

**An Exploration of the Innovation –  
Competitiveness Relationship  
A Descriptive Study of South  
African Businesses**

for the

**National Advisory Council on  
Innovation**

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## ABSTRACT

Innovation has become an increasingly important contributor to economic growth in recent years, through a linked systemic relationship to a nation's competitiveness. There are indications that interventions in innovation can influence competitiveness at the national, sector and organisation levels in varying degrees.

The research set out to explore the dynamics between investments in innovation and competitiveness, mainly focused at the organisational level and the national level in the South African economy. A database of approximately 970 target organisations was compiled comprising universities, public and private organisations and research institutions across South Africa who claim to have innovated. A purposive sample of 252 respondent organisations was utilised in the study, comprising 26% of the target population; a subsample of innovative organisations were selected for further qualitative analyses, ensuring both reliability and validity, to explicate their innovative behaviour in relation to competitiveness.

The personal and telephonic interviews were coded, grouped and analysed utilising mainly response frequency distributions to present the data which enabled conclusions to be drawn and recommendations formulated. In determining the dynamics leading to competitiveness, any constraints to innovation were also investigated.

The empirical study yielded the following findings, the most important ones being:

- First, the finding with regard to the key research question above was whether investments in innovation are linked systemically to competitiveness. This was the case in the literature in terms of countries and sectors, and evidence presented in the research suggested that successfully innovating organisations had some impact on competitiveness.
- The major findings that emerged from the empirical research were that innovating organisations experienced funding limitations. Those seeking funding from support programmes face highly bureaucratic fund mobilisation processes. This is a major inhibitor of innovation.
- Cross entity collaboration between government, HEI and industry are crucial for innovation stimulation and is enhanced though locality.
- The limited skills pool for effective innovation in South Africa another major inhibitor to innovation. Process innovation investments achieve cost reduction which in turn has resulted in competitive advantage for numerous organisations interviewed.

Conclusions drawn from the empirical research lead to recommendations around ways to foster innovation to drive and improve competitiveness. These included high levels of multilateral collaboration, increased funding and the specific enhancement of skills are the highest priority. Focus on the provision these direct support measures to organisations within priority sectors and innovation clusters, to drive innovation activity, through overt management is recommended. Finally it is argued that to achieve innovation-driven competitiveness, a focused *innovation-competitiveness strategy* with measurable outcomes is essential for delivering economic and social value to South Africa.

## Introduction

Developed and most developing countries promote innovation as a driver of economic growth. However, the intensity of investments in innovation varies across countries and is largely dependant on their level of economic development. While some countries often have a unique innovation strategy and supporting policies which are difficult to replicate in other countries due to different environments, circumstances and situations, certain trends in approaches to innovation and outcomes have been noted in the literature. One study, for instance, listed the following trends that might be relevant to South Africa (Clark & Guy, 1997):

- Innovation policies are aimed at improving competitiveness
- 'Innovation' and 'National Systems of Innovation' are becoming new buzzwords
- In less developed regions, only a small part of the science and technology base contributes to the growth of a healthy secondary sector, and policies increasingly attempt to reorient this base
- Many current policy initiatives are designed to unblock innovation exploitation routes and bridge supply and demand
- Many countries are unable to translate their science and technology base into productivity gains

The South African government acknowledges the importance of innovation, as can be seen in, for instance, the aim of the *White Paper on Science and Technology* is "to try to create the conditions that will support both creativity and innovativeness throughout our society" while the *National Research & Development Strategy (NRDS)* aims to bridge the innovation chasm that exists between knowledge generators and the market to create an enabling environment for innovation. Promoting this relationship also represents one of the key objectives of the National Advisory Council on Innovation (NACI). Efforts at stimulating innovation have, however, yet to yield significant and measurable tangible value to South Africa's economy. According to authors such as Mani (2004) who, on the basis of an international five-country comparative study said, "*this subscription to seemingly sophisticated terms and concepts is more in form than in content*". More specifically, he concluded that although South Africa has sophisticated policies related to innovation, this has not been translated into significant economic benefit (Jacks, 2007).

However, the relationship between key concepts, such as innovation, economic growth and competitiveness is not necessarily well understood which would make the development of a strategy problematic. NACI chose a three-phase approach towards developing advice to the Minister of Science and Technology (S&T) in this regard. The first phase consisted of an exploration of the dynamics of the relationship between innovation and competitiveness as a basis upon which the Minister of S&T could be advised on how investments in innovation can impact on the competitiveness of South Africa and ultimately, its economic growth. The second phase will focus on developing a set of reliable, valid and pragmatic indicators to monitor the situation in future. The third and final phase will consider the inputs of the two previous phases and prepare a high-level summary report for consideration by the Minister of S&T.

This report offers a concise overview of research done in the first phase and consists of the following sections: Conceptual and operational context (including a selective overview of relevant literature and case studies of selected countries); the next sections report on an empirical study that was conducted (cf. research questions; the multi-phased design of the study; and main findings); the penultimate section of the paper, Discussion, which offers an interpretation of all the preceding information (i.e. literature and empirical findings); and finally the report concludes with a set of key recommendations.

### **Conceptual and Operational Context**

It is acknowledged that the, academic and non-academic literature, on innovation and competitiveness (and related concepts) is extensive. In view of the strategic intent of this report, however, the following paragraphs offer a concise conceptual context within which the study was designed, and more particularly it offers firstly, definitions of the key concepts used in the study, secondly, summarises the results of selected studies on the situation in South Africa, thirdly presents an overview of three country case studies, and fourthly briefly looks at national and comparative surveys.

#### ***Key concepts***

For the purpose of this study *innovation* was defined as *a creative idea or invention that has been commercially exploited and has created value for the entity* (Rogers, 1998). This definition implies that a new or improved idea (either incrementally or radically new), be it a *product or service*; the implementation of an *improved process or application* or even a *new or improved business management concept*, has to have created tangible value in the form of economic or social benefit. The innovations could be *incremental*, i.e. improvements to existing innovations, or *radical*, i.e. ones that disrupt markets through the development of a radically and totally new offering that creates a new opportunity or new market. This definition does not materially differ from those found in the literature and policy positions (e.g. *White Paper on S&T 1996*).

The attributes of innovation captured by the definition such as novelty, spectrum of forms and utilisation, are well aligned with most of the current innovation models. Here reference can be made to, for instance, the linear and interactive models. The older *linear model* of product innovation that has two versions, the *technology push* model and the *demand pull* model. The *interactive model* (Lundvall, 1992) which is centred around the notion that interaction with organisations and external parties is crucial to successfully foster innovation, an idea which is synergistic with the NSI. Approaches to process innovation and business management innovations are largely driven from within organisations.

The concept of *competitiveness* was defined at an organisation level, namely as *the competitive advantage sought by a firm that enables it to better satisfy its customers' needs due to distinct attributes in products or services delivered, pricing, promotion and distribution*. This definition represents the frame of reference for a number of competitiveness models.

