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**SUMMARY REPORT ON THE**

**REVIEW OF THE TECHNOLOGY INNOVATION AGENCY**

Prepared for the Minister of Science and Technology

**Acknowledgements**

The review panel is grateful to the Minister of Science and Technology, Mr Derek Hanekom, for entrusting us with this task.

We are indebted to the Director-General of Science and Technology, Dr Phil Mjwara, and his executive team for sharing their views on the establishment of TIA and its future direction.

We appreciate the candour of the TIA Chair, Board, CEO and Executive.

We are also grateful to the many stakeholders who responded to the panel's invitation at short notice, and for the valuable written input made by stakeholders with whom we were unable to meet.

# 1. INTRODUCTION

In November 2012, the Minister of Science and Technology, Mr Derek Hanekom, appointed a panel to conduct an external institutional review of the Technology Innovation Agency (TIA). The panel comprised Dr Khotso Mokhele (Chair), Ms Nasima Badsha, Dr Tarmo Lemola, Ms Khungeka Njobe and Mr Cas Coovadia.

The primary purpose of the review was to reflect on the establishment and operations of TIA in order to assess its strengths and weaknesses. The review was to be based on TIA's current strategic plans and its performance since its inception in 2008, with a particular focus on the integration of the biotechnology regional innovation centres (Cape Biotech, BioPAD, LIFElab and PlantBio) into TIA. Annexure 1 gives the detailed terms of reference for the review.

The review panel began the review process on 14 January 2013, when it met with Minister Hanekom to clarify the terms of reference. The Minister emphasised that, as TIA had only been established in April 2009 when its Board was constituted, the review would be a "formative" review of the institution. He also indicated the panel should make any recommendations it considered appropriate on the basis of the review.

On 26 February 2013, the panel was briefed by the Director-General of Science and Technology and his executive management on the background to and motivation for creating TIA, the National Intellectual Property Office, the biotechnology sector, the Technology Stations Programme and the Advanced Manufacturing Technology Strategy.

During the week of 3 to 9 March 2013, the panel received inputs from the TIA CEO and his executive management, as well as representatives of the various stakeholders of TIA, which included the following:

* The science councils, funding entities and other statutory entities in the National System of Innovation (NSI).
* Government departments.
* Higher education institutions.
* Offices of technology transfer.
* Former heads of the biotechnology regional innovation centres ( BRICs).
* Former leadership of the Innovation Fund.
* TIA's interim CEO.
* Technology station managers.
* Parties who made successful applications to TIA.
* Parties who made unsuccessful applications to TIA.
* The private sector, including the venture capital industry.

On 15 and 20 March 2013 the panel received a briefing and input from the Chair and members of the TIA Board.

The panel was assisted in its work by a secretariat, which recorded the panel's interactions with the stakeholders.

The findings and recommendations in this report are based on the following:

* Synthesised input received from all stakeholders.
* An analysis of TIA's foundational documents (e.g. business case).
* The TIA's legal framework (the TIA Act and the Public Finance Management Act).
* The TIA's annual reports, strategic plans and performance reports.
* The panel's experience of the NSI and TIA-lie institutions in other countries.

The panel presented its final report to the Minister on 15 April 2013.

# 2. THE ESTABLISHMENT OF TIA

## 2.1 TIA Act and business case

TIA was established as a juristic person by the Technology Innovation Agency Act, 2008 (Act No. 26 of 2008), which was promulgated in November 2008.

The Act states that TIA's object is to "support the State in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations".

The Department of Science and Technology (DST) articulated the business case for TIA in a document dated December 2008. This document stated that TIA's ultimate goal was "to use South Africa's science and technology base to develop new industries, create sustainable jobs and help diversify the economy away from commodity exports towards knowledge-based industries equipped to address modern global challenges".

To meet its mandate, TIA would provide and mobilise financial and non-financial support across broad technology areas in various sectors of the economy through the following:

* Appropriately structured financial and non-financial interventions for the commercialisation of research and development (R&D) results.
* The development and maintenance of advanced human capacity for innovation as opposed to just R&D human capital.
* Building a culture of innovation in the South African economy.
* Leveraging local and international partnerships in order to facilitate in-bound technology transfer, build local technological competencies, and encourage foreign direct investment for the commercialisation of technologies in South Africa.

