

# MEASURING INNOVATION

by André Buys

**Innovation is the driving force behind a nation's economic development and the improvement of the competitiveness of its firms. In South Africa there is a growing awareness among entrepreneurs, policy-makers and scientists that innovation should be central in business and policy strategies. To formulate such strategies, the existing economic and innovative performance of South African companies must be understood.**

Existing data sources, such as national research and development surveys, are widely recognised as being inadequate to develop policy and support analysis for innovation. As a result, a number of countries, including South Africa, have begun measuring innovation more broadly.

The first survey of industrial innovation in South Africa was the 1996 Survey of Innovation in South African Manufacturing Firms (SISAMF-1996). This was a joint undertaking by the Directorate for Science and Technology Policy of the Foundation for Research Development and the Industrial Strategy Project of the Development Policy Research Unit of the University of Cape Town.

The SISAMF-1996 was modelled on the Community Innovation Survey performed in European Union countries since 1994. The SISAMF-1996 was not a comprehensive national survey as only selected innovative manufacturing companies were surveyed and it could therefore not be benchmarked against overseas industries.

## International research collaboration

In 1999 the University of Pretoria and Eindhoven University of Technology in The Netherlands recognised that without a strong and relevant academic research effort in technological innovation to support and sustain the National Innovation Strategy, South African industry would lag behind in the global competitive arena. These universities thus embarked on a joint research project that sought to measure innovation activities in South Africa.

In 2000 the joint research team conducted the first comprehensive national innovation survey, the South African Innovation Survey 2001 (SAIS2001). The survey design was presented at the Joint SA/OECD Seminar on Innovation Measurement in Pretoria on 29 March 2001 (Oerlemans et al., 2005).

## Research goals

The survey sought to measure the innovative behaviour and performance of South African firms and had three main goals:

- To get a representative, nationwide overview of the innovative activities of South African firms in manufacturing and services from 1998 to 2000

- To benchmark the innovative behaviour of South African firms with the innovative behaviour of firms in the European Community
- To formulate policy recommendations for the key role-players in the National System of Innovation.

## Research methodology

The SAIS2001, covering the period 1998 to 2000, was conducted during 2001. A stratified random sample of 7 039 firms – selected from a commercial database of South African firms – were asked to complete the survey questionnaire. Of these, 617 (8.4%) completed the questionnaire.

A second survey was conducted of a random sample of 416 non-responding firms and a statistical test (the Mann-Whitney U-test) revealed no significant differences ( $p=0.46$ ) in the responses to a number of key questions. Therefore the response group could be considered as representative of the total population of South African firms.

The stratified survey results were weighted to obtain the same firm size distribution as measured in the comprehensive 1996 Census of Manufacturing (Statistics South Africa, 1999). This was done to ensure that the findings accurately described innovation and innovative activities of the entire South African industry base.

## Main findings

The SAIS2001 produced some interesting results. The survey found that 52% of South African firms in the manufacturing sector had technological innovations from 1998 to 2000. This figure is surprisingly high – it is the same as the European average and higher than that of developed countries such as Italy, Norway and France. Furthermore, 31% of South African innovators reported that their relative market position had improved substantially due to their innovative activities and that 30% of their total sales in 2000 could be attributed to innovative products and services.

The survey found that the R&D effort by firms was generally low. About 51% of firms had no R&D effort. The mean R&D



→ Presenting the Innovation Survey Report to the Minister of Science and Technology on 26 January 2004 (from left): Dr G Rooks, Prof. L Oerlemans, Dr B Ngubane, Minister of Science and Technology, Prof. C Pistorius, Principal of the University of Pretoria, Prof. T Pretorius, Dr A Patterson (Department of Science and Technology) and Prof. A Buys.

effort in persons was only 1.8% of the workforce. The innovation expenditure as a percentage of sales in manufacturing in 2000 was 2.6%, which is low, compared to the European mean of 3.7%.

An international comparison of innovativeness versus innovation costs is shown in Figure 1. An unexpected conclusion is that South African innovating firms are able to produce innovation outcomes comparable to European levels with innovation efforts that are lower than their counterparts.

South African innovators are unique in many respects, providing some preliminary and partial explanations for this "input-output paradox". Utilising external knowledge resources complements the relatively low levels of own internal resources dedicated to innovation. A high percentage of firms (32%) developed new or improved products and/or services alone or together with a third party.