Firstly, according to Porter's *Diamond Model* (Porter, 1990) there are certain dynamic conditions that promote competitiveness at the national level. Porter identifies the four interdependent attributes within a nation that will determine whether or not an environment is created that enables organisations in a

particular industry to compete successfully. Secondly, at an industry level, be it domestic or international, the dynamics and nature of competition is embodied in Porter's *Five Competitive Forces model*. The model is extensively used in understanding industry dynamics. Thirdly at an organisation level, Porter's definitive work on competitiveness is portrayed by his *Value Chain Model*. This model addresses how value can be created by a firm pursuing competitive advantage within a market. The activities performed by a firm competing in a particular industry are grouped into segments within the value chain each of which create value through competitive advantage.

### **Conclusions from selected studies**

A number of studies have appeared over the past decade that directly or indirectly assessed innovation in the country and its (implied) relationship with economic growth. The following paragraphs offer a cursory summary of six of these studies.

A pioneering NACI / National S&T Forum study (2000) examined the published evidence of the impact of science and technology on a number of countries concluded that:

- Technology was key to economic growth and competitiveness
- An increasing part of economic growth in South Africa could be attributed to technological development
- Key ingredients for leveraging science and technology for economic growth were R&D investment, investment in human capital, and investment in physical capital stock

An international comparative study of South Africa, India, Brazil, Malaysia and Singapore Mani (2004) reported the following on South Africa: good innovation policy intentions outstripped the outcomes, at least with regard to impact on economic effects. Along similar lines, Kaplan (2001) in an analysis of technology export statistics, concluded that a factor in declining competitiveness in South Africa was due to low technology labour intensive products. He concluded that despite the fact that there is an improvement in technology change and innovation policy, technology policy needed to be improved, integrated and coordinated with industrial policy at higher levels of government to effect significant improvements in economic performance.

An important OECD report of the South African innovation system (2007) listed the following high-level findings and conclusions that are relevant to the present study:

- An important achievement since 1994 has been the reshaping of a relatively strong innovation system primarily serving the social, economic and political goals of the white minority towards another strong system serving all the people of the country.
- A nucleus of technologically strong, innovation-performing business enterprises exists and their R&D expenditure is rising and constitutes a larger fraction of total R&D than in most other comparable economies.

- The innovation system was less well developed and coordinated than the R&D system. In addition, the connection between the articulation of important technological and innovation priorities, and their subsequent implementation, seems relatively poor.
- The report identified a number of priorities, including giving more recognition to business as a key role player in the innovation system and directing the innovation system to better serve the needs of SMEs.

Finally, reference should be made to two South African innovation surveys. One of the useful instruments for gauging the relationship between innovation and competitiveness is undoubtedly national innovation surveys in which the extent of innovativeness of firms in a country is measured. South Africa has seen two such surveys, viz. The first one conducted by a team of the universities of Pretoria and Eindhoven (2003) and the most recent national one commissioned by DST through the HSRC, high-level findings of which were released in April 2007 (i.e. after the completion of the study reported here; DST, 2007). The following are findings and conclusions shared by both: The surveys highlighted that South African firms generated new products and services at a rate similar to the EU countries of Portugal, Sweden and the UK. The survey also revealed that 52% of the local businesses surveyed were involved in innovation activities, against the European average of 48%. Indications are that South Africa's NSI is making an increasing contribution to the economy (DST, 2007), through investments in innovation, with 10% of successful innovators receiving public funding.

### ***International cases on innovation and competitiveness***

In order to provide an international comparative framework for this study a summary is offered of the relationship between innovation and competitiveness in Singapore, Malaysia, and Brazil. These are all countries where the focus on, and investments in innovation, has contributed to enhancing competitiveness. Singapore, Malaysia and Brazil, the first classified as a mostly economically developed country and the other two as less economically developed countries. Analysis of the literature on innovation and competitiveness in relation to industrial development (e.g. Wong (2000), official policies, declarations by political leaders, news magazines such as *The Economist* and government websites was undertaken for these countries and produced the following scenarios:

#### *Singapore*

Singapore faced the rising threat of China as the "factory of the world", escalating labour costs and increasing dangers of relying on the Southeast Asia region for its growth. The country's response to these threats were:

- Strategic alliances between government, industry and academia were aggressively facilitated through active measures and initiatives. Universities were tasked with stimulating innovation and entrepreneurship, while the government invested heavily in education.
- Resources were focused and directed into four technology pillars, particularly the biotechnology sector.

The above initiatives have up until 2007, paid off, generating approximately US\$ 7 billion in revenue in 2004. The Singapore Government's objective is to generate US\$12 billion from this sector by 2010<sup>2</sup>.

### *Malaysia*

Malaysia was traditionally a country dependent on an agricultural economy of rubber, palm oil and petroleum and realised the necessity to move towards a manufacturing economy focused on electrical, electronic, IT and multimedia technology products. The country currently on a mission to transform itself to a knowledge economy, based on the development of the Multimedia Super Corridor (MSC).

A new strategy, *Vision 2020* was introduced and aimed towards a knowledge economy and a developed country by 2020. Since its introduction, the new strategy has influenced all aspects of governmental activities and policies, and bureaucratic arrangements as well as acted as a catalyst towards better utilisation and exploitation of the country's NSI<sup>3</sup>. These include the identification and funding of priority sectors and investment in the education system.

### *Brazil*

Brazil embarked on a strategy of import-substitution aided by tariff protection (Carnoy, 1998). After having undergone rapid growth, it was unable to maintain this growth and its inability to compete was due mainly to the sub-standard quality of its products and the lack of support in the expansionist phase by sufficient SET human capital development.

Subsequent to this, Brazil continued to struggle to build its technology base which led to further tariff protection and the creation of many small and medium enterprises (SMEs) that did not need to attain quality and productivity levels comparable to global standards as they were shielded from international competition. The situation continued to be further aggravated by the poor quality of Brazil's educational system with the government failing to address the key success factor for any innovation policy, namely education.

In the 1990s, the government embarked on technology interventions in technology development including tax incentives to raise R&D investments in business organisations. The government also intervened to create an adequate supply of highly trained scientific manpower. However, the low research scientist and engineer density in Brazil still remains a fundamental weakness in Brazil's national innovation system.

From the above summaries of case studies, key lessons, such as the need to focus on fewer priority sectors, directing resources towards these sectors rather than spreading them over numerous sectors, investing in education and the importance of forming strategic alliances between government, industry and higher education institutions, were probed in the empirical study.

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<sup>2</sup>The Economist.

<sup>3</sup>For more information, visit Multimedia Super Corridor's website: [www.msc.com](http://www.msc.com)

***Innovation and Competitiveness Surveys***

The methodology employed and results of international competitiveness rating/ranking systems offer useful pointers for the development of the instruments used in this study as well as a framework for the interpretation of the results. The innovation - competitiveness relationship is an important component of both rating systems, undertaken annually by the World Economic Forum (WEF) and the Institute for Management Development (IMD). The reports are acknowledged by the most economically developed countries and most competitive in the world. The *WEF Global Competitiveness Report* (GCR) and the *IMD World Competitiveness Yearbook* (WCY) were comparatively analysed and yielded the following common list of challenges facing organisations conducting business in South Africa. These are listed below.