The business case indicated that, at the outset, TIA's budget would be derived from the allocations of existing DST programmes. In the end, the initial budget of the TIA comprised budgets of the following DST programmes, which were all integrated into TIA:

* The Innovation Fund, which was hosted by the National Research Foundation (NRF).
* Tshumisano Trust, which managed the technology stations at universities of technology and was hosted by the Council for Scientific and Industrial Research (CSIR).
* The implementation unit of the Advanced Manufacturing Technology Strategy (AMTS), which was hosted by the CSIR.
* The four BRICs, i.e. BioPAD (Pretoria), LIFElab (Durban), Cape Biotech (Cape Town) and PlantBio (Pietermaritzburg), each of which was managed by a trust constituted by the DST and governed by its own trust deed and board of trustees, which reported directly to the DST.

While TIA was expected to "build on and expand the technology funding experiences and project interventions of the existing entities that are to be incorporated into the TIA", it was never expected to be simply the sum of the constituent parts.

## 2.2. Integration of pre-existing entities into TIA

TIA's first board was appointed in April 2009. The first task of the newly established agency was to bring together the entities that had been identified by the DST as the building blocks of the TIA.

The following may have exacerbated the complexities of the transition of the pre-existing entities into TIA:

(a) The establishment of a new entity with a clear mandate from the TIA Act by merging as going concerns the seven pre-existing entities proved to be a challenge. Each entity had its own mandate and its own legal, structural and organisational background, which meant that the TIA Board was hindered by numerous complexities and problems in incorporating these entities into the new agencies.

(b) The change in the DST personnel responsible for the process of the establishment of TIA impacted negatively on the quality of guidance that the new entity received from the DST.

(c) TIA's inaugural board included the chairs of the boards of trustees of all the four BRICs and the AMTS. This decision was intended to facilitate a healthy transition and to ensure that all interests would be taken into account in the new arrangements. However, it seems to have unintentionally delayed the TIA Board's arrival at a unified vision for the new agency. The panel also heard that the staff of the various BRICs believed that "their" respective former chairs could be lobbied to "fight their battles" on the TIA Board.

(d) It became apparent during the process of winding down BRICs trusts that they had been operating in a manner that made them believe that they enjoyed greater flexibly with regard to the requirements of the Public Finance Management Act (PFMA) than entities listed in terms of this Act. In fact, although these trusts were operating within the stipulations of their trust deeds, they had been operating in contravention of the Public Finance Management Act. These PFMA transgressions led to the very first financial statements of the TIA (for the 2010/11 financial year) attracting an adverse audit opinion by KPMG, the external auditors working on behalf of the Office of the Auditor-General. The adverse audit opinion was based on the lack of consolidated financial statements from associates and subsidiaries. The qualified audit opinion given for TIA's first financial statements undoubtedly resulted in reputational damage to TIA. In 2011/12, TIA spent just over R11,5 million on external audits of all the subsidiaries and associate companies that it had inherited from the BRICs and the Innovation Fund. The results of the audit were presented to the Portfolio Committee on Science and Technology on 11 October 2012. The results were also shared with the National Treasury and the Auditor-General as required by the National Treasury Practice Note.

(e) The panel was informed of serious tensions among the senior managers of the entities merged into the TIA as they allegedly jockeyed for positions of influence in the new agency. Among other things, section 11 of the TIA Act directs that "(1) The Minister must, on the recommendation of the Board, appoint a suitably skilled and qualified person as the Chief Executive Officer who must be responsible for the management of the affairs of the Agency. (2) The appointment must be made after following a transparent and competitive selection process". Following a competitive selection process, which included candidates from both inside and outside TIA, the Board recommended the appointment of an external candidate, who commenced duties on 1 September 2010. Many stakeholders lamented the loss of critical competencies, skills and institutional memory that resulted from the resignation of several of the executive and senior managers from the merged entities in TIA's early existence.

(f) Another challenge was the fact that TIA was established with the Medium Term Expenditure Framework (MTEF) budget allocations of the entities integrated into it, which were of course largely committed to pre-existing projects, thus leaving limited uncommitted funds for the operations of the new agency.

Several of the stakeholders opined that the quality of leadership provided by the DST officials in the lead-up to and transition into the TIA led to many of the woes alluded to above and meant that the TIA was "doomed to fail" from its very inception. The current relationship between the DST Executive and the TIA Board and Executive can be characterised as toxic and the communication between the two entities seems to be very poor. The panel was exposed to a clear disjuncture between the views of the DST and the TIA in relation to the course that has been adopted by the agency. At the heart of this disjuncture is the differing interpretation of the scope and breadth of the TIA mandate.

