaluations, external borrowing by the government and higher international reserves.

Subsequently, several large scale multisectoral CGE models of the South African economy were developed by the Industrial Development Corporation (Coetzee *et al*, 1997), the World Bank/OECD (van der Mensbrugghe, 1995) and the Development Bank of Southern Africa (Gibson & van Seventer, 1996a) which resulted in a number of applications such as investigations in trade liberalisation, green trade restrictions, devaluation and government expenditure and restructuring (see for example Cameron 1994, Gibson & van Seventer (1996b, 1997a, 1997b, 2000a, 2000b, Gibson, 2000a).

There are several CGE models currently in use – and regularly maintained – in South Africa. For example, Global Insight maintains a 36 (industrial) sector CGE model, which provides the sectoral detail for their forecasts. (As mentioned previously, they have an economy-wide econometric model that feeds into this CGE). Some of these models are run using GEM (e.g. Global Insight and University of Pretoria) while others use GAMS (e.g. IFPRI/TIPS, World Bank and HSRC).

However, the focus here is on the CGE that is publicly available, namely the IFPRI/TIPS model. James Thurlow at the International Food Policy Research Institute (IFPRI) and Dirk van Seventer at the Trade and Industry Policy Strategies (TIPS) have carefully documented a standardized CGE model for South Africa and the model can be downloaded from the TIPS website (Thurlow and van Seventer, 2002). The IFPRI/TIPS model for the South African economy is an adaptation of the standard IFPRI model described by Lofgren, Harris and Robinson (2001). It is based on a SAM for 1998 which Thurlow compiled using national accounts information and recently released supply-use tables. By updating to a recent year, and by distinguishing between producers and commodities, this SAM is an improvement on the existing SAM databases for South Africa. Furthermore, this SAM is made consistent with the requirements of IFPRI's standard comparative static CGE model.

Given that the CGE model is an attempt to express the flows represented in the South African SAM as a set of simultaneous linear and non-linear equations, the model therefore follows the SAM desegregation of factors, activities, commodities and institutions. The equations describe the behaviour and interactions of these

factors using rules captured by both fixed coefficients and non-linear first-order optimality conditions. Furthermore, the equations ensure that a set of both micro and macroeconomic constraints are satisfied, such that factor and commodity markets, savings and investment, and government and current account balance requirements are met.

2.4 The use of CGE modelling to forecast labour demand in South Africa

In 2003, the Human Sciences Research Council (HSRC) commissioned an international expert, Prof. Robert Davies of the University of Zimbabwe, to extend the dynamic CGE model developed by Thurlow so as to make forecasts of labour demand over the medium term under a range of plausible scenarios. This project is nearing completion and promises to be a useful starting point for the type of multi-sectoral modelling required for this project.

3. PREVIOUS WORK ON OCCUPATION FORECASTING

3.1 HSRC projections of "work force needs" (1999)

In 1999 the Human Sciences Research Council (HSRC) undertook a study of South African labour market trends and workforce needs in respect of formal employment for the period 1998 to 2003 (Whiteford, *et al.* 1999). The study incorporated eight of the nine economic sectors of the South African economy. (The agricultural sector was excluded.) Detailed forecasts of future demand were made at sub-sector level of the 68 professional and 10 artisan occupational categories. From the outset, the authors were aware of some of the limitations of this type of research:

They acknowledged at the outset that "human resources forecasting, better known as 'manpower forecasting' has always been and still is a controversial activity. Criticism against forecasting relates to certain labour market analysts beliefs about the need for such efforts, the accuracy with which forecasts can be made, the context within and reasons for which forecasting is done, and the methodology used in the process." (Whiteford, *et al.* 1999:1)

The 1999 study commenced with a survey of employers. Information was gathered on employers' views regarding current as well as expected employment, skill shortages and possible changes in future skills needs. This was done by means of

structured questionnaires with key informants in 273 randomly selected companies. An integrated demand-forecasting model for 1998 to 2003 was then developed.

The study examined 36 sub-sectors of the economy and looked at the division of these 36 sub-sectors by 81 different occupational categories and tried to forecast changes to these sub-sectors, and their relative shares of occupations, over a 5-year period. This results in the model making 2916 individual forecasts.[1]

Changes in total employment arise from two major contributors: changes in output and changes in labour productivity. Estimates of the change in these two factors and the derived change in total employment in each sub-sector were based on the expectations of persons active in each sector. In the survey, respondents were asked to estimate the change in output and the change in employment within their sector. From this it was possible to calculate the change in employment relative to the change in output or, more technically, the elasticity of labour demand relative to sector growth.

The 1998-2003 study separately looked at the expected future supply of and demand for labour in South Africa but did not go so far as to make a comparison between the two (Whiteford, Van Zyl, Simkins & Hall 1999:124).

On the demand side, the basic forecasting methodology comprised of four phases:

1. Estimation of the total employment in each of the 36 sub-sectors of the economy and the distribution of that employment across 81 occupational categories for 1998.

2. Forecast of the change in total employment in each sub-sector between 1998 and 2003.

3. Forecast of the change in occupational composition in each sub-sector between 1998 and 2003.

4. Distribution of forecast (2003) total employment in each sub-sector across forecasted occupational composition to arrive at occupational employment in each sub-sector.

On the supply side, the future supply of high-level human resources (HLHR) was estimated by obtaining a current estimate of the stock of HLHR through a stock-flow

modelling process and including projections of the future output of institutions of higher learning.

The fact that detailed comparisons of supply and demand were not undertaken reflects the difficulties (both practical and conceptual) that face the analyst in this objective. Only a few of the projections made in other countries have even attempted to do this.

3.1.1 How good was the HSRC (1999) forecast?

A study by Oosthuizen (2003) compares the observed trends in employment growth (based on the October Household Surveys) between 1995 and 1999 with the HSRC projections for 1998 to 2003. The critique by Oosthuizen is premised on the idea that the HSRC projections for the period 1998-2003 can be judged on the historical occupational changes between 1995 and 1999. Given that the two periods barely coincide, it is not immediately apparent why this should be a useful comparison.

Oosthuizen (*ibid*) argues that the HSRC forecasts were much better for highly skilled categories of workers than for unskilled workers. He goes on to say that this can be explained by the (explicit) exclusion of the informal sector from the HSRC modelling exercise. He argues: "with as many as 30 percent of working individuals active in the informal sector, meaningful estimates of labour demand cannot be made without taking this sector into consideration". While recognising that the informal sector is an important part of the South African labour market, there is still considerable value in understanding the dynamics of formal sector occupational growth and change.

Forecasting the size of the informal sector is an extremely difficult task, due in part to the lack of exact and reliable data from which to derive trends, and in part due to its dynamism and unpredictability.

Oosthuizen (ibid.) argues that "[d]espite the fact that the projections presented in the HSRC report are relatively accurate when compared to the real figures, there remain some methodological issues that may have resulted in inaccuracies". The main issue that he raises pertains to the use of outdated data. The most recent issue of the Manpower Survey that the authors of the HSRC report had available was for 1994. This was used to obtain the occupational breakdown of employment within each subsector for 1994, and historical trends were then used to estimate changes

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[1] 36 sub-sectors x 81 occupations = 2916 estimations

between 1994 and 1998. Oosthuizen argues that this is "a risky procedure when one considers all the economic and other changes impacting employment that occurred during this time." While this criticism may have some validity, it is important to recognise that *all* modelling efforts face data constraints.

The second methodological problem he raises revolves around the way in which firms were chosen to take part in the employer survey. Companies were randomly chosen from the *McGregors* database of companies. Consequently, none of the smaller, unlisted companies were surveyed. While "It seems highly unlikely that all employers, across the size spectrum, will experience identical trends in employment" (Oosthuizen, 2003), it is not clear how the study could have done better without engaging in a potentially costly and quite risky and difficult attempt to survey smaller companies.

3.2 HSRC (2003)

Woolard, Kneebone & Lee (2003) updated the earlier work by Whiteford *et al.*, focusing on employment forecasts for specific high-skill occupations over the period 2001-2006. They used a labour demand model to estimate the number of new positions that will arise as the result of sectoral growth. (The sectoral growth rates were exogenously specified) and a separate "replacement demand" model used to determine demand arising from retirements, emigration and inter-occupational mobility. They found that even in those occupations where employment levels are expected to decline substantially, there was likely to be a need to train new individuals simply to maintain the existing stock of skills at the required level.

A spreadsheet model was created, following the steps outlined below.

3.2.1 Baseline estimates

The first step was to estimate employment by occupation and sector for 2001. The previous study relied on the *Manpower Survey* to obtain the occupational structure of employment within each sector. Unfortunately, the most recent available *Manpower Survey* is for 1995. Consequently, Woolard *et al.* elected to use the data sets from the *Labour Force Surveys* conducted in February and September 2001. These two surveys were based on independent cross-sections, making it possible to pool the two data sets in order to obtain a reasonable sample size.

3.2.2 Sectoral forecasts

The second step was to obtain sectoral growth forecasts for the period 2001-2006. These sectoral growth rates are important exogenous variables as they play a large role in driving the model. They relied heavily on ABSA's growth predictions for the forecast period (ABSA, 2001). ABSA forecasts the performance of 37 sectors of the South African economy. The approach used is "top down", meaning that the analysis begins at the macroeconomic level. The various components of demand are forecast using a Keynesian demand model with a supply-side element that relies in turn on a variety of international and domestic assumptions. The projections of the components of demand then serve as inputs into an input-output based sectoral model. ABSA's sectoral forecasts are thus grounded on a set of consistent underlying assumptions about the macro environment for the next few years.

3.2.3 Demand forecasts

These sectoral forecasts were then fed through a matrix of elasticities to obtain the changes in occupational demand within each sector. (As explained above, these elasticities represent the change in employment relative to output growth.) The change in demand for a particular occupation was obtained by multiplying the sectoral forecasts by the elasticities and then adding up the occupational demand across all sectors. This then gave an estimate of the increase in the number of positions available for each occupation.

The elasticities used in the previous study had been estimated through a complex process heavily reliant on the information provided through interviews with companies and industry experts. A repetition of this survey process was beyond the scope and budget of the update, thus the elasticities obtained in the previous study were assumed to still hold for all sectors, with the important exception of IT.

In the case of IT, however, the authors were of the opinion that domestic and global circumstances had changed sufficiently to require a re-assessment of the elasticities used in the 1999 study. Interviews were conducted with several of the major IT companies and this information was used to re-calibrate the elasticities for computer-related professionals. In general, it was found that IT companies were far more cautious in their predictions about the demand for IT professionals than they had been three years ago. IT companies indicated that they did not expect their workforce to grow by more than 1% or 2% per annum over the next five years. In addition, they

indicated that very few "entry-level" positions were being created. If new positions were being created, these were for experienced staff or specialised programmers.

3.2.4 Replacement demand

In addition to this additional ("new") demand for labour, the authors needed to consider replacement demand arising from retirements, net migration, movement into other occupations and in-service mortality. Indeed, given the relatively low rate of economic growth in South Africa coupled with high mortality, it can be expected that replacement demand will exceed the creation of new positions.

Estimating replacement demand is not straightforward, especially in a country like South Africa where the data on the mortality effects of HIV/AIDS remain uncertain and controversial. To estimate replacement demand one ideally needs the following information:

Data on the age and gender structure of occupational employment;

Data on the rates of outflow due to:

- Retirement (and other reasons for leaving the workforce);

- Emigration;

- Inter-occupational mobility; and

- Mortality.

Information on the age and gender structure is required because many of the flows, especially retirements and mortality, are age and gender specific. Age structures vary significantly by occupation – for example, a higher proportion of managers than IT professionals are likely to be nearing retirement age. Differences in age structure across occupations will clearly influence exits, with more, older people retiring, but more, younger people changing occupations. Age structure also affects mortality – while older people are more likely to die of non-AIDS causes, younger people are more likely to succumb to AIDS.

Because the data for the model were obtained from a household survey, the authors had the distinct advantage of having detailed information about the demographics of

each occupation. This made it possible to estimate specific rates of retirement and mortality for each occupational class.

3.2.5 Validation of model results

The final step was to verify the plausibility of the results by means of interviews with industry experts. It was decided that these interviews needed to be done by the authors of the scarce skills chapters themselves as they had a deep and nuanced understanding of the specific occupational areas.

Where the results of the model were regarded as significantly out of line with the expert views, the authors re-visited the matrix of elasticities for that occupational group and considered whether it was reasonable to make small adjustments within the industrial sectors that seemed to be most in question. They did not, however, arbitrarily change the elasticities to manipulate the results to those that the experts expected.

3.3 Van Aardt (BMR) Projections (2001)

In 2001, the European Union, the Department of Labour and the Department of Trade and Industry commissioned Carel van Aardt from the Bureau of Market Research (BMR) at the University of South Africa (UNISA) to investigate key skills shortages and the fast tracking of skills development (van Aardt, 2001). Only skills shortages in engineering, information technology, management and related fields fell within the ambit of the study.

The study used a mixture of qualitative (interviews and workshops), quantitative (questionnaire and demographic analysis) and meta-analytical (secondary data) methodologies.

The data used for the BMR study were obtained from "researchers and institutions that have proved to be providers of reliable statistics or at least of statistics of greatest likelihood. Examples of such providers of reliable data included, *inter alia*, the World Bank group, the International Labour Organization (ILO), the South African Reserve Bank (SARB), the Human Sciences Research Council (HSRC), Statistics South Africa (Stats SA), the Bureau of Market Research (BMR), the Medical Research Council (MRC), the Development Bank of Southern Africa (DBSA) and the Actuarial Association of South Africa" (van Aardt, 2001: 43). The historical data used in the study were taken from these institutions. Stochastic forecasts were then made

using time series techniques (specifically the ARIMA method). Following this, probabilistic methods were used in order to provide a plausible *range* of outcomes. A number of expert interviews and workshops were conducted to validate and supplement the quantitative approach.

4. CONCLUSION

While it is easy to be critical of previous work in this area, it is important to recognise the difficulties faced by researchers, especially concerning the quality of relevant data. Rather than admitting defeat, it is the present authors' view that such problems and difficulties should be the spur for improvement and renewed effort.

The review of macroeconomic and multi-sectoral modelling in South Africa is encouraging, in the sense that it demonstrates the feasibility of carrying out such work in a South African context. In particular, there is a growing tradition of work on CGE models that provide the potential to produce a consistent set of sectoral employment projections, which lie at the heart of most national employment forecasting exercises. These include both private commercial operations (e.g. ABSA/Global Insights) as well as the IFPRI/TIPS model developed by Thurlow *et al.* The latter is in the public domain and is currently being extended so as to make forecasts of labour demand over the medium term under a range of plausible scenarios. Such models provide a useful starting point for the type of multi-sectoral modelling required for this project.