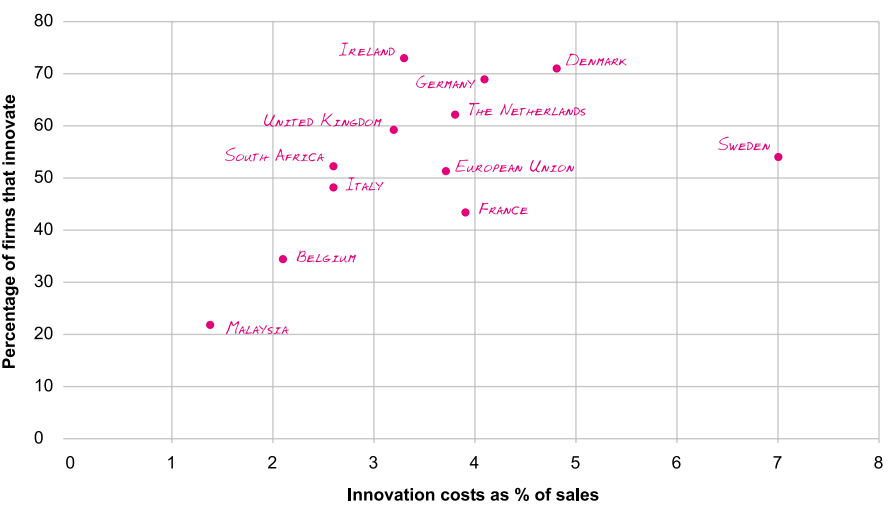
The sources of information for innovations, as well as types of partners used, indicate a tendency to imitate rather than invent.

More South African firms had foreign innovation partners (26%) than domestic innovation partners (18%).

The foreign partners were located predominantly in Europe. The most important external sources of information for innovation were exhibitions, competitors and professional literature, whereas the least utilised sources were research laboratories, innovation centres, universities and patents.

The majority of manufacturing and service sector firms (59%) did not innovate. The main reasons for this were a lack of financial and human resources and time for innovation projects. The same factors hampered the innovating activities of innovative firms. About 40% of innovative firms experienced seriously delayed innovation projects due to a lack of qualified personnel and information or familiarity with technologies, high costs, economic risks and shortage of finance and time to market problems.

The detailed report, *Industrial Innovation in South Africa: 1998 – 2000* (Oerlemans et al., 2004), which contains the results and findings of the survey, is available at [www.sais2001.up.ac.za](http://www.sais2001.up.ac.za). The report was handed to the Minister of Science and Technology on 26 January 2004 and the main findings were also reported in the South African Journal of Science (Rooks et al., 2005).



→ 1 International comparison of innovativeness vs innovation costs

**Research contributions**  
The survey established a database that

contains 122 166 data entries (617 firms with entries in 198 fields each). The SAIS2001 database has been utilised by a follow-on research project, supported by the National Research Foundation (Grant No 2053330), and involving four academics, three PhD and five master's students. The database also sets the baseline for comparison for future innovation surveys.

A number of recent published research studies have utilised the SAIS2001 database. These include the following:

- A study to determine how technology and innovation management activities affect the market position of organisations. Findings showed that conducting technology strategy activities contributes to market success (Oerlemans et al., 2005).
- A study to assess the effectiveness of South Africa's national system of innovation. The findings suggest that relatively inefficient institutions hamper South African innovators. As a result, some vital ingredients of innovation are not adequately provided, compared to some European countries (Rooks & Oerlemans, 2005).
- A characterisation of the South African National System of Innovation. It was found that the South African industry can generally be characterised as being in Stage III of the backward integration process, namely the improvement of products and processes by using foreign technology. South Africa is therefore a type of "technological colony" whose industries are dependent on foreign technology for the improvement of its products and processes (Buys, 2004).
- An illustration that the sources of information for innovation, as well as the types of partners used by firms, indicate a tendency to imitate rather than invent (Buys, 2005).
- A comparative analysis of the innovative behaviours of the defence-related industries and other industrial sectors in South Africa. This study found that the defence-related industries are the most innovative sector in the manufacturing industry (Buys, 2006).

### The South African Innovation Survey 2005

Government sees industrial innovation as a key driver of international competitiveness and the economic growth of the country. The Department of Science and Technology plans to conduct regular surveys to measure the levels of innovation in the South African industrial sectors. To this end, the Department commissioned the Centre for Science, Technology and Innovation Indicators of the Human Sciences Research Council to conduct the next national innovation survey.

The South African Innovation Survey 2005 (SAIS2005) was based on the fourth round of the European Community Innovation Survey and the Centre for Science, Technology and Innovation Indicators worked closely with the OECD and Eurostat, with input from the University of Pretoria, in designing the survey. The results of SAIS2005 were expected late in 2006, but have not yet been published.

### Research collaboration

A clear picture of the economic and innovative performance of South African firms is necessary in order to formulate strategies and policies to stimulate industrial innovation. Existing sources are widely recognised as being inadequate to develop policy and support analysis for innovation.

As the first national survey of the innovative activities of South African firms in manufacturing and services, SAIS2001 provided important knowledge and insight into the functioning of the National System of Innovation. The research collaboration during the SAIS2001 project played a major role in building research capacity in the Department of Engineering and Technology Management at the University of Pretoria (Pretorius & Buys, 2004). This has been the key to establishing a centre of expertise for the measurement and analysis of industrial innovation at the institution. 📍

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