**Recommendation 1:**

To inform the establishment of any other entities by the DST in the future, the panel recommends that the Minister of Science and Technology should (1) request the Director-General of Science and Technology to provide a full assessment of the role played by the DST in establishing TIA, including a critical reflection on the weaknesses that compromised TIA's ability to execute and discharge its mandate appropriately; and (2) request the Chair of the TIA Board to provide an assessment of the role played by the TIA Board and CEO in those activities that were within their sphere of control.

**Recommendation 2:**

The DST was responsible for setting up and overseeing the trusts that governed the BRICs and therefore the reported PFMA contraventions that occurred. TIA has commissioned a legal service provider to advise it on a legal framework to enable the investments inherited from the BRICs and the Innovation Fund to be condoned by the Ministers of Science and Technology and Finance. This is based on the provisions of sections 51, 52 and 92 of the PFMA. It is recommended that the Minister of Science and Technology considers the framework under development and uses it, as appropriate, to approach his counterpart at National Treasury to complete the process of having the contraventions condoned.

**Recommendation 3: Strengthening coordination between TIA and the DST**

The poor relationship between the Director-General and DST senior executives and the CEO and senior executives of TIA is undermining the ability of the both the DST and TIA to discharge their mandates appropriately. The panel recommends that the Minister of Science and Technology and the TIA Board declare the situation unacceptable and hold the Director-General and TIA CEO responsible for ensuring that an environment conducive to cooperative governance prevails between the DST and TIA. The formal bilateral meetings between the DST and TIA should take place regularly and with representation of both parties at the appropriate senior level. Regular formal reports should be made to the Minister and the TIA Board so that they can monitor the working relationship between the two entities.

The panel met with the heads of a number of the technology stations which are hosted at universities of technology, who expressed considerable uneasiness about being under TIA. They felt marginalised within the agency and were of the view that their core mission (assisting SMMEs to access the resources and expertise at the universities of technology) was under threat. In particular, they had not received any funding for major equipment since 2010, which was impacting negatively on their ability to service their clients.

**Recommendation 4: Technology stations**

In view of the marginal position of the technology stations within TIA, the panel recommends that the TIA Board investigate ways of protecting and enhancing TIA's ability to carry out its core function (assisting SMMEs to access the resources and expertise at the universities of technology). The possibility of relocating the technology stations to the CSIR should be considered.

The panel noted the relatively large number of ring-fenced projects that are currently lodged in the TIA by the DST. TIA finds this unsatisfactory, as it reduces the agency's role to the administration of project funding, while ownership and stewardship of the ring-fenced projects remain with the DST. Similar complaints were raised by other agencies related to the DST.

**Recommendation 5: Ring-fenced DST projects and programmes in TIA**

The panel recommends discouraging the lodging of ring-fenced projects by the DST in TIA. In cases where a project or programme initiated by the DST fits best in the mandate of an entity governed by the DST, there should be proper negotiation between the DST and that entity so that agreement can be reached before such a project or programme is transferred. Ideally, the ownership of the project or programme should be transferred as well, and a proper reporting framework agreed to so that the DST can ensure that the objectives are being met.

While many stakeholders identified individual pockets of excellence (usually at middle management level), the panel noted a distinct lack of confidence in TIA from both the public and private sector respondents. Sound working relationships have not been consolidated, particularly with universities. TIA is not meeting the expectations of stakeholders. Some of the shortcomings identified by stakeholders include poor response times for enquiries and applications, application processes that are unwieldy and not sufficiently differentiated or responsive to the needs of stakeholders, and poor communication, including an unhelpful website. The offices of technology transfer were particularly unhappy with the TIA requirement that projects be partially funded by the universities.

**Recommendation 6: Regionalisation of TIA**

The panel recommends that a regionalisation strategy and plan be developed for adoption by the TIA Board. The strategy should, inter alia, clarify the role and scope of operation of regional offices and should be developed in consultation with key stakeholders. There should be a moratorium on the regional expansion of TIA until the Board adopts the strategy.

**Recommendation 7: Strengthening the efficiency and reputation of TIA**

The panel has identified a number of key operational areas that require attention, including the following: turnaround times for enquiries and applications, drawdown of project funding, overhead costs, and communication with stakeholders. The panel recommends that TIA Management make plans to ensure radical improvement in these areas. The plans should include measurable targets and the Board should monitor progress towards the achievement of efficiency goals.