As far as occupational employment projections are concerned, the 1999 study by HSRC demonstrated the general feasibility of producing fairly comprehensive national projections. Subsequent exercises have demonstrated how this might be extended and refined, both with regard to methodology and use of information as well as emphasising the importance of the replacement demand issue. In some respects, the position on data has deteriorated since 1999, but on the other hand a number of important new data sets are now available. These should enable some progress to be made although further improvements in the underlying databases will be an essential part of any longer-term strategy to improve the anticipation of changing skill needs nationwide.

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Separate annexes and reports connected to the present document

Main Report:

Wilson, R. A, I. Woolard and D. Lee (2004). *Developing a National Skills Forecasting Tool for South Africa.* IER/HSRC/Department of Labour.

Separate Annexes:

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.
B: Labour Market Projections: A Review of International Best Practice
C: A Critical Review of Previous Work on Employment Projections in South Africa.
D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

Developing a National Skills Forecasting Tool for South Africa

Annex D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability

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TABLE OF CONTENTS

1.   SOURCES OF LABOUR MARKET INFORMATION

Considerable confusion can arise when employment sources are directly compared, and found to be widely divergent. Different types of surveys measure different things and are useful for different purposes. They are not necessarily interchangeable as sources of information on employment. This section compares data from a variety of different sources.

1.1   Enterprise Based Surveys

One of the most common errors has been to report on total employment using establishment or firm-based surveys. Unless considerable care is taken with the design of both the sampling frame and the way that individual enterprises are selected, such surveys cannot be used to provide information on overall levels of employment although they can provide useful indicators of employment structure.

Firm Level Surveys of Employment and Earnings

Prior to 1998, Stats SA conducted 17 monthly or quarterly business surveys. In an effort to improve coverage and reliability and to reduce the respondent burden, in 1997 Stats SA consolidated and streamlined its firm surveys by replacing the various business surveys with:

1. The Survey of Total Employment and Earnings (*STEE*) which was later renamed the **Survey of Employment and Earnings** (*SEE*); and
2. The Survey of **Average Monthly Earnings** (*AME*).[1]

The Survey of Employment and Earnings (*SEE*) is a quarterly survey covering a sample of 10,183 private and public enterprises in the formal non-agricultural business sector (those with a VAT turnover exceeding R300,000 per annum).

Prior to March 2003, Stats SA published the findings of the *SEE* as a "Discussion paper" (as opposed to a Release containing official data): it was aware that the survey had significant limitations because it did not collect information from the following industries:

- Agriculture, hunting, forestry and fishing;
- Restaurants and other eating and drinking places, boarding houses, caravan

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[1] A Survey of Occupations by Race and Gender was also planned but never got beyond the piloting stage.

parks and guest farms;

- Storage, water and air transport;
- Telecommunication services;
- Financial institutions other than banking institutions and insurance companies;
- Real estate and business services;
- Educational services;
- Medical, dental and other health services;
- Welfare organizations;
- Religious organizations; and
- Recreational and cultural services.

Given the limitations of the *SEE*, it is not surprising that any formal estimates of total employment are underestimated, as not all industries are covered.

Stats SA, in collaboration with the South African Revenue Services and the Departments of Trade and Industry and Labour, have now re-engineered the register of businesses and this now serves as the sampling frame (Stats SA, 2003). This new sample covers all the industries in the formal non-agricultural business sectors, i.e. all previously excluded industries mentioned above are now covered by the sample. Agriculture, domestic services and firms with a turnover of less than R300, 000 (which would include most of the informal sector) remain outside the ambit of the *SEE*. This also allows for a wider coverage of occupations within these industries.

Figure 1 shows the firm-level employment data broken down by sector for the period 1995 to 2003. The change to the sampling frame in 2002 led to a break in the series, with a leap in the measured employment in "banks, insurance, real estate and business services", wholesale and retail, and to a lesser extent in community services and construction. The change in sampling frame brought about substantial improvements in coverage in these sectors. The difference in levels of employment between 2001 and 2002 cannot be used to measure employment change over this period.

Figure 1: Employment by sector, Stats SA firm-surveys

Employment (thousands)	1995	1996	1997	1998	1999	2000	2001	2002	2003
■ Banks, insurance, real estate and business services	201	215	217	218	205	197	193	1230	1209
■ Wholesale, retail and motor trade and hotels	752	757	764	800	872	866	885	1298	1296
□ Community, social and personal services	1466	1597	1597	1578	1535	1473	1446	1708	1742
■ Transport, storage and communication	284	283	276	245	243	222	208	208	201
□ Construction	359	326	314	284	232	223	225	350	337
□ Electricity, gas and water	40	40	40	39	43	40	39	47	46
■ Manufacturing	1438	1456	1396	1352	1314	1307	1260	1250	1249
□ Mining	600	563	558	462	441	413	405	419	417

Source: 1995-2001 figures from Simkins 2003; 2002 figures from Stats SA P0275, August 2003; 2003 figures from Stats SA P0275, September 2003.

The Survey of Average Monthly Earnings (*AME*) is also a firm based survey and is run in conjunction with the Survey of Earnings and Employment (as discussed above). Its sample frame is similar to that of the *SEE* (prior to 2002) in that it only collects information from businesses in the formal non-agricultural business sector. This survey also does not collect any information from those industries mentioned above, i.e. the same industries that the *SEE* disregards prior to 2002. Any overall employment estimates from the *AME* will therefore underestimate the true total including those sectors not covered by the survey.

Manpower Survey

Since 1987, Stats SA has conducted the Manpower Survey on an annual basis. In 1996, the name of this survey changed to the Occupational Survey, which ran through to 1997. In 1998, it was replaced by the Survey of Occupations by Race and Gender, but this survey did not move beyond the initial piloting stage and was discontinued in 1998. The Manpower Survey *(MS)* was an enterprise-based survey covering private and public

enterprises in the formal non-agricultural business sector. It was conducted by mail and based on a sample of approximately 8,500 businesses/organizations. Agriculture, private households and the informal sector were excluded from the survey.

The *MS* covered enterprises in all eight non-agricultural major industrial groups and could be subdivided into further groups and sub groups according to the Standard Industrial Classification of all Economic Activities (SIC). This firm-based survey thus allowed for detailed desegregation by sector, yet accuracy and reliability of the data will drop as the 8 major industrial groups are examined in more detail. Estimates of occupational employment are also made for these industries, classified according to the International Standard Classification of Occupations (ISCO). This also allows for the desegregation of occupational employment by sector, yet once again the more disaggregated the analysis, the more unreliable the data become.

De Lange (1993: 53) disputed the accuracy of the Manpower Surveys, and claims that the "variability from one survey to the next is such that no useful trend information can be extracted for surveys after 1983". This problem persists even when occupations are aggregated to a small number of major groups, "rendering these surveys essentially useless for establishing trends and making suspect any information extracted from a specific survey" (De Lange 1993: 64).

Whiteford *et al*, (1999), in their analysis of these data suggest that there were often inexplicable fluctuations in occupational employment that could have arisen from the following sources:

▪ **Respondents' completing questionnaires incorrectly or interpreting the questionnaire differently over time**. This appears to be a particular problem in large corporations, such as Transnet and Telkom, where employment numbers in the *MS* seem to fluctuate considerably. For example, the 1983 *MS* reported that 309 electrical engineers were employed at Transnet during 1983. Two years later in 1985 the number decreased to 8 just to increase again in 1988 to 397. These figures, along with other questionable data contaminate the whole data set and render the analysis of trends over time extremely difficult.

- **Inadequate coverage of small enterprises**. The latter is a particular problem in the construction industry, where there has been a tendency for companies to reduce their employment complement and "contract in" skills in times of need. The *MS* indicated that there had been a consistent decline in the artisan share of employment in the construction sector, from 20,0 % in 1965 to 11,7 % in 1994. Rather than its being a reflection of a change in occupational composition, this was more probably a reflection of the fact that artisans were leaving existing construction companies and setting up their own businesses, which were not captured in the *MS*.

- **The exclusion of the TBVC[2] states**. As these four homelands became independent, they were excluded from the *MS*. This could have had a significant impact on trends observed in the surveys, since the homelands had significant public service employment and substantial numbers of teachers and nurses, as well as other professionals, in their employ.

SARS

SARS refers to a database collected by the South African Revenue Service (SARS), and it consists of enterprises that are registered for tax purposes. This database is continually updated and downloads are created on a quarterly basis by SARS. This database collects information on both private and public sector enterprises, yet although there are some government enterprises registered, the data on these public enterprises are inadequate for analysis due to overly small sample sizes. (See Table 1 below).

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[2] These were the independent homelands of Transkei, Bophuthatswana, Venda and Ciskei.

Table 1: SETA Information

SETA	NUMBER OF FIRMS
FASSET (1)	12,406
BANKSETA (2)	1,879
CHIETA (3)	3,638
CTFL (4)	4,697
CETA (5)	18,991
DIDETA (6)	80
ETDP SETA (7)	8,056
ESETA (8)	3,578
FOODBEV (9)	4,761
FIETA (10)	3,562
HWSETA (11)	22,407
ISETT (12)	7,987
INSETA (13)	6,193
LGWSETA (14)	1,806
MAPPP (15)	9,982
MQA (16)	3,362
MERSETA (17)	31,202
POSLEC SETA (19)	6,281
PAETA (20)	8,711
PSETA (21)	126
SETASA (22)	2,450
SERVICES (23)	57,224
THETA (25)	12,911
TETA (26)	8,573
W&RSETA (27)	33,320

Source: own calculations on SARS database of February 2003

The database supplied by SARS, as at February 2003 (the most recent readily available dataset at the time of writing), consisted of 274,183 establishments. It can be noted that this database is considered to be the most reliable indicator of the potential sampling frame of businesses that any other firm-level survey should attempt to cover.

1.2 Household Level Surveys

Household surveys

As a result of the unemployment debate of the mid-1970s, the Department of Statistics (which later became the Central Statistical Service and then Statistics SA) introduced the monthly Current Population Survey. For various reasons, not least the flaws in the sample design of the survey, this survey fell into disrepute and was abandoned in the late 1980s. After a gap of several years, the annual October Household Survey (*OHS*) came into existence in 1993, but excluded the TBVC states in the first year. The *OHS* had a detailed labour market module that covered a wide range of issues relating to formal and informal employment and unemployment. However, in order to fulfil the stringent reporting requirements of the IMF, in February 2000 Stats SA introduced a twice-yearly Labour Force Survey (*LFS*).

The household surveys (*OHS & LFS*) have a sample size of 30,000 households. Every individual over the age of 10 in the household is questioned about his/her employment status. The samples for the household surveys are drawn so as to be representative of the provinces or the four population groups. These surveys are discussed in more detail in the next section.

Some of the debate on employment figures relates to wide variations or seemingly sudden increases or decreases in labour force participation or economic activity. Since 1999 the household surveys (*LFS*) have tightened up methodologically in terms of taking a far broader view of what constitutes "employment" and the questionnaires have probed far more deeply for information on economic activity. As a result, the dramatic increases in measured employment between 1998 and 1999 and again between 1999 and 2000 are at least in part the result of methodological changes. The earlier *OHS* relied on self-described labour market status. For example, if a person described herself as a homemaker, she would be classified as "not economically active". In the *LFS*, a long list of questions is asked to determine whether an individual is engaged in any form of gainful economic activity in the 7 days prior to the interview. To continue the example, if this same individual who regards herself as a homemaker had spent an hour tending to her vegetable patch in the previous week she would be classified in the *LFS* as "employed". This may seem implausible as she is unpaid and doing informal 'work', yet she is still considered "employed" based on the *LFS* employment definition.

This increase in measured employment also has an effect on the labour force participation rate since some people who would have described themselves as economically inactive in the *OHS* would be classified as working (and thus economically active) in the *LFS*. It cannot be sufficiently overemphasized that the *OHS* total employment figures should not be compared directly with the *LFS* figures.

Labour Force Survey (and the previous October Household Survey)

In February 2000, Stats SA introduced the Labour Force Survey (*LFS*), to replace the *OHS*. Like its predecessor, the *LFS* is a household-based survey. The *LFS* collects information, twice yearly, regarding employed and unemployed persons in the formal AND informal business sectors. This new survey provides more detailed but similar information to the *OHS*.

The *OHS* was officially recognised in 1994 (including TBVC areas) and ran until 1999 collecting individual level data and household level data on the dynamics of employment and unemployment in South Africa per year. The *LFS* continues this analysis twice yearly and looks at these dynamics in a more in-depth manner.

For the *LFS*, Stats SA uses a rotating panel methodology to collect labour force statistics from households, in order to get a clear picture of the movements in and out of the labour market over time. This involves visiting the same dwelling units on a number of occasions (5 at most), and after this panel is established, replacing a portion of these dwelling units each time (approximately 20%). Each time new dwelling units are added to replace the old. This allows for longitudinal and cross-sectional analysis.

The first *LFS* took place in February 2000, and it was based on a probability sample of 10,000 dwelling units. Because of this limited sample size this is not an ideal data set to use for measuring occupational structure within sectors. The sample size was increased to 30,000 dwelling units in September of 2000. This enables a more detailed examination of occupational structure within sectors to be carried out. These same dwelling units from the first and second rounds were used for the third round in February 2001, but they were subsequently changed in September 2001 when a new sample of 30,000 dwelling units were introduced. The fifth round took place in February 2002, and it was then that the rotating panel was introduced.

There has been much debate over the wide variations or sudden increases or decreases in economic activity that these two surveys (*OHS & LFS*) seem to generate over time. For example, there are vast differences for employment figures between 1999 and 2000. These differences cannot wholly be attributed to changes in economic activity, but should rather be attributed to changes in methodology whereby the questionnaires for the *OHS* and *LFS* have been expanded to allow for better analysis of economic conditions. As a result, any dramatic increases in measured employment are due to methodological changes and thus are unreliable as an accurate estimate of the ***change*** in employment levels for that period. This can be said for the sectoral breakdown of these employment data as well. Nevertheless they may still provide some useful measures of ***structure*** at a point in time.

The fact that the *LFS* has a much more in-depth approach to determining employment figures compared to the *OHS* implies that these two household surveys are not directly comparable. This poses a problem with regard to analysing employment change over time, whether sectoral or occupational. One way of dealing with the problem of small sample size is to pool the data from more than one round of the survey. This can enable a more detailed occupation by industry employment matrix to be constructed than would otherwise be possible.

The target population for the *LFS* is all private households and residents in workers' hostels. The survey does not cover institutions such as students' hostels, old age homes, hospitals, prisons and military barracks. All the *LFS* results are based on a cross-sectional analysis at a point in time.

1996 and 2001 Population census

To date, there have only been two full population census of the whole of South Africa - in 1996 and 2001.[3] These censuses asked a few simple questions about work status. Because only a small number of questions are asked, it is not possible to probe deeply for information about activities that might be regarded as "work" but which the respondent does not regard as such. Consequently one would expect a population census to underestimate employment.