*Table 1: CHALLENGES FACING ORGANISATION'S CONDUCTING BUSINESS IN SA<sup>4</sup>*

Lack of new technology investments	Inadequate supply of infrastructure
Poor export performance	High costs of business operations
Inadequately educated workforce	Unavailability of skilled labour
Restrictive labour regulations	Poor work ethic in national labour force
Poor social and educational factors which hampers human development	Inefficient government bureaucracy
Inadequate support for SMEs	Poor access to financing
Volatile exchange rate	

The challenges highlighted in the table above impact on organisations generally, but ultimately affect their ability to innovate. The resolution of some of these challenges is aligned with the objectives of South Africa's National R&D Strategy, the performance of which is monitored through a set of S&T indicators. Kaplan's (2003) critical remarks on the appropriateness of the international competitiveness indicators were borne in mind in the above comparative analysis.

Following the analysis of the WEF, IMD, as well as insights gained from the report on Ireland's Competitiveness 2005 (Forfas, 2005), indicators common to the abovementioned systems were grouped and analysed in terms of their linkages to innovation. In the WEF report, competitiveness indicators relating to innovation, included higher education and training, the quality of scientific research institutions, technology transfer and skills levels. The IMD report measures productivity, scientific and technological infrastructure and education as indicators of a country's competitiveness, all of which are related to innovation. Similarly, Forfás measures productivity, education and science and technology to determine Ireland's competitiveness.

<sup>4</sup> Source: WEF GCR and IMD WCY



### **Summary**

The international case studies produced a number of dimensions that were pursued further in the empirical study reported on below that was incorporated into the interpretation, discussion and conclusions of the paper:

- Firstly, the concepts of innovation and competitiveness are systemically linked, at least at the conceptual level. The rest of this study endeavoured to determine the nature of the relationship at an empirical level in South African organisations.
- Secondly, the relationship between innovation and competitiveness can be steered through policy and strategy interventions, a condition for this being to establish quantitative instruments to measure their levels, evaluate and monitor progress.
- The three common moderator variables that were shown to impact on the innovation-competitiveness relationship, were productivity, education and technology. These indicators would have to be identified and empirically applied to South African firms – the core of the present study. It should be noted, though, that even a superficial scan of the literature would show that the operationalisation of all the concepts, including the three above, should be carefully considered in interpreting the data.

If this study showed that these factors account for the relationship between innovation and competitiveness, it would follow that practical measures need to be determined in relation to the interventions adopted to stimulate innovation for the improvement of South Africa's competitive position. The latter would however form a sequel to the present study.

### **Research Questions**

In the terms of reference, NACI posed the following questions to be addressed by this research project:

- At the most general level, the terms of reference of this study required an exploration of the dynamics between investments in innovation and competitiveness outcomes at both the organisational and national levels of the South African economy.
- At a more detailed level, this report responds to the following research questions:
  - What are the indications for showing a relationship between increasing investments in innovation and competitiveness at the organisational and national level?
  - Innovation at the **national level** – To what extent are the policies and instruments provided by Government to foster innovation being effectively coordinated and utilised?
  - Innovation at the **sector level** - To what extent is innovation coordinated at sector level to facilitate competitiveness? It should be noted that the purposive sample was not

representative over all of the sectors due to the limited number of organisations in the universe and sector insights were therefore limited.

- What are the best practices characterising innovative organisations?
- Is the organisational and managerial behaviour of successful innovators characterised by best practices recorded elsewhere in the world, such as increased R&D expenditure and collaboration with third parties?
- What should be done at the national and industry levels to stimulate firms to be more innovative?

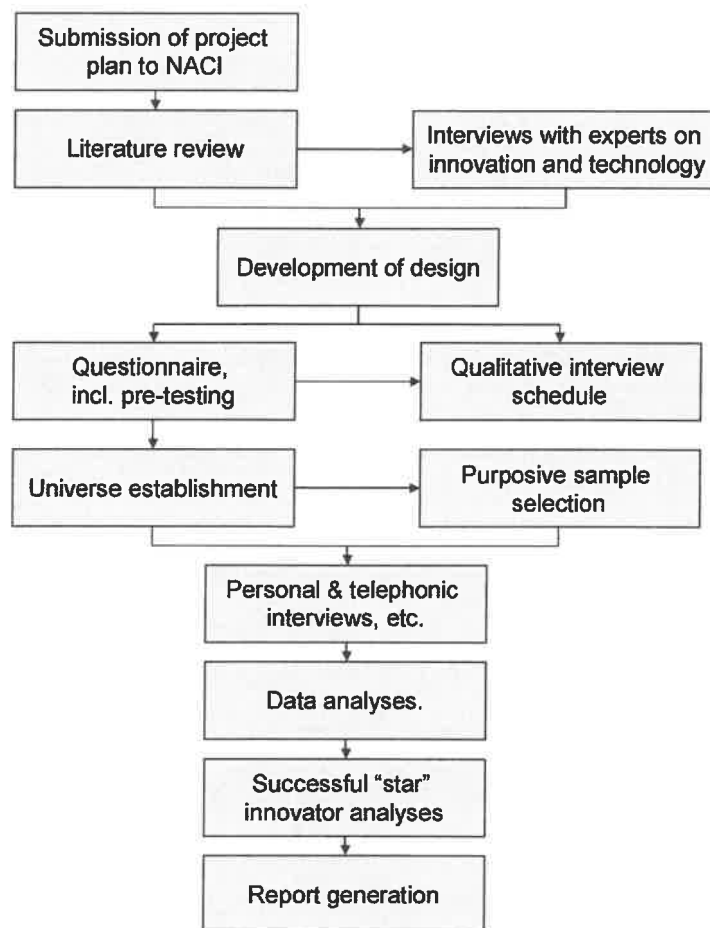
The following important, albeit obvious, methodological note should be made at this point:

The above research questions should not be interpreted as suggesting a causal relationship between innovation and competitiveness – the relationship is far too complex for such an assumption. Any relationship would more probably be of a systemic linkage type, to use systems terminology.

### **Multi-phased Research Design**

The general and specific research objective(s), namely to investigate the nature of the relationship between innovation and competitiveness and to identify the main dynamics in such a relationship in businesses in South Africa, required a relatively complex research design. Given the need to obtain insight into what a cross-cut of organisations in the country were doing and how they were performing, the basic design decided upon was that of a multi-phased survey approach. The design that emerged can best be represented diagrammatically (see Figure 1 below), followed by descriptions of the individual phases and components.

**Figure 1: Multi-phased project design**



In the initial data analysis the questions were not sensitive enough to elucidate the nature of the relationship between investments in innovation and competitiveness.

A set of qualifying criteria, based on the literature overview and theory were then utilised, to select innovators that had achieved commercial success. These organisations were referred to as *successful innovators*. Further analysis of this sub-set revealed insights into how investments in innovation yielded economic benefit at the organisational level.

**Scoping interviews**

In embarking upon the research, experts on innovation, competitiveness and research methodology (further information is available from the author), successfully innovating organisations as well as some unsuccessful innovators (total of 26) were interviewed to obtain and test, firstly, insight into perceptions of innovation, secondly, feasible approaches to the design of the study and, thirdly, the conceptualisation, phrasing and formatting of questions for the questionnaire.

**Questionnaire**

The research questions were developed on the basis of the literature review, the terms of reference as well as the outcomes of the qualitative scoping interviews.