# 3. INNOVATION CHASM

## 3.1 From narrow definition to appropriate definition

Innovation, which involves the introduction of new or significantly improved products, processes or services, will be increasingly needed in South Africa to drive growth and employment and to improve living standards and quality of life. The future of the country should be less dependent on a few leading industries and companies and more on widespread entrepreneurial activity. This poses a significant challenge to traditional South African science, technology and innovation policies.

The principal rationale for public funding of R&D and innovation in market economies in the last half century has been the realisation that market failure will inevitably lead to under-investment in research. For its part, the innovation system approach, which highlights interactions among actors in the production, diffusion and use of knowledge, gives rise to the identification, consideration and overcoming of systemic failures in capability, institutions, networks and frameworks.

The business case for the establishment of TIA that the DST submitted to the Treasury in 2008 was premised on TIA being a public instrument that would close the innovation chasm between local R&D and commercial products and services. R&D in South Africa is predominantly carried out in the higher education sector and publicly funded science councils, and the business case definition of the chasm creates a bias by confining innovation to these. Generally, publicly funded R&D is used to generate innovative ideas and take them to the proof-of-concept stage, but the ideas are not then taken further to the point where they are of real socio-economic value. The business case document makes no direct reference to innovative ideas arising from sources other than publicly funded R&D, and the TIA envisaged in the business case is expected to establish formalised partnerships with universities and public research institutions.

The R&D performed in higher education institutions and public science councils is potentially a good source of innovative ideas, and it may seem legitimate to some to construct an instrument to close the innovation chasm for publicly funded activities. However, this would lead to under-emphasis or even exclusion of innovative ideas emanating from operating commercial and industrial private and public sector entities, which are known worldwide to be the predominant source of such innovative ideas. It is not clear whether the authors of the business case were aware of the study conducted by the Innovation Fund, one of the entities absorbed into TIA, which revealed that only 5% of the projects funded by the Innovation Fund had come from the higher education sector.

The stakeholders (public and private sector) with which the panel interacted were all disappointed that the business case focused predominantly on sourcing innovative ideas from publicly funded R&D activities. They believed that it was critical for TIA's future operations to provide innovation support across all sectors of and to all actors in the South African economy and the NSI.

To many of these stakeholders, the narrow focus of the business case may imply that two features of successful innovation systems have not been understood. First, that operating commercial and industrial entities, both large and small, are the predominant source of innovative ideas in developing and developed economies. Attempts to boost innovation should include private innovators, local communities and non-profit organisations. Secondly, successful innovations are significantly enhanced when the publicly funded R&D entities are brought into constructive interactions with all other sources of innovative ideas. In a world of distributed knowledge, boundaries between organisations are becoming more permeable. Knowledge and Innovation can and should be transferred actively inward and outward. Companies cannot afford to rely entirely on their own research, but instead acquire knowledge, and buy or license inventions and innovations from other actors. In addition, internal inventions not critical to a firm's business could and should be taken outside the company through licensing, joint ventures, spin-offs, etc. TIA should have a role to play to promote the creation of pilots and platforms for open innovation, i.e. for bringing down barriers, and increasing openness and transparency.

The object of TIA, as articulated in the TIA Act, does not restrict the agency's mandate as the business case suggests. The Act states TIA's object as "to support the State in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations". All stakeholders consulted considered this object enabling and appropriate.

Nevertheless, the DST's officials insisted that TIA's mandate was intended to be narrowly focused as per the business case, with its primary emphasis expected to be on supporting innovative ideas emanating from publicly funded higher education institutions and science councils. This view was not shared by any of the stakeholders engaged in the review process. They saw it as reflecting an inappropriate understanding of the requirements for a successful NSI.

All stakeholders believed that it was necessary for TIA to respond to South Africa's innovation chasm as a whole, and not just the innovation chasm in publicly funded research institutions. The Chair of the TIA Board expressed concern that the pervasive culture in the country's higher education institutions, science councils and private business did not encourage cooperation or collaboration, which she believed was essential in a national innovation culture.

## 3.2 The place of TIA in the innovation value chain

Questions about the nature, powers and duties of the TIA instrument elicited the most passionate views by most stakeholders. The powers and duties of TIA as provided in the TIA Act are given above.

Many stakeholders appreciated the enabling nature of the TIA Act and the wide powers and duties it allowed. However, they also felt a properly structured shareholder compact between the Minister and the TIA Board was needed. They believed that this would enable TIA to respond appropriately to the needs of stakeholders. In fact, all higher education stakeholders interviewed claimed categorically that the innovation chasm in higher education had widened rather than narrowed, because the space that the Innovation Fund had occupied had not been filled by TIA.