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[3] The 1991 Census used a technique called "sweeping" to estimate the population size of some parts of the country such as Soweto.

This is important. It must be remembered that questions about work are not always clear. For example, a broad question like 'do you work' might be answered 'no' if the respondent does not consider what she does as 'work', possibly because in her mind it is too marginal. However, her economic activity may nevertheless fit with the official definition of employment. More significantly for the South African case, these are the first national surveys that ask people about their livelihoods – this requires some self-awareness, and also awareness by survey designers about the possible character of non-formal economic activity. The post-Apartheid period released people from oppressive legislation enabling greater economic participation, but at the same time the statistical agency had little experience in measuring non-formal economic activity, and respondents had little experience in describing their circumstances.

Figure 2 shows that there are indeed substantial differences in labour market status depending on whether use is made of the September 2001 *LFS* or the 2001 Population Census conducted a month later. It is clear that the self-description in the Census leads to far fewer people being classified as employed (and far more as unemployed) that the *LFS*. For example, the census and *LFS* finds unemployment rate of 41.6% and 29.3% respectively, almost wholly due to the variations amongst African respondents. It must be emphasized that Stats SA make it very clear that the *LFS* is the official source of labour market information.

Figure 2: Distribution of the working age population by labour market status and race, LFS September 2001 and Census 2001

	LFS	Census	LFS	Census	LFS	Census	LFS	Census	LFS	Census
	African		Coloured		Indian		White		All	
Not economically active	47.1	44.1	36.2	36.2	36.9	36.9	31.0	34.5	43.9	42.3
Employed	33.9	27.8	49.8	49.8	46.1	46.1	64.9	61.4	39.8	33.7
Unemployed (official defn)	19.0	28.1	13.9	13.9	17.1	17.1	4.1	4.1	16.5	24.0

Unemployment rate (%)	35.9	50.3	21.8	21.8	27.1	27.1	5.9	6.3	29.3	41.6

12
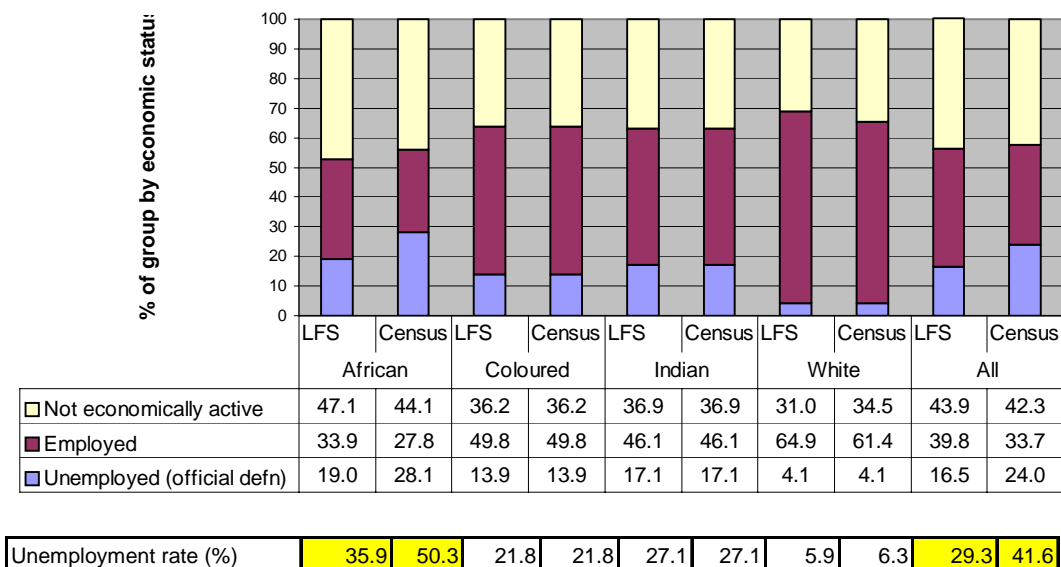
Once all the counting was complete and analysis could take place, certain comments were made by the Statistics Council Census sub-committee. Preliminary independent demographic analyses of the census suggested that the final census figures probably represent the following:

- An underestimate of children under age five;
- An overestimate of children aged between ten and nineteen;
- An underestimate of men relative to women; and
- An underestimate of the white population;
- An overestimate of the extent of unemployment; and
- An underestimate of those who were only employed for a few hours per week.

Given these comments by the sub-committee, there are a few labour market issues that come into play with regard to comparability of the census data with the *LFS* data. The census produces lower estimates of labour force participation than the September 2001 *LFS*. There is also possible underreporting of employment in the informal and subsistence agriculture sectors, particularly among those who work only a few hours per week. The *LFS* questionnaire includes more prompts to clarify these issues, which is not possible during census enumeration. The UN and ILO thus note that the *LFS* is expected to produce more reliable estimates of labour market variables than censuses. Consider a labour market status comparison between the September 2001 *LFS* and Census 2001.

Table 2: Labour Market Status Comparisons (LFS September 2001 - Census 2001)

Labour Market Status	LFS September 2001	CENSUS 2001
Employed	39.8	33.7
Unemployed*	16.5	24.0
Not Economically Active	43.9	42.3
Unemployment Rate	**29.3**	**41.6**

Source: Census 2001, LFS September 2001

*Note: * Official or Strict definition of Unemployment. The percentage unemployed is not the unemployment rate, but rather the percentage unemployed of the entire working age population.*

In Table 2, the Census 2001 figures show lower overall employment, and higher unemployment based on the official definition, when compared to September 2001 *LFS*. Their representations of the non-economically active population seem to be quite similar.

The problem thus lies in the different methodologies used for each survey. The *LFS* is the one that uses a more in-depth questionnaire approach and thus would be more accurate to reference in this case.

It is also important to assess the comparability of the census data over time. A comparison can be carried out between the 1996 census and the 2001 census to determine what has happened over the past 5 years with respect to sectoral employment. Estimates are shown in Table 3 below.

Table 3: Sectoral Employment (Census96,01)

Industry	1996	2001	Increased by:
Agriculture, Hunting, Fishing & Forestry	834,499	960,487	**125,988**
Mining & Quarrying	531,755	383,495	-148,260
Manufacturing	1,132,141	1,206,842	**74,701**
Electricity, Gas & Water	108,494	71,630	-36,864
Construction	562,540	520,488	-42,052
Wholesale & Retail Trade	1,117,018	1,454,443	**337,425**
Transport, Storage & Communication	489,238	442,727	-46,511
Financial & Business Services	695,009	904,564	**209,555**
Community & Social Services	1,607,285	1,841,850	**234,565**
Private Households	1,083,917	940,326	-143,591
Total	**8,161,896**	**8,726,852**	**564,956**

According to the census data, the industries that grew the most over the past 5 years include the wholesale and retail sector, the financial services sector and the community services sector. There were, however, large drops in employment in mining and quarrying as well as in private households. These drops offset the overall growth in employment leading to a net increase of only 564,956 workers in that 5-year period. Keeping in mind that the estimates of employment are considered to be slightly lower for the census than in the *LFS* data, this increase seems plausible.

1.3   Private Data Houses

Private organizations such as Quantec and Global Insight produce their own employment series, which attempt to harmonise an array of labour market information sources. It

would appear, however, that they rely most heavily on the *SEE* – largely because this is the data series consistent with the National Accounts (thereby avoiding internal inconsistencies with other series produced by these companies). These databases are produced for profit and are not "official" sources of data, but could be the best current time-series data for trend analysis.

1.4   Information from the SETAs

The SETAs collect limited information from employers, based on Workplace Skills Plans (WSPs). Only a small minority of employers have submitted WSPs to date. Consequently, this is not currently a useful source of employment information.

In addition, some SETAs have conducted employer surveys. The sampling frame for these surveys is typically the SARS database of skills levy-paying firms. It is possible to map the sectoral categories and SETA classifications. (This mapping has been included as an addendum to this report).

Unless such surveys are centrally co-ordinated they are unlikely to provide a consistent and comprehensive source of labour market information that can be used for anticipating general skill needs across all sectors.

2. DATA ADEQUACY FOR SECTORAL FORECASTING

2.1 *SEE* vs *LFS*
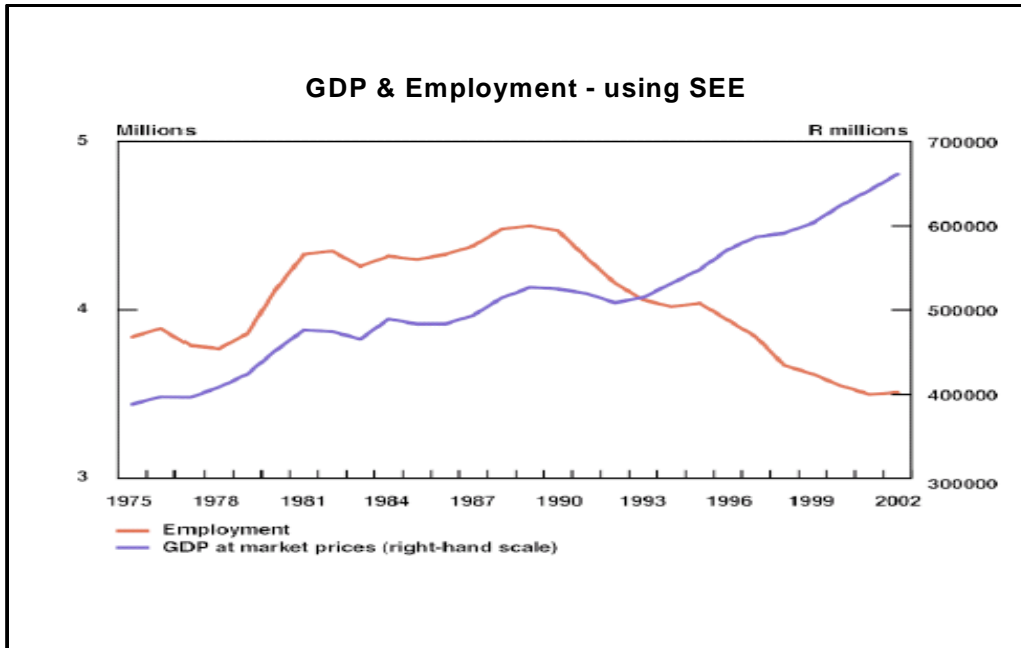
Source: SARB
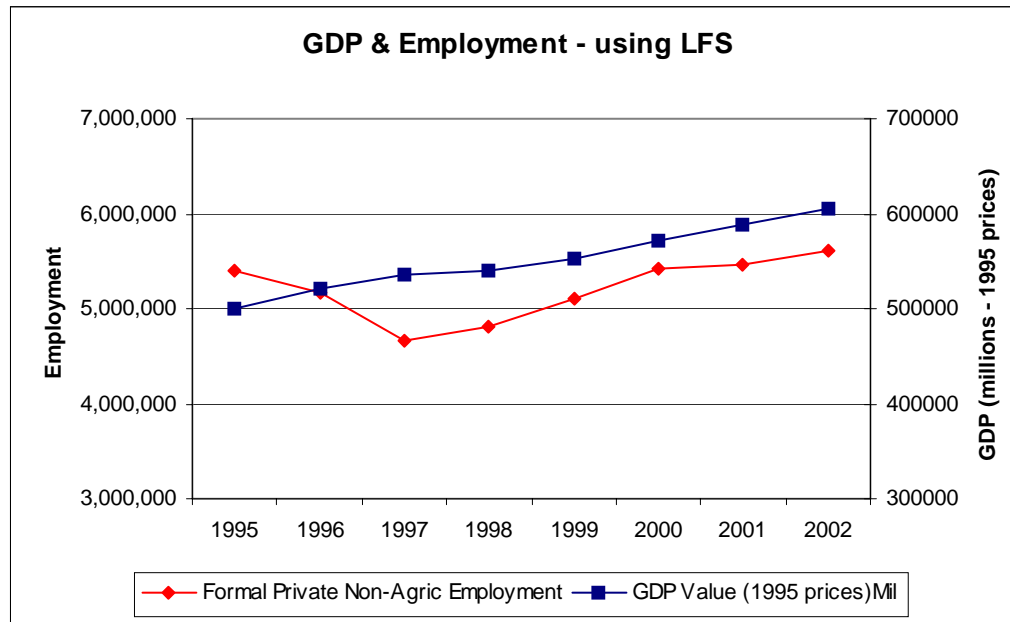
Source: Own Calculations (OHS/LFS)

Figures 3 and 4 compare formal employment and GDP data between the *SEE* and the *OHS/LFS* surveys over time. Looking from 1995 onwards, one can see the discrepancy between employment data for the *SEE* compared to employment data from the *OHS/LFS* surveys. The *SEE* shows a downward trend, whereas the household surveys show on average an upward trend.

Table 6 below compares formal employment data taken from the *LFS* of September 2001 with estimates from the *SEE* of September 2001. The lower levels of total formal employment in the *SEE*, as shown below do not necessarily imply an equivalent increase in unemployment, but rather indicate the limitations of the *SEE* survey, since these other employed individuals (the difference between the values from September 2001 *LFS* and *SEE*) could be employed in industries or occupations not covered by the *SEE*.

Table 6: Formal Employment Comparison (*LFS* September 2001-*SEE*)

MAIN INDUSTRY	LFS-SEPTEMBER 2001	*SEE*-SEPTEMBER 2001
Agric, hunt, forest, fishing	666,000	NOT COVERED
Mining and Quarrying	484,000	404,000
Manufacturing	1,384,000	1,264,000
Elec, Gas & Water	93,000	39,000
Construction	319,000	219,000
Wholesale & Retail Trade	1,427,000	880,000
Transport, & Comm	429,000	209,000
Financial Intermediation	890,000	191,000
Community Services	1,812,000	1,441,000
Private Households*	37,000	NOT COVERED
Foreign Organisations	0	NOT COVERED
TOTAL (excl. agriculture & private households)	**6,838,000** **(2.2 million more than *SEE*)**	**4,647,000**

Source: LFS September 2001, SEE September 2001

*Note: * indicates private households which constitutes domestic workers.*

Using the *SEE* survey as it stands up to now (1997 to 2002) to measure **total employment** is not a good idea (as employed individuals in sectors not covered would be missing and total employment- by sector and occupation- would be greatly

underestimated). However, it can provide a useful measure of occupational structure *within* those industries which are covered.

2.2 *SEE* vs Manpower Survey

Similar comments as mentioned above also apply to the Manpower survey *(MS)*, although this survey does provide a somewhat broader sectoral coverage than the *SEE*.

"It should be noted that the results of the *MS* are not directly comparable with the results from the *SEE*. The *MS* collects information from enterprises in all industrial groups. Therefore, an enterprise may have one or more establishments, which may operate in different industries, e.g. mining and quarrying, manufacturing, agriculture and fishing." Stats SA, 1995.