## Exploration of the Innovation – Competitiveness Relationship

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The following subjects were covered in the questionnaire: organisation demographics; insights from employees involved in innovation (e.g. awareness of innovation and how innovation is managed); factors hampering and promoting innovation; extent to which innovators collaborate, including the utilisation of support programmes; the perceived relationship between innovation and competitiveness; and the role of intellectual property in organisational dynamics and innovation processes (the latter two subjects are not dealt with in this report).

The draft questionnaire was pretested in a number of interviews and adjustments made in cases where the meaning of an item was not clear to the respondent. The final questionnaire consisted of 66 items and were completed by the total sample (105 in individual personal interviews and 147 in telephonic interviews), each lasting on average one hour. The questionnaire can be obtained from the author.

### Reliability and validity

The following serve as two indications of the internal consistency of the questionnaire;

- Triangulation - reliability and validity, was attained by ensuring that the measuring instruments were pilot-tested and improved before being utilised, pre-screened respondents were interviewed, qualified (pre-tested) researchers were utilised for both in-depth interviews supplemented by telephonic interviews. The competitiveness – innovation relationship was analysed from data sourced from interviews, competitiveness-innovation literature and country cases illustrating the relationship all of which supported a triangulated approach.
- Correlation was found to be positive between items confirms internal consistency.

### Qualitative interviews

Additional qualitative interviews were undertaken on a sub-sample of successfully innovating organisations, referred to as the *successful innovators*, to explore the dynamics of and best practices utilised in innovation in those organisations further (see note following the research design figure). The intent behind this phase of the study was to provide deeper insights into the conditions that need to prevail for innovation to result *successfully* in competitive advantage at the organisation level, and in addition gain an understanding as to which factors need to be addressed strategically at sector and national level.

### Sample

A database of 970 respondent organisations was developed from sources such as NACI studies, *Financial Mail's Innovations* publication, *Engineering News* and *Business Day's SA Exporters*, and databases of the *Technology Top 100*, *Innovation Fund*, *THRIP*, and the *McGregor* business database. The sample selected for the research was based on the responding organisations' innovative activity, which had been purposefully pursuing these activities within the past three years.

Considerable attention was paid to deciding the type of sampling approach that would be appropriate. As the concept of innovation is an abstract concept and it was clear from the scoping interviews that many respondents might not relate what they were doing to the abstraction, labelled innovation. After

considering the outcomes of the scoping interviews and consultation with national experts in research methodology, it was decided to choose for a purposive sampling approach where the primary qualifying criteria for inclusion in the sample was an organisation's innovative capability and claim to have innovated. This was established through a set of screening questions. It should be emphasised that the fact of a purposive sample, of course, does not allow unconditional generalisations to the population of South African firms.

The sample comprised a total of 278 respondents of which 37.8% were personally interviewed and 62.2% were telephonically interviewed. (Of the personal interviews, 24.8% qualitative interviews were undertaken with innovation, competitiveness and intellectual property rights experts. A list of the sample is available from the author). A summary of the composition of the sample can be found in Table 2.

**Table 2: Research sample frame**

SIC Division	Respondent / Sector	No. of Interviews				Total No. of Interviews	OECD Technology classes
		Emerging	S	M	L		
2	Mining and quarrying	1	1	1	8	10	Medium – High technology Medium – Low technology Low technology  Services (Not an OECD class)
3	Manufacturing	4	14	2	5	21	
4	Power generation	0	3	1	0	4	
	Water	0	2	2	2	6	
5	Civil and Construction	0	1	0	5	6	
6	Wholesale and retail	0	1	0	4	5	
7	ICT & Telecommunications and Transport	6	38	12	14	64	
8 & 9	Services	3	22	5	18	45	
		24	122	40	90	252	
	Innovation, competitiveness and IPR expert interviews					26	
	<b>TOTAL</b>	<b>24</b>	<b>122</b>	<b>40</b>	<b>90</b>	<b>278</b>	

Table 2 shows that the sample ranged from small (48%), medium (16%) to large (36%) organisations across all of the Standard Industrial Classification (SIC) sectors. The table also shows that firms in the sample varied in terms of their age (emerging, established or mature).

### **Sub-sample**

A subset of the sample, comprising organisations that were successfully innovating, was consequently drawn; it constituted 28.6% of the main sample. These successful innovators met a number of innovation best practice criteria, the most important being that their investments in innovation had manifested in competitiveness. These organisations were further analysed, in terms of the way in which they practised innovation, the result of their investment in innovation and, more importantly, their opinions on improving innovation in South Africa.

### **Data transformation and analyses**

The questionnaire responses were cross-tabulated after open-ended items had been coded.

## Results

### *Relationship between Increasing Investments in Innovation and Competitiveness*

This relationship was explored at two levels, firstly the organisation level and secondly the national level.

#### *Organisational level*

At the organisation level a strong link between R&D expenditure and innovation was found with nearly 60% of respondents investing over 2.1% of their turnover on R&D expenditure. This is high compared to the measured 2004/5 level of national R&D expenditure which was reported at 0.87% of GDP. Of these successful innovators, 96.4% of these organisations stated that they had realised tangible competitive advantage through product, service and process differentiation, cost reduction and organisational effectiveness and improving the quality of products and services. In the *successful innovators* group, 77.8% indicated that they spend over 2% of their turnover on R&D. This supports the evidence (Porter (1990) Christensen (2003) and National Council on Competitiveness (2005) in Ireland) that the higher the level of investment in research and development expenditure, the more likely it will yield an increase in innovative activity and hence competitive advantage for the organisation.

The research revealed that 23.8% of general respondents regard the need to achieve competitive advantage as a major internal driver of innovation. This view is also held by 22.2% of successfully innovating organisations. Some 87.5% of successful innovators indicated they have achieved improvements in productivity through their innovations. Of these, respondents cited an average improvement in productivity of 78.3% of which 71.8% reported a medium to high impact of innovation on sustained cost savings and 81.4% indicated a medium to high impact of innovation on sustained increases in turnover. This implies that great emphasis is placed on process innovation. Although product / service innovation is the most common type of innovation practised, by 94.4% of respondents, process innovation is also very common with 76.6% of organisations also practising this type of innovation.

Considering that productivity is a major determinant of competitiveness, the productivity improvements as a result of innovation suggest that innovation will contribute (Porter, 2001; Blunck, 2006) to increased competitiveness.

The research primarily set out to explore the dynamic between innovation and competitiveness, but more specifically whether investments in innovation would result in competitive advantage for an organisation. Previous evidence from the literature (WEF, 2006) presented, indicated that higher R&D expenditure, contributed to successful innovators achieving competitive advantage. In terms of product / service differentiation and process innovation, the findings presented further evidence.

Some 36.3% of respondents indicated that limitations in funding R&D impacted on their competitiveness. Funding limitations due to the unavailability or limited access to funds was stated by 35.7% of respondents as a factor that inhibits their ability to develop and improve products and services to be able to compete effectively. Qualitative analysis revealed that this was a function of the stringent qualification requirements, such as a clear market quantification and proven technology to name two, being imposed for funding

approval from support programmes or the lack of awareness of the specific requirements of the funding agencies.