All stakeholders considered section 4(1)(a)(i) of the Act the kind of enabling provision that TIA required. They also felt that, although section 4(1)(a)(ii) and (iii) enabled TIA to move downstream in the innovation value chain, TIA should not do so.

One key stakeholder argued that section 4(1)(a)(ii) and (iii) should be amended to ensure that TIA's mandate was sufficiently circumscribed to eliminate any confusion or possibility of contestation. However, the vast majority of stakeholders, while cognisant that the mandate could expand because of these two subsections, thought that a properly structured shareholder compact between the Minister and the TIA Board would be a better remedy at this point than a parliamentary process to amend the Act. To these stakeholders, subsections (ii) and (iii) were not inherently inappropriate for an agency like TIA, and it might be appropriate to invoke them in special circumstances. They also provided the agency with the flexibility it needed to discharge its mandate fully. However, TIA should not currently be preoccupied with what these subsections empowered it to do.

There were strong views that the erstwhile Innovation Fund had operated under a great deal of misguided pressure from the DST to demonstrate success through the commercialisation of the entities it had supported. Similarly, TIA seemed to display a strong affinity for a return-on-investment model, seeking returns on the TIA balance sheet rather than in respect of social and economic development in the national interest.

This emphasis on short-term return on investment might be driving TIA's investment in late-stage projects, which should rather come from venture capital and private equity funds. There was concern that TIA's focus on return on investment would make investment policy more risk-averse, as the need for greater certainty of success would predominate. This risk profile, it was argued, would be inappropriate for a publicly funded innovation support instrument whose very mandate should be to provide support in the early stages of the innovation value chain where the risk level is particularly high, making investment by private venture capital and equity funds unlikely. The focus on short-term return on investment was seen as a fundamental problem which, if not urgently addressed, would lead to the corruption of TIA's mandate, and render the instrument ineffective to achieve its intended goals.

The stakeholders who expressed reservations about TIA's apparent focus on operating downstream in the innovation value chain supported the idea that TIA operations cover the entire value chain. In fact, most stakeholders argued that TIA's mandate should cover the entire innovation value chain, but that it should be clear about what it supports at the various stages of the value chain. There were strong views expressed that the current technological innovation support system in South Africa demanded that TIA's focus be on the early stages of the innovation value chain, where there was a paucity of support instruments.

**Recommendation 8: The TIA Act and shareholder compact**

The panel recommends that a properly structured shareholder compact be entered into between the Minister and the TIA Board so that there is agreement on TIA's scope and mandate within the broad mandate enabled by the TIA Act. Once the shareholder compact has been signed, the TIA Board will have the authority to govern the TIA without undue interference from the DST. The TIA Act will still allow the TIA to engage in activities that may be beyond the scope of the shareholder compact, but the explicit agreement of the Minister would be a prerequisite in such cases.

**Recommendation 9: The mandate of TIA**

The panel recommends that TIA be given a mandate to serve as a "hub" where, inter alia, the following entities would interface with the objective of converting ideas into commercial activities:

* Publicly funded R&D entities (higher education institutions, science councils and national laboratories).
* Large and small commercial and industrial businesses.
* Innovative private individuals.
* Non-governmental organisations and community-based organisations.
* Technological innovation support instruments funded by government departments and public and private entities.

TIA's fundamental role would be that of a publicly funded instrument that ensures a national innovation ecosystem functioning at maximum efficiency and effectiveness. The following features will define the TIA that will successfully discharge the mandate outlined above:

* The role of this entity would be to build bridges between the various sources of innovative ideas and potential supporters and investors. The entity would need to develop competencies to seek out and find innovative ideas from all sources in the innovation ecosystem, be they in publicly funded R&D institutions, public or private businesses, small or large commercial operations, innovative private individuals and communities.
* An important role of the entity, once the initial engagements have been established with a source of an innovative idea, would be to facilitate the seamless articulation of innovative developments along the technological innovation value chain.
* The mandate would cover the entire innovation value chain, from the early stages, where innovative ideas emanate from R&D activities, all the way to commercialisation. However, the TIA's role as a primary grant giver would be confined to the early stages, up to proof of concept. Beyond proof of concept, the TIA would play the role of using its funding to facilitate connections between the proven concept, generated either through the TIA primary grant or brought to the TIA as already proven concepts, and suitable funding vehicles, irrespective of whether the concept is the result of publicly or privately funded R&D. This facilitating role would require TIA to bring potential downstream funders into the conversation when the agency was considering making a primary grant. TIA would also provide soft funding if this was a necessary step to securing funding to progress a project along the value chain.
* To carry out its mandate, TIA would need skilled people, including engineers, scientists, and people with experience in venture capital, manufacturing, finance and economics, at least.
* TIA would need to develop an organisational structure and culture that would fit this mandate. A swift, agile, lean, effective and efficient organisation with an understanding that its staff should not to be confined to the office, but should be in the field sourcing ideas, building bridges and facilitating relationships.
* TIA would operate transparently and engage in active consultation with all relevant stakeholders to secure their involvement in the design of initiatives, thus ensuring broad-based support for its initiatives. A coherent communication strategy would underpin this transparency.