The *SEE* collects information from enterprises in the construction, wholesale trade, retail trade and motor trade, transport, storage and communication, financial institutions and community, social and personal services industries. In the manufacturing and hotels industries, however, information is collected from establishments.

2.3 SARS

The *SARS* provides a comprehensive list of entities i.e. enterprises that are disaggregated by sector based on the 5 digit SIC sectoral codes. It does not, however, have any information regarding occupational segregation with respect to the employees in these registered enterprises. An analysis of the database indicates that 43% of the firms did not supply any information regarding their number of employees. The *SARS* database will therefore have limited use in verifying sectoral information obtained from the macro model, but might be useful in indicating sectoral change because the database is continuously updated.

Table 7: Number of Firms and Average Number of Employees by Sector (SARS)

1 DIGIT SIC CODES	NO OF FIRMS	AVG NO EMPLOYEES
Agriculture	8,779	41,62
Mining	2,472	419,67
Manufacturing	39,374	265,77
Electricity, Gas & Water	737	367,77
Construction	14,605	72,07
Wholesale / Resale Trade	53,427	94,65
Transport	10,602	25,33
Financial Services	67,066	83,39
Community Services	59,931	110,37
All	**274,183***	**114,10**

Note: Own calculations based on SARS database, February 2003

* Column total may not add up due to missing values.

Considering Table 7 above, if the average number of employees (based only on non-missing records) is correct, then the average firm in the database employs 114 workers, implying that estimated total employment from the *SARS* database is just over 3 million – well below other private formal sector employment estimates.

2.4   Census vs LFS

When considering employed individuals and the industries that they work in, one can observe lower employment estimates for the Census 2001 than for September 2001 *LFS*. Table 8 illustrates this with regard to employment in different economic industries.

Table 8: Industry Comparisons (LFS September 2001 – Census 2001)

Industry	LFS Sep ('000)	% of total	Census 2001 ('000)	% of total
Agriculture etc	1,051	9.7	960	11.0
Mining and Quarrying	487	4.5	383	4.4
Manufacturing	1,605	14.9	1,207	13.8
Electricity etc	95	0.9	72	0.8
Construction	594	5.5	520	6.0
Wholesale & Retail trade	2,397	22.2	1,454	16.7
Transport etc	543	5.0	443	5.1
Finance etc	975	9.0	904	10.4
Community services etc	1,998	18.5	1,841	21.1
Private households	1,055	9.8	940	10.8
Total	**10,800**	**100**	**8,724**	**100**

Source: Census 2001, LFS September 2001

In all industries the September 2001 LFS once again shows higher levels of employment. The shares of different sectors are, however, broadly similar.

2.5   SASID vs LFS

The table below contains a comparison of sectoral employment from the *LFS* and the South African Standard Industry Database (*SASID*), obtained from Quantec.

Table 9: Sectoral Employment, 2000

Total Employment	SASID		LFS	
	TOTAL	% Share	TOTAL	% Share
Agriculture, forestry and fishing	783,235	13.1%	686,200	9.1%
Mining and quarrying	416,270	6.9%	514,297	6.8%
Manufacturing	1,296,166	21.6%	1,320,234	17.6%
Electricity, gas and water	72,643	1.2%	79,450	1.1%
Construction (contractors)	222,420	3.7%	354,098	4.7%
Wholesale and retail trade, catering and accommodation	1,011,487	17%	1,453,916	19.4%
Transport, storage and communication	273,162	4.6%	432,231	5.7%
Financial int., insurance, real estate & business services	485,054	8.1%	866,810	11.5%
Community, social and personal services	1,415,785	24%	1,785,315	23.8%
TOTALS	**5,976,222**	**100%**	**7,492,551**	**100%**

Source: SASID, September 2000 LFS

The size of the sectors is broadly similar except with regard to Trade, Transport, Finance services and Community services. These employment estimates are higher in the *LFS* as this data set covers these sectors in more depth than *SASID* (remember *SASID* is based on *SEE*). With regard to shares of total employment, these values are similar across the sectors.

3. DATA ADEQUACY FOR OCCUPATIONAL FORECASTING

3.1 LFS vs Census

Table 10 shows a breakdown of occupations from the September 2001 *LFS* and the Census 2001. The percentage shares of total employment in each occupation are also given.

Table 10: Occupational Comparisons (LFS September 2001 – Census 2001)

Occupation	LFS Sep ('000)	% of total	Census 2001 ('000)	% of total
Legislators	661	6.1	515	5.8
Professionals	485	**4.5**	**668**	**7.5**
Technicians	1,146	10.6	920	10.3
Clerks	1,101	10.2	1,048	11.7
Service Workers	1,396	12.9	978	10.9
Skilled Agriculture	469	4.3	268	3.0
Craft Workers	1,434	13.3	1,165	13.0
Plant Operators	1,085	10.0	844	9.4
Elementary Occupations	2,115	**19.6**	**2,539**	**28.4**
Domestic Workers	916	8.5	*	
Total	**10,808**	**100**	**8,945**	**100**

Source: Census 2001, LFS September 2001

*Note: * Domestic workers are included in Elementary occupations for Census 2001.*

Although employment figures are higher for most occupations within the *LFS* data set, there are two occupations that show much higher employment with the Census 2001 data set. These occupations are Professionals and Elementary occupations. Elementary

occupations are quite large (in the Census data) due to the fact that domestic workers are included in this category. Once they are accounted for, elementary occupations show a lower level of employment for Census data than for *LFS* data. Focussing on percentage shares of the total, the patterns are broadly similar.

This information is disaggregated by occupation only. Table 11 illustrates the situation when it comes the data are further disaggregated, comparing percentage shares of total employment in each occupation by sector using Census 2001 and LFS data. The Census share is compared to a confidence interval share that is based on the occupational and sectoral employment matrix obtained from the *LFS* data. The values highlighted in italics are within the confidence intervals from the *LFS* September 2001 employment matrix. This implies that those particular values from the Census are comparable with the *LFS* values within that same employment matrix context. There are, however, only 27 comparable values in a sectoral and occupational employment matrix giving 90 different values. This does not necessarily imply that the Census is incorrect, as it may very well be the *LFS* that has partially incorrect employment figures and thus distorted confidence intervals. This table is only being shown to determine whether or not the *LFS* can be used in conjunction with the Census data to provide a more accurate employment matrix.

3.2   Census 1996 vs Census 2001

Another factor to consider with regard to whether or not the Census is the best option for sectoral and occupational forecasting, is what kind of changes have taken place over time within the Census and whether or not these changes are feasible given other time-series data.

Table 12 shows percentage shares of occupations within each sector for 1996. The values for Census 2001 are given in Table 11, along with their respective confidence intervals. Over this 5-year period, most of the shedding of employment has occurred in the craft occupations as well as the skilled agricultural occupations. These occupations' shares of total employment by sector have dropped since 1996. The overall share of total employment by sector has managed to stay broadly similar though, over this 5-year period.

One of the key questions, however, with regard to the scope of this project, is whether or not the Census data can be used in conjunction with other data to get a more accurate portrayal of the labour market over time. The Census data available for analysis consist of surveys done in 1996 and 2001, with the next Census survey being conducted in 2011. This leaves the years in between unaccounted for with respect to data for that time period, creating a need for another data series to be used to fill in the gaps. The question remains which data series is the most reliable option for using in the interim whilst 'waiting' for the next Census year. The review of the particular surveys as specified above, leads to the conclusion that, broadly speaking, the Census data are the more robust and as a result, would give the more accurate portrayal of the South African labour market at that particular moment in time. The *LFS* could be used as not only a benchmark, but also as a means to filling in the blanks with regard to the interlinking years which are not covered by the Census. It is important to remember that the focus in this project is on occupational and qualification employment structures, in aggregate and within industries.

Table 11: Occupational Breakdown by Sector (Census 2001: Total Employment)

(With confidence intervals for total employment from the LFS September 2001)

% SHARE OF TOTAL EMP Occupation	Agriculture, hunting; forestry and fishing	Mining and quarrying	Manufacturing	Electricity; gas and water supply	Construction	Wholesale and retail Trade	Transport storage and communication	Financial, insurance, real estate and business services	Community, social and personal services	Private Households
(Census) Legislators etc	2.2%	*2.3%*	*6.2%*	5.4%	*4.2%*	10.1%	9.2%	9.4%	4.5%	0.2%
LFS4 confidence intervals	(0.5% - 1.8%)	(1.7% - 4.2%)	(5.2% - 7.7%)	(7.3% - 18.6%)	(3.4% - 6.5%)	(7.5% - 9.6%)	(14.9% - 20.4%)	(11.6% - 15.9%)	(2.7% - 3.9%)	(0.0%)
(Census) Professionals	0.9%	5.6%	5.1%	8.8%	3.3%	3.3%	5.2%	16.1%	*16.7%*	0.1%
LFS4 confidence intervals	(0.4% - 0.6%)	(0.7% - 2.5%)	(2.1% - 3.6%)	(1.4% - 8.2%)	(0.4% - 2.1%)	(0.26% - 0.76%)	(0.7% - 2.6%)	(8.7% - 12.4%)	(13.9% - 16.9%)	(0.0%)
(Census) Associate Professionals	0.9%	*2.6%*	*6.5%*	*8.5%*	3.2%	5.2%	*9.4%*	12.1%	28.8%	*0.2%*
LFS4 confidence intervals	(0.2% - 0.6%)	(1.5% - 3.6%)	(6.6% - 9.1%)	(4.9% - 14.6%)	(1.1% - 2.9%)	(2.9% - 4.2%)	(5.9% - 9.5%)	(17.2% - 21.5%)	(32.1% - 35.6%)	(0.0% - 0.2%)
(Census) Clerks	1.9%	*5.1%*	10.7%	*13.5%*	5.0%	17.7%	*16.2%*	*22.7%*	*13.3%*	0.4%
LFS4 confidence intervals	(0.8% - 1.7%)	(4.7% - 7.7%)	(8.1% - 10.4%)	(8.4% - 17.2%)	(1.5% - 3.4%)	(10.4% - 12.5%)	(14.7% - 19.9%)	(21.9% - 26.8%)	(12.2% - 14.8%)	(0.0%)
(Census) Service Workers	2.1%	*2.7%*	4.7%	3.9%	2.5%	22.9%	*5.6%*	20.8%	14.2%	1.5%
LFS4 confidence intervals	(0.4% - 1.1%)	(1.4% - 3.5%)	(2.3% - 3.7%)	(2.2% - 3.6%)	(0.3% - 1.6%)	(30.1% - 33.2%)	(3.3% - 6.3%)	(15.8% - 20.4%)	(16.5% - 19.5%)	(0.4% - 1.2%)
(Census) Skilled Agric Workers	22.0%	0.5%	0.6%	*0.7%*	0.3%	0.6%	*0.2%*	0.3%	0.6%	1.3%
LFS4 confidence intervals	(27.0% - 33.3%)	(0.01% - 0.3%)	(0.04% - 0.36%)	(0.3% - 2.7%)	(0.0%)	(0.03% - 0.22%)	(0.0% - 0.4%)	(1.2% - 2.6%)	(1.1% - 2.1%)	(11.1% - 14.2%)
(Census) Craft Workers	3.1%	42.5%	23.9%	*31.8%*	51.6%	13.6%	*5.9%*	4.0%	2.9%	0.8%
LFS4 confidence intervals	(0.9% - 1.9%)	(31.4% - 39.5%)	(25.2% - 29.1%)	(18.9% - 33.1%)	(68.0% - 74.1%)	(10.2% - 12.2%)	(5.3% - 9.2%)	(1.1% - 2.6%)	(1.4% - 2.4%)	(0.0%)
(Census) Plant Operators	8.2%	23.2%	23.3%	10.4%	6.7%	5.7%	*36.7%*	2.3%	2.5%	0.6%
LFS4 confidence intervals	(8.5% - 11.3%)	(34.3% - 42.8%)	(25.6% - 29.6%)	(13.4% - 27.1%)	(2.5% - 5.0%)	(2.3% - 3.3%)	(31.7% - 38.3%)	(1.0% - 2.6%)	(1.3% - 2.1%)	(0.0% - 0.3%)
(Census) Elementary Occups	*56.7%*	*13.2%*	*16.3%*	14.5%	20.4%	18.3%	*9.3%*	*9.4%*	14.2%	92.5%
LFS4 confidence intervals	(51.7% - 58.0%)	(9.1% - 13.6%)	(14.6% - 17.6%)	(9.7% - 20.2%)	(12.9% - 17.3%)	(28.9% - 32.3%)	(8.2% - 12.1%)	(7.7% - 10.9%)	(9.9% - 12.1%)	(85.0% - 88.9%)

Note: Italics denotes acceptable values based on LFS data

Source: Own Calculations (lfs4) & Census 2001

Table 12: Occupational Breakdown by Sector (Census 1996: Total Employment)

% SHARE OF TOTAL EMP Occupation	Agriculture, hunting; forestry and fishing	Mining and quarrying	Manufacturing	Electricity; gas and water supply	Construction	Wholesale and retail Trade	Transport storage and communication	Financial, insurance, real estate and business services	Community, social and personal services	Private households
Legislators etc	1.3%	2.1%	4.9%	3.8%	1.7%	10.1%	5.3%	7.0%	3.0%	0.3%
Professionals	0.5%	3.8%	3.5%	6.0%	2.6%	1.7%	2.5%	13.5%	39.2%	0.2%
Associate Professionals	0.7%	1.9%	5.9%	7.4%	3.4%	5.6%	8.5%	17.4%	10.3%	0.4%
Clerks	1.0%	2.8%	6.5%	7.8%	1.9%	12.5%	11.6%	24.5%	8.7%	0.4%
Service workers	1.2%	2.8%	3.9%	3.0%	0.8%	25.6%	3.4%	18.2%	15.9%	1.5%
Skilled agricultural Workers	29.4%	0.4%	1.5%	0.5%	0.3%	0.6%	0.3%	0.4%	1.0%	5.6%
Craft workers	1.9%	37.1%	27.7%	47.6%	66.2%	14.9%	5.9%	3.2%	2.5%	1.3%
Plant and machine operators	4.9%	20.5%	18.2%	7.8%	3.3%	4.0%	45.5%	2.1%	1.9%	0.5%
Elementary occupation	54.9%	19.1%	14.5%	7.6%	14.9%	17.5%	7.9%	6.2%	11.4%	87.7%

Source: Census 1996

4. DATA ADEQUACY FOR ESTIMATING REPLACEMENT DEMAND

4.1 Replacement demand

In addition to changes in overall occupational employment levels it is important to consider replacement demand arising from retirements, net migration, movement into other occupations and in-service mortality.