### *Innovation at the National Level*

Items dealing with awareness of government initiatives could be taken as a weak proxy. Analyses of such questions yielded the following results. In terms of the awareness and utilisation of government support programmes used to foster innovation, the following emerged from the research:

- Small and emerging organisations tended to be more aware of government support programmes. Only 30.4% of large organisations were aware of the Support Programme for Industrial Innovation (SPII).
- Of the successful innovators that were aware of the government support programmes, some 46.4 % of successful innovators utilise the Innovation Fund, 62.9% utilise SPII and 53.6% utilise THRIP.
- Of the successful innovators aware of other government support programmes, such as those offered by the DTI and IDC, 62.5% stated that they utilised the programmes.

Two challenges in terms of funding were highlighted and relate firstly to the limited funding available and secondly, to the limited access to the available funds provided by national government. Some 50% of the successful innovators collaborate with government support programmes infrequently. This emphasises the need for these support programmes to work effectively and actively to support innovators as time is usually a critical factor in the innovation process.

Respondents that use SPII, Technology and Human Resources for Industry Programme (THRIP) and the Innovation Fund indicated that the dominant negative aspect in utilising these programmes was that of the lengthy and bureaucratic application and approval processes. These processes slow down the disbursement of funds and discourage applicants and potential applicants.

Sharing resources through collaborative efforts have benefited 94% of respondents who indicated that they collaborated extensively with external parties, within the NSI during their innovation activities. The dominant entities that they collaborated with were higher education institutions (HEIs) with some 56.1% of respondents collaborating with HEIs.

The general trend and obvious conclusion that emerged from an analysis of these items was that innovators are more likely to collaborate with government support programmes of which they are aware. However, the awareness of these programmes amongst respondents was not very high considering that they are organisations that claim to be continuously innovating. A counter argument is that organisations not utilising the Government support programmes are able to fund their own innovation.

The dominant external factor that inhibits competitiveness is the unavailability of funding. This is a result of the poor access to funds due to stringent fund disbursement requirements as well as the bureaucratic application and approval process.

### *Innovation at Sector Level*

The coordination of innovation between sector and industries did not emerge in the findings of the research due mainly to the fact that limited responses in each of the technology driven sectors were obtained.

Industry clusters and also clusters of innovating organisations within an industry are often provided with incentives by governments to locate in a selected geography to foster increased interaction and collaboration and to stimulate competition. Most of the respondents were found to collaborate with innovation support institutions within the same metropolitan area in which they were located. This indicates that proximity of innovating organisations is an important factor in stimulating the process of innovation. The clustering of industries is therefore conducive to innovation, and more specifically, innovation clusters within industrial sectors to stimulate innovation is advantageous but not well developed in South Africa.

In summarising the research on innovation it is clear from the research findings that innovation is a multi-dimensional concept and is nurtured from a number of conditions inside an organisation as well as a number of impacting factors external to the organisation. It can be argued that, on the basis of the findings of the research, a consequence of innovating within an industry and ultimately within a sector promotes competition between organisations within their operating environment. This can play a role in impacting the macro economy as a whole as is illustrated by the country case studies which demonstrate effective innovation interventions at the national level.

### Best Practices Characterising Innovating Organisations

The questionnaire covered the issue of best practices and the analyses yielded a number of best practices from successfully innovating organisations emerged from the research, the findings of which are described as follows.

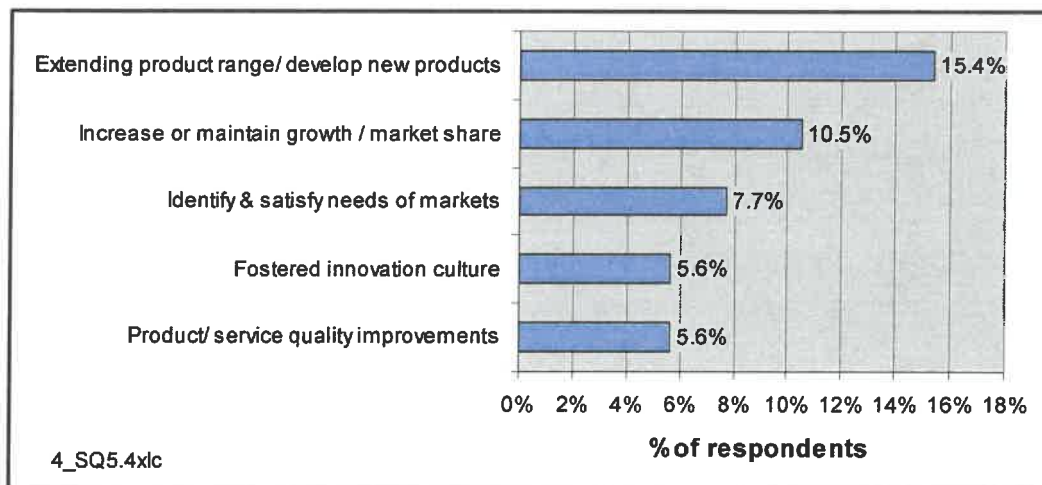
Innovation practised in South Africa is skewed towards incremental innovation which is the dominant strategic approach adopted by respondents across all sectors of the economy, specifically incremental innovation on products / services. Some 41.3% of respondents indicated that over two thirds of their innovative activities centred around incremental *product / service innovation*. This increased to 58,9% for successful innovators. The dominance of incremental innovation could imply and be argued that South Africa is adept at building on existing and acquired technologies which suggests that technology adoption / diffusion should be encouraged.

It was established that of those respondents that actively manage innovation, 62.9% do so proactively and 26.7% manage it in collaboration with a third party. In arguing that innovation leads to competitiveness, innovation should be viewed as a strategic initiative within an organisation that requires directed management rather than an abstract concept that happens by chance.

The following figure illustrates the innovation policies and strategies that guided the management of innovation in respondent organisations.



Figure 1: The top five ranked innovation promotion strategies prevalent in organisations



The findings revealed that some 73.4% of innovating organisations measure their innovation activity (83.3% of successful innovators) and the outputs thereof and 27.6% do so by measuring the sales and profits derived from innovations. Measuring of innovation is critical in determining the effectiveness of the innovation system.

Innovation is inspired mainly from the executive level within organisations specifically from R&D/Technology/Design Engineering departments, as was stated by 39% of the successful innovators. This indicates that an increase in R&D activity is likely to yield an increase in innovation stimulated from within this organisation function. It also indicates that the success of innovation depends largely on the supply of qualified science and engineering human resources.

The findings revealed that 34.5% of respondents in innovating organisations indicated that product / service and process differentiation, which was one of the sources of their competitive advantage, was derived as a result of their organisations innovation activities.

The survey findings revealed that 71.8% of respondents reported that the consequences of their innovation activities had a medium to high impact on sustaining cost savings. This implies that respondents are not consciously aware that cost savings are a direct result of innovation. However, further investigation provided evidence that cost savings are a very real and tangible benefit of pursuing innovation activities within an organisation.

#### Organisational and Managerial Behaviour of Successful Innovators

Of the qualitative personal interviews undertaken with innovating organisations, 63.3% of the respondents indicated that they had made changes to their organisational structure to create a more innovation-conducive environment. The dominant change to the organisation functional structure, as cited by respondents, was that of the creation of a dedicated R&D / Innovation and Technology department.