**Recommendation 10: TIA's approach to return on investment**

The panel recommends that TIA's role be that of a granting agency receiving funding from the Treasury for the purpose of facilitating an efficient and effective NSI. The agency should understand return on investment accruing not in terms of the agency's balance sheet, but rather in terms of the benefits to the national economy and jobs created from the commercialised innovations.

**Recommendation 11: People as innovators**

People are at the heart of innovation. Innovation requires people with the skills and attitudes to be entrepreneurial in their professional lives, whether by creating their own companies or innovating in existing organisations in both the public and private sectors. Although South Africa has made progress towards encouraging a more favourable culture and environment for innovation-based entrepreneurship, much remains to be done. TIA can promote an entrepreneurial culture, for example by encouraging events that highlight entrepreneurial role models and supporting the integration, by relevant education departments, of entrepreneurship into the education system.

The members of the TIA Board were at pains to get the panel to appreciate the difficulties that the agency went through in the early phases of its establishment. The strategic plan that interpreted the mandate was approved only in 2012 and TIA has now attained a level of stability that has to be built upon. Any radical change either in mandate or operations would return TIA to the sense of instability that would inevitably lead to the flight of key staff. The panel proposes Recommendations 9, 10 and 11, fully cognisant of these passionately articulated views, but also mindful of the value and benefit of a formative review performed early in the life of an entity to ensure that course correction can happen if needed. The panel is convinced such course correction is vital if TIA is to be sustainable.

## 3.3 Innovation as a cross-departmental imperative

Many stakeholders expressed a view that the innovation imperative is important to many line function government departments. The Industrial Development Corporation (IDC) received frequent mention as a key element in the innovation conversation as it has developed a unique array of industrial and innovation support vehicles. The IDC has for many years reported into the Department of Trade and Industry (DTI), but its reporting line was recently changed to the Economic Development Department. The panel was informed that the DTI is contemplating repatriating into the Department the Support Programme for Industrial Innovation (SPII) that it had supported through the IDC and the Technology and Human Resources for Industry Programme (THRIP) that is managed by the NRF. This repatriation would entail reviewing these programmes to decide if they fulfilled the requirements of the DTI. It is important that the DST engage the DTI to ensure that the innovation ecosystem is strengthened and not weakened as the DTI reviews these very successful programmes.

The Department of Health and the Department of Agriculture, Forestry and Fisheries are also important when considering the innovation imperative. The DTI has declared the pharmaceutical sector an area in which local manufacturing capacity and competence should be enhanced. Innovations in health have also received a fair amount of funding through the instruments designed by the DST to support the National Biotechnology Strategy. South Africa used to enjoy preeminent status in the world as a source of innovation in veterinary medicine, another area that speaks directly to the National Biotechnology Strategy, but this capacity has been eroded over the years.

The Department of Higher Education and Training is also important as it oversees the higher education system, which is crucial to the success of the national innovation endeavour.

**Recommendation 12: Cross-departmental oversight and coordination of innovation**

The panel is well aware of the challenges of coordination in government, both within and between departments. The panel recommends that the Minister endeavour to create a high-level interdepartmental forum to coordinate innovation across the NSI, preferably at ministerial level, but at least at director-general level. It is further recommended that, in order to strengthen coordination across the NSI, the TIA Act should be amended to allow the Director-General, the Director-General of Trade and Industry, the President of the CSIR, the President of the NRF and a nominee of the IDC to be appointed as ex-officio, non-voting members of the TIA Board.

In appointing the new TIA Board, the Minister should include individuals who have a track record of involvement in innovation in the private sector (large companies, SMMEs and parastatals), as well as individuals from the universities and science councils.