Estimating replacement demand is not straightforward, especially in a country like South Africa where the data on the mortality effects of HIV/AIDS remain uncertain and controversial. To estimate replacement demand one ideally needs the following information:

- Data on the age and gender structure of occupational employment;
- Data on the rates of outflow due to:
    1. Retirement (and other reasons for leaving the workforce)
    2. Emigration;
    3. Inter-occupational mobility; and
    4. Mortality.

Information on the age and gender structure is required because many of the flows, especially retirements and mortality, are age and gender specific. Age structures vary significantly by occupation – for example, a higher proportion of managers than IT professionals are likely to be nearing retirement age. Differences in age structure across occupations will clearly influence exits, with older people retiring, but younger people changing occupations. Age structure also affects mortality – while older people are more likely to die of non-AIDS causes, younger people are more likely to succumb to AIDS.

From the household survey/population census data, it is possible to analyse the demographic composition of each occupation. This makes it possible to estimate specific rates of retirement and mortality for each occupational class.

4.2 Retirements

For the purposes of modelling retirements, a fraction of the occupational class that is aged 55 to 65 (say) in a given year can be assumed to retire each year. It is important to

choose a fairly wide age category, as the occupational samples are quite small in some cases. It might be possible to measure retirement flows over time, although this kind of approach could result in the sampling errors being too large. Nevertheless, some reasonably robust assumptions can be made that result in better estimates that simply ignoring the issue.

4.3   Mortality

To estimate replacement demand arising from deaths in each occupation it is possible to use the race-, age- and gender-specific mortality rates contained in the Actuarial Society of South Africa's "AIDS demographic model 2000". The ASSA model was developed by the ASSA AIDS Committee, which was set up in 1987 "to assist the actuarial profession (and later the wider public) in estimating the impact of the AIDS epidemic in South Africa". As part of this work, the Committee has produced various papers and monographs on the epidemic and constructed models (the ASSA500 model released in 1996, the *ASSA600* model released in 1998 and most recently the *ASSA2000* suite of models) to predict the impact of the epidemic at both the national and regional level (ASSA, 2002). It is expected that a new version of the ASSA model – based on the 2001 Census results - will be released in 2004.

Using the mortality assumptions of the ASSA model, it is possible to calculate the risk of dying for each member of an occupational class in the survey data and use this to arrive at the number of people that will be required to replace those dying over the forecast period.

4.4   Migration and mobility

The migration of skilled professionals from the country has also been an increasing source of concern over the past few years. Skills migration is clearly a reality and must also enter the model as these losses also impact the supply and demand for higher-level human resources.

The official source for skills migration data in South Africa is the annual reports published by Statistics South Africa. These sources are as a result of a joint effort between the Department of Home Affairs and Stats SA. It is the Department's responsibility to record who leaves and enters the country via any of the major airports in South Africa. When

individuals leave they are required to fill in a departure form, in which they state their reasons for leaving. Stats SA then captures the relevant emigration information from the departure forms. Immigration data are also gathered from records of individuals who have been granted permanent residence in the country (Bailey, 2003). These data are largely incomplete and inaccurate due to the following reasons outlined by Brown, Kaplan & Meyer (2001):

a) The completion of departure forms is not always enforced and not all those individuals intending to emigrate permanently indicate as much (Stats SA, 2001).
b) Only individuals leaving from the major South African airports are captured.
c) Many South Africans leaving the country to travel, and who then stay abroad permanently are not captured.
d) The system only recently started capturing disaggregated occupation data; therefore a trend analysis of skills leaving the country is limited at best.
e) Stats SA categories have changed over the years, making it difficult to formulate trend analyses.

A study conducted by Meyer, Brown and Kaplan (2000) illustrated that the receiving countries data reported around three times as many skilled South Africans entering their borders in the decade prior to 1997 than did the Stats SA data. This shows that the official data show a severe undercount of emigration in South Africa. However,

> "There is no consensus on the number of highly skilled human resources leaving South Africa, and how many of them will be returning after a shorter or longer period abroad. With increasing globalisation and a relatively free flow of the factors of production (including workers, professionals and management), it is assumed that people are engaging in 'return migration' for certain periods to other destinations, with the implication that a large percentage of human resources leaving the country will probably return." (van Aardt, 2001)

According to the official figures, only 8,487 people left South Africa during 1999, of which only 4,848 were economically active and only 1,831 of these were professionals. The loss of highly skilled people is therefore ostensibly relatively limited (Stats SA, 1999). Figures released by the South African Network of Skills Abroad (SANSA) are significantly higher than the official statistics and are serious cause for concern. Van Aardt (2001)

indicates that, should the SANSA figures be correct, the implication would be that South Africa is losing highly skilled professionals much faster to other countries than it is able to train such professionals. For eleven years from 1987 to 1997, the number of recorded South African emigrants to Australia, Canada, New Zealand, the United States and the United Kingdom was 233,609. This is compared with the figure of 82,811 declared, registered and officially recorded by Stats SA for the same period. This is 2.8 times higher than what the official figures show.

SANSA also found that the number of professionals who left South Africa after 1994 was 56 % higher than during 1989, and that about 77 % of South African emigrants to the United States had a tertiary education. The implications of these findings are that the extent of emigration from South Africa and the educational profile of those who emigrate may be of such a nature that South Africa has been incurring extensive losses in human capital for quite some time, could be facing acute skills shortages and could be heading for a situation where the possibility of sustainable economic growth and development is threatened.

Figure 5: Estimates of the Number of Emigrants (1996-2000)
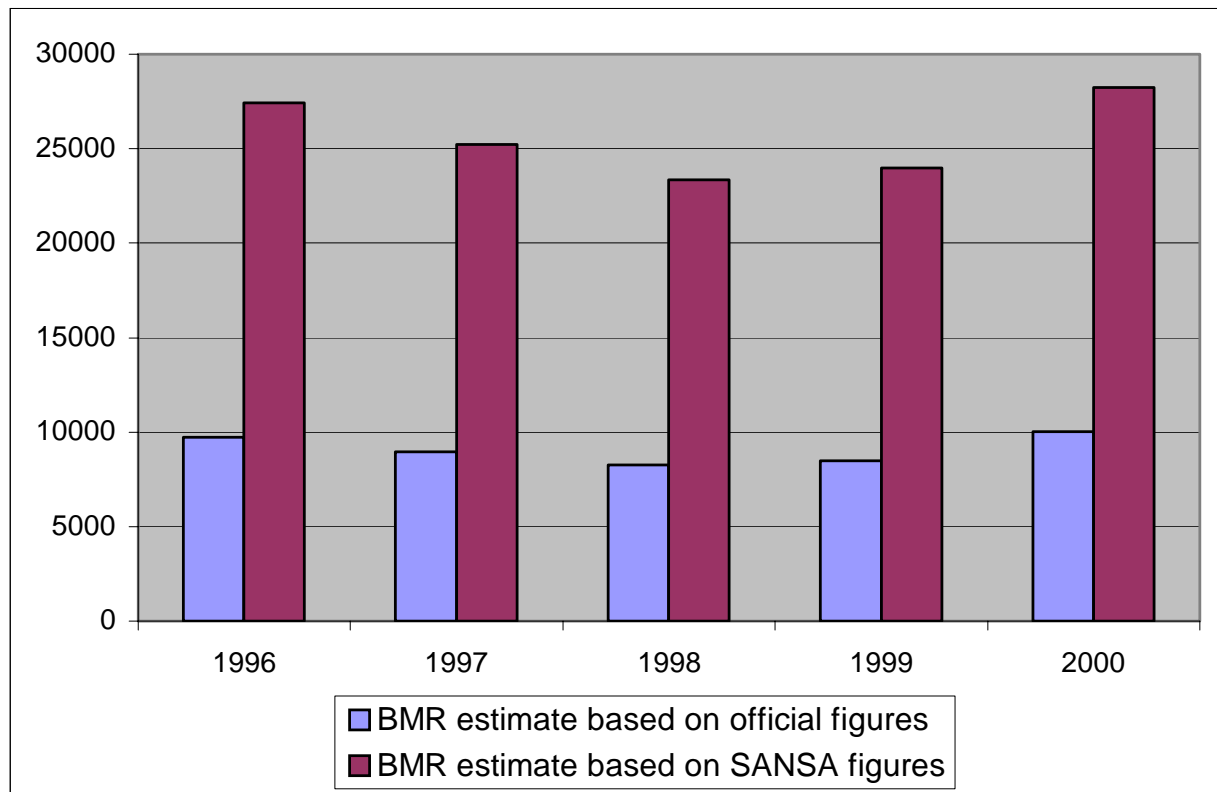
Sources: SAIRR (2001) and BMR estimates

Barker (1999) agrees that the impact of labour migration, especially of highly skilled human resources, on labour supply in South Africa has been considerable. Barker refers to data provided by Statistics South Africa and points out that by 1997, 41.2% of emigrants were professional, semi-professional and technical workers, while a further 13.9% were managerial and administrative workers. Updated statistics provided by Stats SA (1999) shows that about 54% of the emigrants who left South Africa during 1998 were economically active. Of these, about 44.3% were people with professional, semi-professional and technical skills, 15.2% were people with specialist managerial skills and 6.8% were artisans.

If these figures are used to estimate the number of emigrants with the above-mentioned skills during the period 1989 to 2000 (on the basis of the BMR's estimates derived from the SANSA data), a figure of about 167,326 economically active South African emigrants during the period in question is obtained, of whom 74,125 were people with professional, semi-professional and technical skills, 25,433 were people with specialist managerial skills, 11,378 were artisans and 10,951 were engineers or technologists.

5.   CONCLUDING REMARKS

This review has considered a number of potentially important data sources, which might be used to develop a comprehensive national multi-sectoral occupational forecasting tool. Ideally, it should be possible to draw upon existing official statistics that are consistent with the National Accounts and as already used in existing macro and sectoral models. This does, however, presume that there is some consensus on such matters. This unfortunately is not always the case, and there are many discrepancies in the data that make trend analysis difficult. There are also comparability issues with regard to certain survey data sets at a particular point in time.

There is an ongoing debate over which survey data sets are the best to make use of for the purposes of multi-sectoral analysis. Therefore what needs to take place is a meeting whereby a decision on what sectoral and occupational employment data (and related indicators such as output and productivity) should be used for any new forecasting work. This should be agreed upon with the various interested parties. These various parties include:

- Stats SA as arbiters of the official view on the data;

- Macro modellers, such as Global Insight and ABSA, who have an interest in establishing robust and agreed estimates;

- The Department of Labour which has an overall responsibility for employment across all sectors and

- The SETAs, who will have strong views about those sectors (or parts thereof) falling within their remit.

This should be undertaken as part of the process of setting up a comprehensive multi-sectoral forecasting tool, (Module 1, as set out in the main report).

The sources that this Annex has covered are important for developing the other modules set out in the main report. These include Module 2, which deals with the occupational model within sectors, Module 3, which deals with the replacement demands, and lastly, Module 4, which deals with the implications for qualifications and other aspects of skills. With regard to the adequacy of the available data, it seems that the Labour Force Survey appears to be the most reliable when it comes to in-depth data collection methods and thus high levels of data quality. However, its sample size raises issues about how detailed a picture one can develop on changing occupational employment structure.

The Manpower Survey and the Survey of Earnings and Employment have both strengths and weakness, but potentially provide useful corroborative evidence to be set against the Labour Force Survey material.

The Census offers potentially much larger sample sizes, although there are issues to be resolved regarding the reliability and possible bias in the 2001 results and of comparability with previous Census results.

Two more data sources considered are the SARS data set and information obtained from the SETAs (currently very limited). The SARS is essentially a sample frame of tax paying businesses or establishments and thus as a result does not offer much with respect to the projects objectives of focussing on skills. The SETAs typically use the SARS database as the sampling frame for their own surveys, so the SETA data-sets will tend to have the same limitations as the SARS database.

Whilst sectoral trends will have to rely on national accounts and private data houses, as stated above, the occupational structure within sectors and replacement demand will have to come from a variety of different sources, these sources being chosen based on the review conducted in this Annex.

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Separate annexes and reports connected to the present document

Main Report:

Wilson, R. A, I. Woolard and D. Lee (2004). *Developing a National Skills Forecasting Tool for South Africa.* IER/HSRC/Department of Labour.

Separate Annexes:

A: The Rationale for Conducting National Occupational Projections and how they are Typically Undertaken.

B: Labour Market Projections: A Review of International Best Practice

C: A Critical Review of Previous Work on Employment Projections in South Africa.

D: Data Sources for National Skills Forecasting in South Africa: Strengths and Weaknesses - A Critical Assessment of Data Availability.

APPENDIX A: CONCORDANCE TABLE- MAPPING BETWEEN SETA AND SIC CODES

09001 SERVICES Marketing services

09000 StatsSA Other activities not adequately defined

09002 SERVICES Marketing communications

09000 StatsSA Other activities not adequately defined

09003 MAPPP Production of craft art

09000 StatsSA Other activities not adequately defined

09004 MAPPP Production of traditional art

09000 StatsSA Other activities not adequately defined

09005 MAPPP Production of designer goods

09000 StatsSA Other activities not adequately defined

09006 MAPPP Production of functional wares

09000 StatsSA Other activities not adequately defined

09007 MAPPP Production of souvenirs

09000 StatsSA Other activities not adequately defined

09008 SERVICES Direct marketing

09000 StatsSA Other activities not adequately defined

11140 SETASA Seed production and marketing

11000 StatsSA Agriculture, hunting and related services

11121 PAETA Growing of vegetables, horticultural specialties (including ornamental horticulture) and nursery products

11120 StatsSA Growing of vegetables, horticultural specialties and nursery products

11122 PAETA Sugar Plantation including sugar cane and sugar beet etc.

11120 StatsSA Growing of vegetables, horticultural specialties and nursery products

11221 PAETA Ostrich farming

11220 StatsSA Other animal farming; production of animal products n.e.c.

11222 PAETA Game Farming

11220 StatsSA Other animal farming; production of animal products n.e.c.

12101 FIETA Establishment

12100 StatsSA Forestry and related services

12102 FIETA Re-establishment

12100 StatsSA Forestry and related services

12103 FIETA Maintenance

12100 StatsSA Forestry and related services

12104 FIETA Fire protection, fire suppression, fire prevention

12100 StatsSA Forestry and related services

12105 FIETA Forest conservation

12100 StatsSA Forestry and related services

12106 FIETA Forest protection

12100 StatsSA Forestry and related services

12107 FIETA Forest management

12100 StatsSA Forestry and related services

12108 FIETA Forestry and tree nurseries for forests

12100 StatsSA Forestry and related services

12109 PAETA Growing of trees as second crop by farmers

12100 StatsSA Forestry and related services

12201 FIETA Harvesting

12200 StatsSA Logging and related services

12202 FIETA Road construction and maintenance

12200 StatsSA Logging and related services

12203 FIETA Transport (short haul and long haul)

12200 StatsSA Logging and related services

23001 MQA Thin tabular operations

23000 StatsSA Mining of gold and uranium ore

23002 MQA Thick tabular operations

23000 StatsSA Mining of gold and uranium ore

23003 MQA Massive mining operations

23000 StatsSA Mining of gold and uranium ore

25101 MQA Quarrying/dimension stone operations

25100 StatsSA Stone quarrying, clay and sandpits

25102 MQA Open cast/strip mining operations

25100 StatsSA Stone quarrying, clay and sandpits

25103 MQA Open pit operations

25100 StatsSA Stone quarrying, clay and sandpits

25201 MQA Marine mining operations

25200 StatsSA Mining of diamonds (including alluvial diamonds)

25202 MQA Coastal mining operations

25200 StatsSA Mining of diamonds (including alluvial diamonds)

30101 N/A Production, processing and preservation of meat products by local governments

30100 StatsSA Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats

30114 SETASA Poultry and egg production

30110 StatsSA Production, processing and preserving of meat and meat products

30115 SETASA Production, sale and marketing of agricultural by-products (e.g. bones, hides)

30110 StatsSA Production, processing and preserving of meat and meat products

30116 PAETA Slaughtering, dressing and packing of livestock including poultry and small game for meat and processing of ostrich products