Models and approaches used by organisations to manage innovation vary across sectors, innovation types and organisations. Although many organisations have been successful as a result of one of the following models, no dominant model was observed as being utilised for managing innovation to realise the creation

of tangible value within an organisation. A qualitative analysis of the expert interviews revealed the following broad approaches to managing innovation:

- A set innovation process is developed, usually facilitated by an external consultant, to encourage people to think and act in a certain way.
- Time-based innovation where organisations place a deadline by which employees have to have had introduced an innovation. This pressurises employees as many people are more productive and have a higher propensity to innovate under pressure.
- The creation of an innovation culture which is free, flat and project-based which allows people the freedom to explore new opportunities and ideas. This is 3M and Google's concept of innovation.

South African organisations are however faced with the challenge of sourcing skills due to the limited skilled labour pool in the country. The lack of skills was stated by 40.5% of respondents as a major factor that inhibits innovation. The supply of skills is therefore an area of concern that needs to be given further attention by Government, with a specific focus in the innovation supported sectors so as to foster innovation. Factors that were reported to enhance competitiveness were related to employee competencies and qualities, which reinforces the importance of investing in skilled and competent human capital to stimulate innovation. Some 28.7% of respondents indicated that their competitiveness was inhibited by the lack of skills and competencies

The role of culture in innovating organisations was cited by innovation experts as an important contributor to the success of innovation at the firm level. The findings revealed that a surprisingly low 4% of respondents mentioned that the culture within the organisation is an internal factor that promotes competitiveness and supporting this, 7.5% of respondents indicated that the absence of an innovation-conducive culture inhibits their ability to innovate. Respondents mentioned that nurturing a culture of innovation is one of the main motivators of innovation and that it can provide organisations with a significant competitive advantage.

What should be done at National and Provincial Levels to Stimulate Innovation in Firms?

A qualitative analysis of the information provide by innovation experts suggest that in an analysis of growth industries in AsgiSA, the government is attempting to tackle too broad a scope of industry sectors by directing its efforts into ten priority sectors (The South African Presidency, 2006). This is likely to result in the government's resources being spread too thinly and eventually losing its effectiveness.

Most of the challenges to competitiveness mentioned by the WEF and IMD world competitiveness rankings also emerged from the qualitative analysis undertaken in the research and are consistent with the challenges currently reported to be faced by South African organisations. The challenges reported impact on organisations generally, but ultimately affect their ability to innovate. These aforementioned challenges, none of which are unfamiliar, were called upon by respondents to be addressed by Government to establish strong foundations, not only to provide organisations with the essential infrastructure and an

environment to operate effectively and efficiently but in doing so, also allow organisations to pursue innovative ventures.

### **Interpretation of the Dynamics of Innovation and Competitiveness**

This section offers an interpretation of all the evidence presented in this study, i.e. literature, case studies and empirical part. The empirical findings substantiated by the successful innovators argue that organisations that engage the following practises, firstly increase /maximise R&D expenditure, secondly, collaborate with third parties, thirdly, actively managing their innovation activities within the business and finally measure the impact of their investments in innovation are likely to increase their chances of gaining and sustaining competitive advantage. It can possibly be assumed that the application of these practices within an increasing number of South African organisations, and the knock-on effect within industries, sectors and the nation itself, could enhance competitiveness through investments in innovation if the “innovation ethic” of successful innovators is adopted.

The insights gained from the way in which successful innovators practice innovation therefore need to be carefully considered in the formulation of recommendations on what interventions need to be considered to drive innovation at firm, industry and national level to realise tangible impacts on competitiveness at all three levels.

From the evidence presented on the relationship between innovation and competitiveness at the micro level, namely innovating organisations and some evidence at the meso and macro level through the literature on industry, sector and innovation at the national level the dynamics in this relationship are further explicated in this section.

Competitiveness and innovation are inextricably linked to economic development according to von Kirchbach (2003).

An analysis of evidence presented in this research suggests that South Africa is well aware of the importance of investing in technology and innovation at an early stage to stimulate economic development regardless of which stage of development a country is in. Porter and Stern (Porter & Stern, 1999) states that “*innovation opportunities are present today in virtually any industry*”. It is not a question of whether South Africa should innovate’ but rather how South Africa should purposefully and effectively support and manage its investments in innovation to drive economic growth by becoming more competitive.

Addressing the innovation – competitiveness dynamic in South Africa is complex, due to the operation of a dual economy, one side being geared to needs of the undeveloped population and the other to global business and exports with developed countries. Evidence of innovation impacting competitiveness as a short term outcome is inconclusive, especially in developing countries which generally have less sophisticated infrastructures, smaller skills pools and inadequate funding. However, over the long term, evidence presented suggests that the workings of innovation in an economy manifest in improvements in competitiveness.

Productivity plays an important role in innovation. The results of this study showed that innovation and in particular *process innovation*, impacts positively on the productivity in organisations. The ultimate goal of

an innovation is to create tangible value which will ultimately be manifested through improvements in the productivity constructs of effectiveness, efficiency, utilisation or the elimination of waste. Given the linkage of productivity to improved competitiveness through cost reduction, the dynamic between innovation and competitiveness can be further explicated.

It can be argued, that the research findings showed a systemic relationship between competitiveness and innovation and it could be argued that investments in innovation can impact on a number of attributes affecting the competitiveness in South Africa. The evidence previously addressed in the research is consolidated in the following points:

- The relationship between innovation and competitiveness have been extensively reported by authors such as Porter (1990), Christensen (2003), Hamel (2000), Prahalad (1996) and von Kirchbach (2003)
- Investments in innovation undertaken by countries at the national economy level, as was the case in Malaysia and Singapore, resulted in significant economic benefits
- Innovation investments and measures of innovation are a sub-component of the indices used to measure global competitiveness by the IMD and WEF
- The productivity link between innovation and competitiveness is well proven in the literature to be inextricably linked to both innovation and competitiveness
- Information gained by means of qualitative analyses in this study supports the notion that innovation is an important contributor to competitiveness
- Evidence was presented by successfully innovating organisations that claimed increased competitive advantage in both the local and international markets due to higher levels of investment in R&D and innovation

Firstly, a number of conclusions can therefore be drawn on how specific innovation interventions need to be considered. Secondly, how the national challenges, explored in this study and highlighted by the WEF and IMD have a direct relevance to innovation and how they can be addressed to contribute to improving competitiveness at a national and at industry level.

### **Conclusions**

A number of conclusions can be drawn as a result of the analysis of the secondary research, qualitative opinions from innovation experts in South Africa and the empirical data gathered from successful and unsuccessful innovating organisations across organisation sizes and sectors. These are summarised below:

*Competitiveness – innovation linkages:* Investments in innovation and innovation activities at the organisation level across the broad base of organisations in South Africa, as well as at industry level, have yet to translate into significant, tangible value to South Africa's economy through increased levels competitiveness as measured by the WEF and IMD surveys.

*Innovation and skills:* Organisations with access to high-level skills are able to apply and utilise technology and leverage process know-how to foster innovation activity. Executives and technology management within organisations, who generally have these skills, play a significant role in fostering innovation.

*Innovation and collaboration:* The level of collaboration across the innovation system was found to be relatively low with few national and industry–sector coordinated innovation programmes. Coordinated innovation programmes are essential for stimulating collaboration within innovating organisations. Where collaboration currently exists, the efficiency of maintaining collaborative processes is imperative.