30110 StatsSA Production, processing and preserving of meat and meat products

3011A N/A Intensive production, slaughtering, de-boning and packaging of livestock (including small game and ostriches)

30110 StatsSA Production, processing and preserving of meat and meat products

30121 FOODBEV Manufacture of canned, preserved and processed fish, crustaceans and similar foods (except soups)

30120 StatsSA Processing and preserving of fish and fish products

30132 SETASA Fruit packed in cartons, fruit juice concentrate drummed and fruit juice in container ready for human consumption

30131 StatsSA Manufacture of canned, preserved, processed and dehydrated fruit and vegetables (except soups), incl. fruit juices, juice extracts and potato flour meal

30332 SETASA Manufacture of starches and starch products

30320 StatsSA Manufacture of starches and starch products

30331 SETASA Manufacture of pet foods

30330 StatsSA Manufacture of prepared animal feeds

30401 FOODBEV Manufacture of food preparation products

30400 StatsSA Manufacture of other food products

30493 SETASA Growing and marketing of coffee and tea

30490 StatsSA Manufacture of other food products n.e.c.

3011B SETASA Grading, ginning and packaging of wool and cotton raw material

31111 StatsSA Grading, ginning and packaging of wool and cotton raw material

31214 CTFL SETA Manufacture of made-up textile articles and fibres except apparel

31210 StatsSA Manufacture of made-up textile articles, except apparel

31291 CTFL SETA Manufacture of textiles, clothing, leather goods and other textiles n.e.c.

31290 StatsSA Manufacture of other textiles n.e.c.

31292 CTFL SETA Fashion clothing, textiles and footwear manufacture and design

31290 StatsSA Manufacture of other textiles n.e.c.

31501 CTFL SETA Dressing and dyeing of fur; manufacture of artificial fur, fur apparel and other art

31400 StatsSA Manufacture of wearing apparel, except fur apparel

31701 CTFL SETA Manufacture of footwear from material other than leather

31700 StatsSA Manufacture of footwear

32108 FIETA Mill maintenance

32100 StatsSA Sawmilling and planing of wood

32110 FIETA Charcoal

32100 StatsSA Sawmilling and planing of wood

32111 FIETA Wattle extract manufacturing

32100 StatsSA Sawmilling and planing of wood

32102 FIETA Saw doctoring

32101 StatsSA Sawmilling and preserving of timber

32103 FIETA Wet milling

32101 StatsSA Sawmilling and preserving of timber

32104 FIETA Lumber drying

32101 StatsSA Sawmilling and preserving of timber

32105 FIETA Lumber grading

32101 StatsSA Sawmilling and preserving of timber

32106 FIETA Dry milling

32101 StatsSA Sawmilling and preserving of timber

32107 FIETA Finger jointing and laminating

32101 StatsSA Sawmilling and preserving of timber

32211 FIETA Fibreboard and chipboard products

32210 StatsSA Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board another panels and boards

3010C FIETA Manufacture of wooden doors

32220 StatsSA Manufacture of wooden doors

32221 FIETA Truss manufacturing

32220 StatsSA Manufacture of wooden doors

32222 CETA Joinery and wood machining including manufacture and installation of timber and other building fixtures

32220 StatsSA Manufacture of wooden doors

32223 CETA Kitchen cabinet making for customized requirements on-site

32220 StatsSA Manufacture of wooden doors

32224 N/A Kitchen cabinet making for standardized production

32220 StatsSA Manufacture of wooden doors

32293 FIETA Match manufacturing

32220 StatsSA Manufacture of wooden doors

32294 FIETA Pallets and bulk bins

32220 StatsSA Manufacture of wooden doors

32311 FIETA Manufacture of Pulp, Paper, Paperboard, Tissue and Paper Recycling

32310 StatsSA Manufacture of pulp, paper and paperboard

32323 MAPPP Manufacture of packing material

32390 StatsSA Manufacture of packing material

32393 MAPPP Printing and embossing of stationery and labels

32391 StatsSA Stationery

32392 MAPPP Books and stationery

32399 StatsSA Books and stationery

33421 CHIETA Manufacture raw materials and chemical compounds used in agriculture

33420 StatsSA Manufacture of fertilizers and nitrogen compounds

33431 CHIETA Manufacture of plastic bags

33430 StatsSA Manufacture of plastics in primary form and of synthetic rubber

33501 CHIETA Chemically-based general household and personal care products

33500 StatsSA Manufacture of other chemical products

33502 CHIETA Manufacture, sale and/or distribution of diversified specialty chemicals for industrial use

33500 StatsSA Manufacture of other chemical products

33543 CHIETA Manufacture of beauty products

33542 StatsSA Manufacture of perfumes, cosmetics and other toilet preparations

33594 CHIETA Manufacture of chemicals for the mining industry

33590 StatsSA Manufacture of other chemical products n.e.c.

33791 MERSETA Calendaring

33790 StatsSA Manufacture of other rubber products

33792 MERSETA Compounding

33790 StatsSA Manufacture of other rubber products

33799 N/A Manufacture of other rubber products

33790 StatsSA Manufacture of other rubber products

33801 MERSETA Injection moulding

33800 StatsSA Manufacture of plastic products

33802 MERSETA Blow moulding

33800 StatsSA Manufacture of plastic products

33803 MERSETA Extrusion

33800 StatsSA Manufacture of plastic products

33804 MERSETA Plastics processes

33800 StatsSA Manufacture of plastic products

36301 N/A Rotational moulding

33800 StatsSA Manufacture of plastic products

39001 MERSETA Rotational moulding

33800 StatsSA Manufacture of plastic products

39003 MERSETA Compression moulding

33800 StatsSA Manufacture of plastic products

39004 MERSETA Cast moulding

33800 StatsSA Manufacture of plastic products

34211 CETA Manufacture of tiles and sanitary ware

34210 StatsSA Manufacture of non-structural non-refractory ceramic ware

34231 CETA Brickmaking

34230 StatsSA Manufacture of structural non-refractory clay and ceramic products

34232 CHIETA Pottery

34230 StatsSA Manufacture of structural non-refractory clay and ceramic products

34251 CETA Manufacture of articles of concrete, cement and plaster including pre-cast building and civil engineering products on-site and off-site

34250 StatsSA Manufacture of articles of concrete, cement and plaster

35412 MERSETA Manufacture of basic metals, fabricated metal products, machinery and equipment

35590 StatsSA Manufacture of basic metals, fabricated metal products, machinery and equipment

35780 MERSETA Manufacture and installation of pneumatic and hydraulic systems

35790 StatsSA Manufacture and installation of pneumatic and hydraulic systems

35791 ISETT Manufacture of alarm systems

35790 StatsSA Manufacture and installation of pneumatic and hydraulic systems

35691 MERSETA Air conditioning and refrigeration equipment, and its design and installation

36000 StatsSA Air conditioning and refrigeration equipment, and its design and installation

36504 MAPPP Graphic design, manufacture and display of illuminated signs and advertising displays and other graphic media outputs and products

36502 StatsSA Manufacture of illuminated signs and advertising displays

36601 MERSETA Manufacture of electrical machinery and apparatus n.e.c

36600 StatsSA Manufacture of other electrical equipment n.e.c.

87147 ISETT Electronics importation and product integration of pre-manufactured electronics IT and telecommunications equipment

36600 StatsSA Manufacture of other electrical equipment n.e.c.

87148 ISETT Telecommunications importation and product integration of pre-manufactured electronics IT and telecommunications equipment

36600 StatsSA Manufacture of other electrical equipment n.e.c.

37201 MERSETA Manufacture of television and radio transmitters and apparatus for line telephone and telegraphy and other communications equipment n.e.c.

37200 StatsSA Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy

37413 HWSETA Manufacture of medical precision and optical instruments

37410 StatsSA Manufacture of medical and surgical equipment and orthopedic appliances

37601 MQA Manufacture of watches, clocks and related articles

37600 StatsSA Manufacture of watches and clocks

38101 MERSETA Manufacture and assembly of motor vehicles

38100 StatsSA Manufacture of motor vehicles

39104 N/A Ship fitting

38420 StatsSA Building and repairing of pleasure and sporting boats

39105 FIETA Furnishing of ships

38420 StatsSA Building and repairing of pleasure and sporting boats

39005 CHIETA Powder coating and shelving

39002 StatsSA Dip coating

39106 FIETA Cane furniture

39100 StatsSA Manufacture of furniture

39107 FIETA Bedding

39100 StatsSA Manufacture of furniture

39108 FIETA Curtaining

39100 StatsSA Manufacture of furniture

39109 N/A Wooden utility items

39100 StatsSA Manufacture of furniture

3910A N/A Upholstery

39100 StatsSA Manufacture of furniture

3910B N/A Wooden furniture

39100 StatsSA Manufacture of furniture

39110 FIETA Caravan furniture

39100 StatsSA Manufacture of furniture

39521 MERSETA Recycling of plastic materials

39520 StatsSA Recycling of non-metal waste and scrap n.e.c.

41114 ESETA Generation of renewable energy

41111 StatsSA Generation of energy

41117 N/A Generation of electric energy by local governments

41111 StatsSA Generation of energy

41115 ESETA Transmission of energy

41112 StatsSA Distribution of purchased electric energy only

41118 ESETA Marketing of electricity

41112 StatsSA Distribution of purchased electric energy only

41116 ESETA Project management, maintenance and operation of electrical generation, transmission and distribution, plants, networks and systems

41113 StatsSA Generation and/or distribution for own use

41210 CHIETA Manufacture of industrial gases in compressed, liquefied or solid forms

41200 StatsSA Manufacture of gas; distribution of gaseous fuels through mains

42001 LGWSETA Public water enterprises: Collection, purification and distribution of water, including potable water supply, domestic waste and sewage systems, refuse and sanitation services

42000 StatsSA Collection, purification and distribution of water

42002 LGWSETA Private water companies: Collection, purification and distribution of water, including potable water supply, domestic waste and sewage services, refuse and sanitation services

42000 StatsSA Collection, purification and distribution of water

42003 LGWSETA Irrigation boards: collection, purification and distribution of water, including potable water supply, domestic waste and sewage systems, refuse and sanitation services

42000 StatsSA Collection, purification and distribution of water

50001 CETA Contractor development

50000 StatsSA Construction

50101 CETA Excavation. earth moving and tunneling

50100 StatsSA Site preparation

50102 CETA Demolition of buildings and structures

50100 StatsSA Site preparation

50103 CETA Shoring and piling

50100 StatsSA Site preparation

50201 CETA Construction management and supervision

50200 StatsSA Building of complete constructions or parts thereof; civil engineering

50202 CETA Cutting, bending and fixing of reinforcing steel

50200 StatsSA Building of complete constructions or parts thereof; civil engineering

50203 CETA Manufacture and assembly of building related aluminium components and fixtures, including aluminium fenestration and skylight installation

50200 StatsSA Building of complete constructions or parts thereof; civil engineering

50212 CETA Building construction and project management

50210 StatsSA Construction of buildings

50213 CETA Timber construction

50219 StatsSA Timber construction

50221 CETA Construction and maintenance of water supply, sewage and storm water infrastructure

50220 StatsSA Construction of civil engineering structures

50222 ESETA Construction of pylons for electric transmission lines

50220 StatsSA Construction of civil engineering structures

50223 N/A Construction of pylons for electric transmission lines by local governments

50220 StatsSA Construction of civil engineering structures

50231 CETA Plant operation

50230 StatsSA Construction of other structures

50232 CETA Building installation, services and completion

50230 StatsSA Construction of other structures

50241 CETA Carpentry

50240 StatsSA Construction by specialist trade contractors

50242 CETA Ceiling and partition erection

50240 StatsSA Construction by specialist trade contractors

50243 CETA Conservation, restoration and refurbishment of buildings, structures etc.

50240 StatsSA Construction by specialist trade contractors

50244 CETA Shuttering

50240 StatsSA Construction by specialist trade contractors

50250 CETA Structural steel and cladding contracting

50240 StatsSA Construction by specialist trade contractors

50260 CETA Construction, maintenance and repair of roads, runways, bridges, tunnels and related structures including draining and road services

50240 StatsSA Construction by specialist trade contractors

50261 CETA Road surfacing and repair; hot mix and cold mix asphalt manufacture; and bituminous slurry, bituminous emulsion and modified bituminous binder manufacture

50240 StatsSA Construction by specialist trade contractors

34261 CETA Dimensional stone trades

50390 StatsSA Dimensional stone trades

50340 CETA Bricklaying

50390 StatsSA Dimensional stone trades

50350 CETA Plastering, tiling and paving

50390 StatsSA Dimensional stone trades

50360 CETA Fencing

50390 StatsSA Dimensional stone trades

50370 CETA Glazing

50390 StatsSA Dimensional stone trades

50380 CETA Scaffolding

50390 StatsSA Dimensional stone trades

50391 CETA Fire suppression equipment installation and maintenance in buildings

50390 StatsSA Dimensional stone trades

50392 MERSETA Manufacture of fire sprinklers

50390 StatsSA Dimensional stone trades

34221 CETA Installation of refractory ceramic products

50490 StatsSA Installation of refractory ceramic products

50411 SERVICES Decorating business / Interior designers and decorators

50490 StatsSA Installation of refractory ceramic products

50420 CETA Roofing

50490 StatsSA Installation of refractory ceramic products

50430 CETA Floor covering

50490 StatsSA Installation of refractory ceramic products

50491 CETA Waterproof contracting

50490 StatsSA Installation of refractory ceramic products

50492 MERSETA Manufacture of waterproofing products

50490 StatsSA Installation of refractory ceramic products

50493 MERSETA Manufacture of resistant and insulation material

50490 StatsSA Installation of refractory ceramic products

30133 SETASA Fruit Exporters and importers

61221 StatsSA Fruit Exporters and importers

61421 SERVICES Import and Export of various metals

61420 StatsSA Wholesale trade in metal and metal ores

61502 SETASA Wholesale & retail trade in agricultural machinery

61509 StatsSA Wholesale & retail trade in agricultural machinery

62111 SETASA Sale and distribution of agricultural raw materials and other farming inputs

62110 StatsSA Retail trade in non-specialised stores with food, beverages and tobacco predominating

62112 SETASA Service for nut farmers and companies

62110 StatsSA Retail trade in non-specialised stores with food, beverages and tobacco predominating

62208 SETASA Processing and dispatching of tobacco

62209 StatsSA Processing and dispatching of tobacco

62311 W&RSETA Retail of non-prescribed medicines and pharmaceutical products other than by pharmacists

62310 StatsSA Retail trade in pharmaceutical and medical goods, cosmetic and toilet articles

62313 HWSETA Private sector pharmacy services

62310 StatsSA Retail trade in pharmaceutical and medical goods, cosmetic and toilet articles

62314 HWSETA Public sector pharmacy services

62310 StatsSA Retail trade in pharmaceutical and medical goods, cosmetic and toilet articles

62315 HWSETA Pharmacy management services

62310 StatsSA Retail trade in pharmaceutical and medical goods, cosmetic and toilet articles

65004 W&RSETA Retailing of beauty products

62310 StatsSA Retail trade in pharmaceutical and medical goods, cosmetic and toilet articles

65002 W&RSETA Retail of baby clothing

62320 StatsSA Retail trade in textiles, clothing, footwear and leather goods

65005 W&RSETA Sale of marine equipment and everything to do with boats

62323 StatsSA Retail trade by general outfitters and by dealers in piece goods, textiles, leather and travel accessories

65003 W&RSETA Selling of wooden doors

62340 StatsSA Retail trade in hardware, paints and glass

65006 W&RSETA Retail of packing materials

62399 StatsSA Retail trade by other specialised stores

86010 ISETT Consumer electronics repair and maintenance

62602 StatsSA Repair, servicing and installation of household and personal appliances

63001 N/A Sale, maintenance and repair of motor vehicles and cycles

63000 StatsSA Sale, maintenance and repair of motor vehicles and motor cycles; retail trade in automotive fuel

63205 MERSETA Sale, service, fitting, maintenance and repair of new and used cars

63200 StatsSA Maintenance and repair of motor vehicles

86012 ISETT Communication equipment repair and maintenance

63202 StatsSA Electrical repairs

86013 ISETT Other electronic and precision equipment repair and maintenance

63202 StatsSA Electrical repairs

86014 ISETT Repair and maintenance of electronic marine equipment

63202 StatsSA Electrical repairs

96133 ISETT Installation, Maintenance and repair of tracking devices for cars

63209 StatsSA Other maintenance and repairs n.e.c.

63312 MERSETA Sale, service and fitting of car accessories

63300 StatsSA Sale of motor vehicle parts and accessories

63314 MERSETA Sale fitting and service of new and used tyres

63311 StatsSA Sale of tyres

63313 MERSETA Sale of used parts and accessories from metal scrap yards

63320 StatsSA Sale of used parts and accessories from metal scrap yards

63401 N/A Sale of new and used motor cycles

63400 StatsSA Sale, maintenance and repair of motor cycles and related parts and accessories

63402 MERSETA Sale, service, fitting, maintenance and repair of new and used motor cycles

63400 StatsSA Sale, maintenance and repair of motor cycles and related parts and accessories

63002 W&RSETA Retail trade in automotive fuel

63500 StatsSA Retail trade in automotive fuel

64101 THETA Hotels, motels, boatels and inns not registered

64100 StatsSA Hotels, camping sites and other provision of short-stay accommodation

64104 THETA Hotels, motels, boatels and inns registered

64100 StatsSA Hotels, camping sites and other provision of short-stay accommodation

64105 THETA Bed and breakfast

64100 StatsSA Hotels, camping sites and other provision of short-stay accommodation

64106 THETA Management and operation of game lodges

64100 StatsSA Hotels, camping sites and other provision of short-stay accommodation

64206 THETA Fast food establishments

64200 StatsSA Restaurants, bars and canteens

64207 THETA Other catering services n.e.c. including pubs, taverns, night clubs

64202 StatsSA Restaurants or tearooms without liquor license

64205 THETA Take-away restaurants

64203 StatsSA Take-away counters

74111 TETA Transport of goods

71000 StatsSA Land transport; transport via pipelines

71201 TETA Land transport

71200 StatsSA Other land transport

71213 N/A Urban, suburban and inter-urban bus and coach passenger lines, operated by local government

71211 StatsSA Urban, suburban and inter-urban bus and coach passenger lines

71214 THETA Tour operators (inbound and outbound tour operators)

71220 StatsSA Tour operators (inbound and outbound tour operators)

71223 THETA Safaris and sightseeing trip operators

71220 StatsSA Tour operators (inbound and outbound tour operators)

74136 SETASA Transport of livestock as supporting activity

71239 StatsSA Other freight transport by road

73002 THETA Inbound international flights

73000 StatsSA Air transport

71232 TETA Freight forwarding and clearing

74110 StatsSA Freight forwarding and clearing

30313 SETASA Handling and storage of grain

74120 StatsSA Handling and storage of grain

74112 TETA Tow truck services

74132 StatsSA Tow truck services

73001 TETA Civil aviation

74134 StatsSA Civil aviation

75121 SERVICES Mail handling

75100 StatsSA Postal and related courier activities

75201 ISETT Wired telecommunication carriers

75200 StatsSA Telecommunication

75202 ISETT Television broadcasting

75200 StatsSA Telecommunication

75203 ISETT Cable networks and programme distribution

75200 StatsSA Telecommunication

75204 N/A Telephone and wired telecommunication carriers

75200 StatsSA Telecommunication

75205 ISETT Wireless telecommunication carriers except satellite

75200 StatsSA Telecommunication

75206 ISETT Radio Broadcasting

75200 StatsSA Telecommunication

75207 ISETT Radio networks

75200 StatsSA Telecommunication

75208 ISETT Radio stations

75200 StatsSA Telecommunication

75209 ISETT Television broadcasting

75200 StatsSA Telecommunication

75210 ISETT Telecommunications

75200 StatsSA Telecommunication

75211 ISETT Telecommunication and wired telecommunication carriers

75200 StatsSA Telecommunication

75212 ISETT Paging

75200 StatsSA Telecommunication

75213 ISETT Cellular and other wireless telecommunications

75200 StatsSA Telecommunication

75214 ISETT Satellite telecommunications

75200 StatsSA Telecommunication

75215 ISETT Other telecommunications

75200 StatsSA Telecommunication

75111 SERVICES Banking via post office

81900 StatsSA Banking via post office

81901 SERVICES Project financial management

81900 StatsSA Banking via post office

81903 N/A Asset management

81900 StatsSA Banking via post office

81904 FASSET Investment entities and trusts

81900 StatsSA Banking via post office

81905 BANKSETA Unit trusts

81900 StatsSA Banking via post office

88102 FASSET Asset portfolio management

81900 StatsSA Banking via post office

82132 HWSETA Medical aid schemes

82100 StatsSA Insurance and pension funding, except compulsory social security

82191 INSETA Short term insurance

82100 StatsSA Insurance and pension funding, except compulsory social security

82131 INSETA Health care benefits administration

82130 StatsSA Medical aid funding

82192 INSETA Funeral insurance

82190 StatsSA Other insurance n.e.c.

82193 INSETA Reinsurance

82190 StatsSA Other insurance n.e.c.

83101 BANKSETA Securities dealings by banks

83100 StatsSA Activities auxiliary to financial intermediation, except insurance and pension funds

83102 BANKSETA Activities ancillary to financial mediation

83100 StatsSA Activities auxiliary to financial intermediation, except insurance and pension funds

83121 FASSET Stock broking activities

83120 StatsSA Security dealing activities

83180 FASSET Development corporations and organizations

83120 StatsSA Security dealing activities

84111 THETA Time sharing

84130 StatsSA Time sharing

84202 SERVICES Property management services

84200 StatsSA Real estate activities on a fee or contract basis

84203 SERVICES Estate Agencies

84200 StatsSA Real estate activities on a fee or contract basis

84201 SERVICES Real estate valuation services

84210 StatsSA Real estate valuation services

85111 THETA Renting of land transport equipment including car rentals

85110 StatsSA Renting of land transport equipment

86005 ISETT Office machinery and equipment rental and leasing

85230 StatsSA Renting of office machinery and equipment (including computers)

85291 MQA Supply of mining equipment

85290 StatsSA Renting of other machinery and equipment n.e.c.

86001 ISETT Software publishers

86200 StatsSA Software publishers

86002 ISETT Computer systems design and related services

86200 StatsSA Software publishers

86006 ISETT Computer programming services

86200 StatsSA Software publishers

86009 ISETT Computer system design services and integrated solutions

86200 StatsSA Software publishers

86004 ISETT Electronic and precision equipment repair and maintenance

86500 StatsSA Electronic and precision equipment repair and maintenance

86011 ISETT Computer and office machine repair, maintenance and support services

86500 StatsSA Electronic and precision equipment repair and maintenance

86003 ISETT Computer facilities management services

86900 StatsSA Computer facilities management services

86007 ISETT Other computer related activities

86900 StatsSA Computer facilities management services

87141 ESETA Industrial research for electrical energy

87140 StatsSA Industrial research, e.g. fuel research

87142 ISETT Research and development of electronic equipment and systems

87140 StatsSA Industrial research, e.g. fuel research

87143 ISETT Information technology import and product integration of pre-manufactured electronics IT and telecommunications equipment

87140 StatsSA Industrial research, e.g. fuel research

87144 FIETA Forest research

87140 StatsSA Industrial research, e.g. fuel research

87145 N/A Scientific research and development services

87140 StatsSA Industrial research, e.g. fuel research

87146 ISETT Research and development in the physical and engineering sciences

87140 StatsSA Industrial research, e.g. fuel research

87132 ETDP SETA Research and development

87190 StatsSA Research and development

87131 HWSETA SA medical Research council

87200 StatsSA SA medical Research council

9110E FASSET Departments of state expenditure and finance

88100 StatsSA Legal, accounting, bookkeeping and auditing activities; tax consultancy; market research and public opinion research; business and management consultancy

88101 FASSET Tax services

88120 StatsSA Tax services

91108 FASSET South African Revenue Service (SARS)

88120 StatsSA Tax services

81902 INSETA Risk management

88140 StatsSA Risk management

88103 FASSET Company secretary services

88140 StatsSA Risk management

88141 SERVICES General consulting services

88140 StatsSA Risk management

88201 MERSETA Precision engineering

88211 StatsSA Precision engineering

88217 N/A Roads

88211 StatsSA Precision engineering

88218 N/A Municipal public works functions (specifically assigned)

88211 StatsSA Precision engineering

88219 N/A Municipal fencing and fences

88211 StatsSA Precision engineering

8821A N/A Municipal roads

88211 StatsSA Precision engineering

8821B N/A Street lighting

88211 StatsSA Precision engineering

8821C CETA Earth crust drilling

88211 StatsSA Precision engineering

88221 HWSETA Biomedical engineering

88211 StatsSA Precision engineering

8821D CETA Landscape architecture

88212 StatsSA Architectural activities

88222 CETA Testing the strength of concrete

88220 StatsSA Technical testing and analysis

88229 N/A Other activities - engineering and other commercial research, developing and
    testing e.g. SABS

88220 StatsSA Technical testing and analysis

88313 MAPPP Commercial design

88312 StatsSA Sign writing and industrial and commercial artistry

86008 ISETT Call centre and customer relationship management system development

88900 StatsSA Call centre and customer relationship management system development

88913 CETA Labour only contracting for building and construction

88910 StatsSA Labour recruitment and provision of staff

88914 CETA Sub-contracting for building and construction

88910 StatsSA Labour recruitment and provision of staff

88915 HWSETA Health professionals' employment agencies

88912 StatsSA Hiring out of workers (labour-broking activities)

88916 SERVICES Private employment agencies & temporary employment services

88912 StatsSA Hiring out of workers (labour-broking activities)

88917 SERVICES Temporary employment services

88912 StatsSA Hiring out of workers (labour-broking activities)

88918 SERVICES Permanent Employment Agencies

88912 StatsSA Hiring out of workers (labour-broking activities)

88931 N/A Building and industrial plant cleansing activities

88930 StatsSA Building and industrial plant cleaning activities

8899A THETA Event and conference management

88999 StatsSA Other business activities n.e.c.

8899B MAPPP Duplicating / photocopying in copy shops

88999 StatsSA Other business activities n.e.c.

91106 DIDTETA Department of foreign affairs

91101 StatsSA Government departments

91107 DIDTETA Department of trade and industry

91101 StatsSA Government departments

9110A POSLECSETA Policing

91101 StatsSA Government departments

9110B POSLECSETA Correctional services

91101 StatsSA Government departments

9110C POSLECSETA Justice

91101 StatsSA Government departments

9110D DIDTETA Department of defence

91101 StatsSA Government departments

91104 DIDTETA NIA National Intelligence Agency

91109 StatsSA NIA National Intelligence Agency

91105 DIDTETA SASS South African Secret Services

91109 StatsSA NIA National Intelligence Agency

9110F PSETA Parastatals n.e.c.