*Innovation funding support programmes:* The bureaucratic reputation of government innovation funding programmes by innovators is dissuading applicants from applying and successfully utilising allocated funds. New innovators, who in future are not made aware of the requirements of the different funding support programmes, through more effective communication, are likely to encounter similar challenges.

Organisations that are pursuing product / service innovations and seeking sources of funding are aware of government funding and support programmes. It can be concluded therefore that non-innovating organisations would be largely unaware of these programmes to assist the same with pursuing innovation activities. Venture capital funding through commercial marketing processes will alleviate this situation.

*Managing innovation:* Innovation is being increasingly recognised as a strategic driver of business success which yields tangible economic benefits. Organisations benefiting economically from investments in innovation are overtly managing innovation processes often across the organisation with committed financial and human resources. It is evident that a number of models of innovation are being utilised by consultants to advise and provide support to organisations intent on suing innovation to enhance their competitiveness.

*Innovation and productivity:* Productivity improvement programmes and their resultant achievements are strongly linked to process innovation which impacts directly on the relationship between innovation and competitiveness.

*Measuring innovation and competitiveness:* Successfully innovating organisations that actively manage innovation through the development and execution of innovation related strategies and tactics, measure the outputs and acknowledge that they derive economic benefit through improved competitiveness.

Given that the conclusions drawn are based on the empirical findings and best practices from successfully innovating organisations as well the qualitative analysis of expert opinions, they are considered, in the main to be relevant to all current, prospective, new and commercial entities in South Africa.

The summarised conclusions above form the basis of the recommendations. The recommendations consider ways to monitor, through the use of indicators, the impact of selected and agreed interventions to stimulate innovation thereby deriving increased economic and social value through improvements to South Africa's competitiveness.

Having stated the abovementioned conclusions and related assumptions, the following recommendations are made.

## **Recommendations**

In considering the aforementioned empirical findings and conclusions drawn, the following eight recommendations were formulated, culminating in a fundamental and primal recommendation. (Both the recommendations and the supporting rationales are presented in a very concise way here, since they flow from the results and interpretations offered above.) There are however a number of obvious recommendations that have emerged, as a result of the empirical findings that are already uppermost in the Governments' priorities. Some of these recommendations already have interventions that are, at the time of the study between 2005 and 2007, being pursued through a wide variety of government structures. A number of these priority interventions can however be considered in a more focused way from an innovation - competitiveness improvement perspective.

### ***Recommendation 1***

Develop and execute selected but focused innovation development programmes at industry level, through the DTI's Centralised Sector Programmes. These focused innovation development programmes would address specific WEF and IMD competitiveness rating criteria that relate directly to innovation, and that challenge and impact negatively on the competitiveness and economic growth of the sector. These would include business operating costs, specific sector SME support and export performance.

*Rationale* - Given the systematic relationship between innovation and competitiveness and the notion that South Africa needs to become more competitive, the inputs relating to innovation and competitiveness need to be monitored through the selection of appropriate indicators against which targets are set and investment in a variety of initiatives are made.

***Recommendation 2*** – Select and adequately resource and focus on a manageable number of AsgiSA priority sectors<sup>5</sup> that have the highest propensity to nurture innovation to create economic and social value. In each of the selected sectors monitor their innovation outputs and competitiveness criteria to be able to justify that they are making a measurably significant contribution to the economy.

*Rationale* - Lessons from international case studies and benchmarks reveal that the successful countries have all narrowed their focus onto a selected few priority sectors, numbering no more than four or five sectors. In South Africa, an analysis of AsgiSA suggests that the government is attempting to tackle too broad a scope of sectors by directing its efforts into ten priority sectors. This is likely to result in the government's resources being spread too thinly and eventually losing effectiveness.

***Recommendation 3*** – The South African Government, through collaborative efforts between the DTI and DST, should specifically select and establish industry clusters within the selected sectors that have a propensity to innovate. Innovation must be fostered through the creation of a support infrastructure of

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<sup>5</sup> Six high-priority sectors have now been selected by the DTI. Engineering News 26 January 2007.

innovation facilities to encourage collaboration and an enabling environment of business support services that will streamline the commercialisation of new products and services<sup>6</sup>.

*Rationale* - There is strong evidence supported by research that Government and agency support for industry should be increasingly organised around clusters. Considering that innovation takes considerable time to manifest in tangible economic value, clustering is especially important as it stimulates increased competition, which in turn results in the faster rate of innovation adoption and implementation within organisations<sup>7</sup>.

**Recommendation 4** – In the sectors selected for innovation investment and funding support, it is essential to focus on acquiring and increasing the technical and scientific skilled labour pool in these specifically selected sectors. This intervention should align with the Government’s current scarce skills programme (JIPSA), facilitated by the Department of Labour, but should have a key focus on outputs within the selected sectors.

*Rationale* - The research again confirms, as has numerous similar recommendations in prior research, that a major factor that hampers innovation is the shortage of the appropriate skills in an organisation. This is still highly problematic as R&D human resources are a vital contributor to innovative performance. Although this is currently being undertaken, specific focus is required where innovation needs to be stimulated.

**Recommendation 5** – Provide increased pre-venture and venture capital funding, facilitate efficient application processes for the disbursement of funds for innovators to address specific sector needs specifically in the sectors selected for rapid innovation stimulation.

*Rationale* - Bureaucracy and long approval processes has been cited as a negative factor that has consistently impacts on the attractiveness and efficient utilisation of all Government support programmes. Pre-venture and venture capital as an alternate funding mechanism should be considered, as is the case biotechnology investments currently being made in South Africa.

**Recommendation 6** – Improve collaboration between HEIs and the private sector through the provision of multiple-lateral budgets, through contributions from different government departments, to support focused innovation initiatives in the sectors selected to nurture innovation. Source funds for multiple-lateral budgets from public sector departments of education, science and technology (including contributions from government support programmes) and trade and investment, simultaneously attracting matching investments from the private sector; to coerce collaboration.

*Rationale* - The common strategy among successfully innovating nations is that of the involvement and the commitment of all players within their National System of Innovation (NSI). For example, Singapore’s

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<sup>6</sup> Since the research was undertaken in July 2007, the formation of the Technology Innovation Agency (TIA) has begun to address this point.

triple helix approach of collaboration between government, industry and universities enabled the country to attain success in the innovation arena. While South Africa does have an NSI, the actual level of collaboration between the different role players is fragmented.

**Recommendation 7** – Communicate broadly within the private sector to resolve concerns on pending IPR legislation in respect of Publicly Financed Research and at the same time set up promotional campaigns to encourage organisations enhance their skills to enable them to manage their IPR effectively.

*Rationale* – Respondents regarded the review of IPR legislation, ownership and protection to be too restrictive. Respondents cited a lack of assistance with patents registrations, to the extent that registering IP was said to be unrewarding.

**Recommendation 8** – Track the impact of innovation investments on South Africa's competitiveness by agreeing on appropriate and related measures and indicators of competitiveness. This must be considered at the national level, sector level and eventually the industry cluster level based on investments in innovation being monitored through the Innovation Survey.

*Rationale* – It is not feasible to achieve competitiveness targets across selected sectors in the absence of reaching consensus on relevant and appropriate competitiveness measurements. It is for this reason that government must, through DTI and DST, agree on or adopt a set of indicators most relevant to measure, direct and hence drive competitiveness through investments in innovation. The establishment of these measures should be informed by the WEF and IMD surveys and if necessary used as proxy indicators of both international surveys. Upon agreement and adoption, the selected competitiveness measures should be used as performance indicators to monitor the impact of investments in innovation interventions to improve South Africa's rankings in both international surveys.

**Fundamental recommendation** – Develop and execute a focused and consensus-based *Innovation-Competitiveness Strategy* over a five to seven year time frame, based on the proposed recommendations as well as other inputs from all relevant stakeholders. The two key outstanding inputs to the strategy would be the National Research and Development Strategy (NRDS) and the Innovation Survey and harmonious alignment with the DTI's 2007 National Industrial Strategy / Policy, currently being finalised.

*Rationale* – Innovation and competitiveness are managed across a number of government departments that have responsibilities for various components of innovation and competitiveness which also include institutes and councils. There is therefore a strong need to develop a coordinated strategy that aligns and focuses the wide variety of interventions that stimulate innovation to impact on the competitiveness of South Africa. The performance of the Innovation-Competitiveness strategy will then be able to be

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<sup>7</sup> The science park concept, developed from the Finnish Model, is similar to that of a cluster approach and is likely to be part of the approach utilised by the TIA in national and provincial innovation systems.



monitored and measured by selected indicators which will emerge from both the research and the formulation process<sup>8</sup>.

The supporting primary recommendations were formulated and prioritised by determining the magnitude of the issues analysed from the qualitative responses of respondents, innovation experts and secondary research, and the analyses thereof.

In addition, numerous corollaries were also formulated to support the abovementioned recommendations. These include recommendations such as fostering a risk-taking and entrepreneurial culture, appropriately tailoring incentives to stimulate innovation, and streamlining the regulatory and legal processes required to start up, fund and manage an organisation.

### **Further research**

Following the findings of this study, it is recommended that further research in the following areas be considered:

- Impact of the DTI National Industrial Strategy (2007) and its implication on the recommendations in this report and the coordination and alignment of the strategies.
- The Innovation Survey outcomes will in all likelihood impact on some of the suggested interventions mentioned in the recommendations<sup>9</sup>.
- Clustering – Further research on priority sectors that can be stimulated by innovation and which industry clusters or science parks should be developed through investments in innovation, must be undertaken.
- For the Innovation–Competitiveness Strategy to be effectively executed and monitored, measurable objectives and interceding performance and tracking indicators needs to be established and ideally, guided by the initial formulation of a hypothetical strategy and even a model. The WEF, IMD and the Forfás competitiveness surveys, as well a significant amount of literature around the topic needs to be considered to establish meaningful metrics<sup>10</sup>.

### **Concluding remarks**

Addressing the primary purpose of the study, the future potential economic growth of South Africa has been investigated in relation to the dynamics between innovation and competitiveness and how through a

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<sup>8</sup>The innovation side of this strategy, currently being tables by DST, should now emanate from the TIA.

<sup>9</sup>These have subsequently been published in the Innovation Survey 2005, published in 2007. It was reported that an increase from 44% to 52% of SA organisations were involved in innovation activities.

<sup>10</sup>The 2007 IMD and WEF surveys released in the second quarter, both surveys reported that South Africa has declined significantly in their global ranking of competitiveness. South Africa's IMD ranking slipped 12 places, from 38th in 2005 to 50th in 2006 and the WEF's Global Competitiveness Index ranked South Africa's 46th in 2005 declining to 46th in 2006 which is also significant. This supports the notion that unique analytic metrics need to be established from the various strategic objectives decided upon. This is, however the objective in Phase 2 of the research project.

systematic driver relationship South Africa's economic growth can be expected to be impacted. The impact of intellectual property rights on how investments in innovation can contribute to improving competitiveness, particularly at the firm level, has also been investigated. This systematic relationship is to a large extent also driven by productivity. With South Africa's natural and imported resources, technology, know how, as well as its capital and human resources, the leveraging of these relationships can be meaningful contributions in terms of social and economic value.

The extent of the contribution of investments in innovation towards improving competitiveness has been supported from three viewpoints. Innovation as a driver of competitiveness has been verified in numerous published sources as well as by the two instruments measuring comparative competitiveness between both developed and developing countries on a global basis, namely the IMD and the WEF. The primary research surveyed innovators in South Africa and also verified that the relationship between innovation and competitiveness was indeed necessary for their success and ability to compete in both local and global markets. The results were further substantiated by a subset of the sample, referred to as the successful innovators. These best practice innovators were able to demonstrate that fundamental investments in innovation, from a financial and management perspective, play a significant role in their success as well as their competitive position in the market.

South Africa's competitiveness can be strongly entrenched as part of its economic fundamentals through investments in innovation across a spectrum of recommended interventions. These have been presented for further consideration. The substantiation of these recommendations has been supported as far as possible by the evidence presented in the research, although many more inferences can still be drawn from the results and their relevance to both public and private sector organisations in South Africa in terms of innovation and competitiveness can be noted. It is believed that this process should be part of the final phase of the project, after consideration of a set of indicators that are informed by the outcomes of this research, which will enable both innovation and competitiveness to be effectively and actively managed.

This therefore concludes the first of three phases of the engagement, the purpose of which was to generate not only a set of consensus recommendations amongst stakeholders for the Minister of Science and Technology, with what is considered to be important to manage innovation as a driver of competitiveness, but also to formulate an *Innovation-Competitiveness Strategy*. This vitally important step would enable the investment in such a process to be performance managed effectively so as to realise tangible outcomes that will have an attributable impact on South Africa's economic performance, and in particular the achievement of the target 6% GDP growth rate.

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## **Acronyms**

AsgiSA – Accelerated Shared Growth Initiative South Africa  
CBD – Convention on Biodiversity  
DST – Department of Science and Technology  
DTI – Department of Trade and Industry  
GCR – Global Competitiveness Report  
GDP – Gross Domestic Product  
HEI – Higher Education Institute  
ICT – Information & Communication Technology  
IDC – Industrial Development Corporation  
IK – Indigenous Knowledge  
IKS – Indigenous Knowledge System  
IMD – Institute of Management Development  
IP – Intellectual Property  
IPR – Intellectual Property Rights  
MSC – Multimedia Super Corridor  
NACI – National Advisory Council on Innovation  
NEDLAC - National Economic Development and Labour Council  
NRDS – National Research & Development Strategy  
NSI – National System of Innovation  
NSI – National System of Innovation  
OECD – Organisation for Economic Co-operation and Development  
PCT – Patent Cooperation Treaty  
R&D – Research & Development  
S&T – Science and Technology  
SET – Science, Engineering and Technology  
SIC – Standard Industrial Classification  
SME – Small, Medium Enterprise  
SPII – Support Programme for Industrial Innovation  
THRIP – Technology and Human Resources for Industry Programme  
TRIPS – Trade-Related Aspects of Intellectual Property Rights  
WCY – World Competitiveness Yearbook  
WEF – World Economic Forum  
WIPO – World Intellectual Property Organisation