91300 StatsSA Parastatals n.e.c.

91201 LGWSETA All functions, services and facilities provided by a metropolitan council
as determined by 84(1); (2) and (3) of Act 117 of 1998 - Local Government Municipal
Structure Act of 1998

91300 StatsSA Parastatals n.e.c.

91202 LGWSETA Category B municipalities: all functions, services and facilities provided
by local council as determined by 84(1), (2) and (3) of Act 117 of 98

91300 StatsSA Parastatals n.e.c.

91203 LGWSETA Category C municipalities: all functions, services and facilities provided by a district council and district area management as per Act 117 as determined by 84(1), (2) and (3) of Act 117 of 1998 Local government Municipal Structures Act 1998

91300 StatsSA Parastatals n.e.c.

91204 LGWSETA Organized local government- any statutory or regulatory body assigned the function as per constitution of RSA, to deal with matters at and executive level within local government

91300 StatsSA Parastatals n.e.c.

91301 N/A Metro police

91300 StatsSA Parastatals n.e.c.

91302 N/A Traffic management / law enforcement

91300 StatsSA Parastatals n.e.c.

91303 N/A Air pollution

91300 StatsSA Parastatals n.e.c.

91304 N/A Municipal planning

91300 StatsSA Parastatals n.e.c.

91305 N/A Trading regulations

91300 StatsSA Parastatals n.e.c.

91306 N/A Billboards and the display of advertisements in public places

91300 StatsSA Parastatals n.e.c.

91307 N/A Control of public nuisances

91300 StatsSA Parastatals n.e.c.

91308 N/A Control of undertakings that sell liquor to the public

91300 StatsSA Parastatals n.e.c.

91309 N/A Licensing of dogs

91300 StatsSA Parastatals n.e.c.

9130A N/A Licensing and control of undertakings that sell food to the public

91300 StatsSA Parastatals n.e.c.

9130B N/A Noise pollution

91300 StatsSA Parastatals n.e.c.

9130C N/A Street trading

91300 StatsSA Parastatals n.e.c.

9130D N/A Management of parking lots, park meters and traffic lights

91300 StatsSA Parastatals n.e.c.

9130E CETA Town and regional planning

91300 StatsSA Parastatals n.e.c.

9130F N/A Land use planning

91300 StatsSA Parastatals n.e.c.

93101 HWSETA Universities, specialist pharmaceutical and drug information services

92007 StatsSA Education by universities

9200A ETDP SETA NGOs involved in education

92009 StatsSA Other educational services - own account teachers, motor vehicle driving schools/tutors and music, dancing and other art schools etc

9200B N/A Pre-primary education and activities of after school centres by local authorities

92009 StatsSA Other educational services - own account teachers, motor vehicle driving schools/tutors and music, dancing and other art schools etc

92010 ETDP SETA Examination and assessment bodies

92009 StatsSA Other educational services - own account teachers, motor vehicle driving schools/tutors and music, dancing and other art schools etc

93102 HWSETA Public and private rehabilitation

92009 StatsSA Other educational services - own account teachers, motor vehicle driving schools/tutors and music, dancing and other art schools etc

93104 HWSETA Ancillary health care services

93000 StatsSA Health and social work

93105 HWSETA Residential care facilities

93100 StatsSA Human health activities

93106 HWSETA Rehabilitation services

93100 StatsSA Human health activities

93107 HWSETA Environmental and occupational health and safety services

93100 StatsSA Human health activities

93108 HWSETA Health maintenance organizations

93100 StatsSA Human health activities

9311B HWSETA Private hospitals

93110 StatsSA Hospital activities

9311C HWSETA Mine hospitals

93110 StatsSA Hospital activities

9311D HWSETA Company owned hospitals

93110 StatsSA Hospital activities

9319D HWSETA Public hospitals and clinics

93110 StatsSA Hospital activities

9319F HWSETA Private hospitals and clinics

93110 StatsSA Hospital activities

9319H N/A Municipal clinics

93110 StatsSA Hospital activities

9311A HWSETA Defence force hospitals

93119 StatsSA Other hospitals, n.e.c.

9311E HWSETA Hospice care facilities

93119 StatsSA Other hospitals, n.e.c.

9319E HWSETA Community services

93119 StatsSA Other hospitals, n.e.c.

9319G N/A Day clinics

93119 StatsSA Other hospitals, n.e.c.

9319I N/A Community care services

93119 StatsSA Other hospitals, n.e.c.

9312A HWSETA Public sector doctors

93120 StatsSA Medical and dental practice activities

9312B HWSETA Private sector doctors

93120 StatsSA Medical and dental practice activities

9312D HWSETA Industry based doctors

93120 StatsSA Medical and dental practice activities

9312E HWSETA Doctors in charitable organisations

93120 StatsSA Medical and dental practice activities

9312G HWSETA Public service dentists

93120 StatsSA Medical and dental practice activities

9312H HWSETA Private sector dentists

93120 StatsSA Medical and dental practice activities

9319J N/A Public sector clinicians and managers

93120 StatsSA Medical and dental practice activities

9312C HWSETA General and specialist practice

93121 StatsSA Medical practitioner and specialist activities

9312F HWSETA Pediatrics

93190 StatsSA Pediatrics

9312I HWSETA Oral hygienists

93190 StatsSA Pediatrics

9312J HWSETA Dental therapists

93190 StatsSA Pediatrics

9312K HWSETA Dental laboratories

93190 StatsSA Pediatrics

9319A HWSETA Public sector emergency services

93190 StatsSA Pediatrics

9319B N/A Local government services

93190 StatsSA Pediatrics

9319C HWSETA State services

93190 StatsSA Pediatrics

9319M HWSETA Optical and optometric services

93190 StatsSA Pediatrics

9319N HWSETA Dietetics and nutritional services

93190 StatsSA Pediatrics

9319P HWSETA Complementary health services

93190 StatsSA Pediatrics

9319Q HWSETA Laboratory services

93190 StatsSA Pediatrics

9319R N/A Laboratories

93190 StatsSA Pediatrics

9319K N/A Private sector nurses

93191 StatsSA Supplementary health services or paramedical staff (practitioners)

9319L N/A Local government nurses

93191 StatsSA Supplementary health services or paramedical staff (practitioners)

33531 HWSETA Traditional healing services

93199 StatsSA Traditional healing services

9319S HWSETA Ambulance services

93199 StatsSA Traditional healing services

9319T HWSETA Blood transfusion

93199 StatsSA Traditional healing services

9319U HWSETA Psychological and psychometric testing

93199 StatsSA Traditional healing services

9319V N/A Public and private laboratory services

93199 StatsSA Traditional healing services

93201 N/A State services

93199 StatsSA Traditional healing services

93202 N/A Local government

93300 StatsSA Local government

93301 HWSETA Public welfare sector

93300 StatsSA Local government

93302 HWSETA Private Welfare Sector

93300 StatsSA Local government

93303 HWSETA Development and social services

93300 StatsSA Local government

93304 N/A Social Work Activities within local government

93300 StatsSA Local government

9391W HWSETA NGO Welfare Sector

93300 StatsSA Local government

93103 HWSETA Other services including local government, mines and industry

94000 StatsSA Other services including local government, mines and industry

94002 N/A Health and community services

94000 StatsSA Other services including local government, mines and industry

94003 N/A Water and sanitation services (potable water supply, domestic waste water and sewage systems)

94000 StatsSA Other services including local government, mines and industry

94004 TETA Waste management

94000 StatsSA Other services including local government, mines and industry

94005 N/A Other community, social and personal service activities provided by municipalities

94000 StatsSA Other services including local government, mines and industry

94001 N/A Refuse and sanitation

94009 StatsSA Refuse and sanitation

95121 ETDP SETA Professional organizations in education

95120 StatsSA Activities of professional organisations

95122 SERVICES Professional bodies n.e.c.

95120 StatsSA Activities of professional organisations

95991 SERVICES Bargaining councils and dispute resolution

95200 StatsSA Activities of trade unions

95911 SERVICES Religious institutions, grief counseling, work with the dying e.g. Hospices, etc

95910 StatsSA Activities of religious organisations

95992 SERVICES Associations, federations and umbrella bodies

95990 StatsSA Activities of other membership organisations n.e.c.

96001 N/A Recreational, cultural and sporting facilities within local government

96000 StatsSA Recreational, cultural and sporting activities

96002 THETA Recreational, leisure and outdoor adventure activities incl. management and operation of facilities, government departments

96000 StatsSA Recreational, cultural and sporting activities

96113 MAPPP Film and video reproduction

96111 StatsSA Motion picture and video production and distribution

96123 MAPPP Bioscope cafes

96122 StatsSA Motion picture projections by drive-in cinemas

96131 ISETT Providing radio and television transmission signals

96130 StatsSA Radio and television activities

96132 MAPPP Production and broadcast of radio and television broadcast content

96130 StatsSA Radio and television activities

96141 MAPPP Activities of artists and entertainers

96140 StatsSA Dramatic arts, music and other arts activities

96142 MAPPP Activities of theatre and entertainment technicians

96140 StatsSA Dramatic arts, music and other arts activities

96143 MAPPP Production of 'live' theatrical and artistic events

96140 StatsSA Dramatic arts, music and other arts activities

96144 MAPPP Activities of arts councils and other related institutions

96140 StatsSA Dramatic arts, music and other arts activities

96191 N/A Beaches and amusement facilities and fairs

96190 StatsSA Other entertainment activities n.e.c.

96192 N/A Pounds

96190 StatsSA Other entertainment activities n.e.c.

96193 N/A Public places

96190 StatsSA Other entertainment activities n.e.c.

96194 N/A Amusement arcades

96190 StatsSA Other entertainment activities n.e.c.

96195 THETA Operation & management of convention centres

96190 StatsSA Other entertainment activities n.e.c.

96196 THETA Amusement Parks

96190 StatsSA Other entertainment activities n.e.c.

96311 ETDP SETA Provision and operation of libraries of all kinds

96310 StatsSA Library and archives activities

96321 N/A Museum activities and preservation of historical sites and buildings by local governments

96320 StatsSA Museum activities and preservation of historical sites and buildings

96331 N/A Parks and gardens under control of municipalities

96330 StatsSA Botanical and zoological gardens and nature reserve activities

96332 N/A Zoos

96330 StatsSA Botanical and zoological gardens and nature reserve activities

96333 THETA Game parks, reserves incl. but not limited to wildlife, parks, zoological or animal parks and botanical gardens

96330 StatsSA Botanical and zoological gardens and nature reserve activities

96334 THETA Activities of conservation bodies

96330 StatsSA Botanical and zoological gardens and nature reserve activities

96335 THETA Wildlife conservation incl. wildlife, game, parks, game reserves, zoological establishments, botanical gardens etc

96330 StatsSA Botanical and zoological gardens and nature reserve activities

96336 THETA Tourist info centres

96330 StatsSA Botanical and zoological gardens and nature reserve activities

93195 THETA Operation and management of health and well-being centres incl. but not limited to hydros, spas, fitness centres etc.

96400 StatsSA Operation and management of health and well-being centres incl. but not limited to hydros, spas, fitness centres etc.

96411 THETA Operation and management of sporting facilities and clubs

96410 StatsSA Sporting activities

96412 THETA Operation and management of sport academies

96410 StatsSA Sporting activities

96413 THETA Promotion and management of sporting events and activities

96410 StatsSA Sporting activities

96414 N/A Local sports facilities under control of municipalities

96410 StatsSA Sporting activities

96415 THETA Management and operation of non-motorized sporting activities

96410 StatsSA Sporting activities

96416 N/A Operation of golf courses and clubs

96410 StatsSA Sporting activities

96417 THETA Sporting activities incl. but not limited to sport federations etc.

96410 StatsSA Sporting activities

96418 THETA Management and operation of motorized sporting activities

96410 StatsSA Sporting activities

96419 THETA Operation and management of horse racing events and clubs and academies

96410 StatsSA Sporting activities

96491 THETA The operation and management of recreation parks and beaches, fairs and shows of a recreational nature and recreational transport activities

96490 StatsSA Other recreational activities

96492 MAPPP The activities of casting for motion pictures, television and theatre productions.

96490 StatsSA Other recreational activities

96493 N/A Municipal parks

96490 StatsSA Other recreational activities

96494 THETA Gambling, licensed casinos and the national lottery incl. but not limited to book makers, totalisators, casinos, bingo operators

96490 StatsSA Other recreational activities

99001 N/A Building regulations

99000 StatsSA Other service activities

99002 SERVICES General cleaning

99000 StatsSA Other service activities

99003 SETASA Pest control

99000 StatsSA Other service activities

99004 N/A Project Management Frameworks

99000 StatsSA Other service activities

99005 N/A Project management integration

99000 StatsSA Other service activities

99006 N/A Project scope management

99000 StatsSA Other service activities

99007 N/A Project time management

99000 StatsSA Other service activities

99008 N/A Project Risk Management

99000 StatsSA Other service activities

99009 N/A Project communication management

99000 StatsSA Other service activities

99011 N/A Project human resource management

99000 StatsSA Other service activities

99012 N/A Project procurement management

99000 StatsSA Other service activities

99013 N/A Project quality management

99000 StatsSA Other service activities

99014 SERVICES Quality management and related services

99000 StatsSA Other service activities

99015 SERVICES Non-financial business management and management consulting

99000 StatsSA Other service activities

99016 SERVICES NGO management and services

99000 StatsSA Other service activities

99017 SERVICES SETA Management

99000 StatsSA Other service activities

99018 SERVICES Cleaning of carpet and upholstery

99000 StatsSA Other service activities

99019 SERVICES Cleaning equipment and consumable supply

99000 StatsSA Other service activities

99025 SERVICES Dry cleaning and laundering

99000 StatsSA Other service activities

99026 SERVICES Garden maintenance services

99000 StatsSA Other service activities

99027 SERVICES Domestic services

99000 StatsSA Other service activities

99028 THETA Car Hire

99000 StatsSA Other service activities

99028 THETA Car Hire

99000 StatsSA Other service activities

99029 SERVICES Function and catering equipment hire

99000 StatsSA Other service activities

99031 N/A Cemeteries

99000 StatsSA Other service activities

99032 N/A Facilities for the accommodation, car and burial of animals

99000 StatsSA Other service activities

99033 SERVICES Coffin making by funeral enterprises

99000 StatsSA Other service activities

99034 SERVICES Manufacture of funeral and tombstones

99000 StatsSA Other service activities

99035 SERVICES Miscellaneous item hire

99000 StatsSA Other service activities

99036 SERVICES Truck Hire

99000 StatsSA Other service activities

99037 SERVICES Video Hire

99000 StatsSA Other service activities

99038 SERVICES Brand marketers

99000 StatsSA Other service activities

99039 SERVICES Generic project management

99000 StatsSA Other service activities

99039 SERVICES Generic project management

99000 StatsSA Other service activities

99040 N/A Call centres

99000 StatsSA Other service activities

99041 SERVICES Nail technology including nail technologist, nail technicians and distributors and agencies of nail products

99000 StatsSA Other service activities

99042 SERVICES Perfumery including aromatics, aromatic oils and related products, perfumery consultants, sales people and distributors of perfumes

99000 StatsSA Other service activities

99043 SERVICES Health and skin care incl. health and skin care therapists, stress therapists and somatologists, slimming salons and distributors of slimming products including slimming machines

99000 StatsSA Other service activities

99044 SERVICES Make-up artistry

99000 StatsSA Other service activities

99045 SERVICES Personal services agencies

99000 StatsSA Other service activities

99046 SERVICES Modelling agencies

99000 StatsSA Other service activities

99047 SERVICES Pet care

99000 StatsSA Other service activities

99048 THETA Tourism authorities incl. but not limited to tourism marketing, tourist information centres, publicity associations

99000 StatsSA Other service activities

99049 THETA Guides incl. tourist river, mountain etc

99000 StatsSA Other service activities

99050 SERVICES Distributors of slimming products including slimming machines

99000 StatsSA Other service activities

99051 SERVICES Distributors of make-up products and related merchandise

99000 StatsSA Other service activities

99052 SERVICES Truck and plant hire

99000 StatsSA Other service activities

99053 SERVICES Valuers

99000 StatsSA Other service activities

99054 SERVICES Fashion design not related to clothing

99090 StatsSA Other service activities n.e.c.