

Too many actions, too few priorities: Commentary on the ministerial review of the STI landscape

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The final report¹ of the Ministerial Review Committee on the Science, Technology and Innovation (STI) Landscape is the latest in a series of documents^{2,3} seeking to review South Africa's National System of Innovation (NSI) and to identify the important actions that are required to enhance innovation within the system and 'deliver a sustained and durable knowledge-based economy'⁴.

Although not explicitly stated, it is evident that the Minister of Science and Technology is concerned about the underperformance of the NSI, which necessitated this review. The committee's first report presented its view of the reasons for this underperformance, which included inadequate human capital development, the lack of a common understanding of research and innovation, limited horizontal and vertical coherence, poor support for innovation activities other than formal research and development, and inadequate oversight or analysis.⁴ Many of these problems have persisted since the 1990s, especially the issues of low research capacity in many universities, inadequate investment by the private sector in innovation, faltering coordination across ministries, and the lack of political support for innovation from the government as a whole.⁵

The final report outlines how the DST might act to rectify the underperformance, to invigorate the NSI, and, in particular, to direct the system such that it addresses the country's main priorities. By anyone's standards, the committee has completed an extensive review; its output includes the Phase 1 report (a desktop study of the present NSI landscape), seven background papers and the Phase 2 report (41 main recommendations and countless sub-recommendations on the future of the NSI).

Such reviews are inherently ambitious, seeking to identify priorities across a wide range of actors and fields of practice, and as a consequence tend towards multiplicity rather than simplicity and detail across diverse areas rather than focus on specific constraints. Therein lies the principal weakness of the report; faced with so many recommendations, without any guidance as to their relative priorities, the Minister's response may at best be to approach the recommendations on an *ad hoc* basis, or, at worst, to ignore the report in its entirety, based on practicality. Such a response would be fatal for the report's overall ambition to help create a 'full-spectrum, fully national system of innovation that reaches into all productive activities contributing to livelihoods in all sectors of society'¹.

The National System of Innovation: A useful analytical framework

The NSI concept dates from the 1980s and has been widely adopted by agencies and countries as a useful analytical framework to understand the funding and performance of science, the development and diffusion of new technologies, and the productivity of a country or region with respect to innovation.^{6,7} In South Africa, a broad and inclusive conception of the framework has been reflected in all policy documents since 1995, beginning with the Green Paper on Science and Technology (S&T). The main benefit of the approach is that it recognises the importance not only of multiple actors in the innovation process (such as government departments, business entities and research organisations), each performing according to their respective mandates, but also of strong relationships between these actors. Innovation is considered to be the outcome of a highly networked set of institutions operating as a single system rather than as independent entities, and innovation systems policies seek to optimise the collaboration and the functioning of the system across the nation, sectors and group. Broad participation of all groups in society beyond the organisations traditionally already involved in science and technological innovation is crucial for success.

The NSI approach is not without its critics; its application to developing countries in particular is criticised on the basis that it ignores social needs (innovation for development), it presupposes that national governments have the resources or capability to influence innovation, it is less open and oriented to inclusiveness than suggested, it is more oriented to compromise within the bureaucracy than towards consensus about clear strategic goals and priority programmes



to achieve them, and its application tends to result in burgeoning bureaucratisation of government.⁸ Some of these criticisms may also apply to this report, which places an inappropriate level of emphasis on the reform and growth of government structures. Table 1 gives an overview of the report's recommendations; the main categories are now discussed in more detail.

New structures

Of the 41 recommendations, 9 cover the establishment of new structures, including the National Council on Research and Innovation (NCRI) and the Office for Research and Innovation Policy (ORIP), with little discussion of the associated costs or sustainability. The danger of such a preoccupation with structure is that the proposed changes deal with symptoms at best, but do not really address the more fundamental political and organisational problems that stand in the way of real progress towards a well-functioning nationwide and inclusive system of innovation. In general, the proposed new structures, (1) can stymie good intentions and are empty without clear programmes of action and talented, well-directed employees, (2) take time to establish (1–3 years, depending on the size) and become effective (at least 5 years) and (3) create further duplication and confusion in the system as a result of an initial unavoidable overlap of mandates (the role of the DST in the case of the NCRI, and the National Council on Innovation (NACI) in the case of ORIP).

These problems are bound to occur as the document is unclear about what exactly the new structures will address and should accomplish. This comment does not ignore the committee's own criticisms that 'the compelling vision of the White Paper on S&T has not been adopted widely enough' or 'the New Strategic Management Model (NSMM) has failed to create a functioning system of innovation'. But the solution is certainly not just establishing new structures and models alongside existing ones, especially as this approach seems to have failed historically (for instance, from being a solution, the NSMM now seems to have become the cause of underperformance). Rather, it is important that the DST and NACI act more vigorously and strategically with their respective tasks of realising the vision of the White Paper in ways that do *not* imply the multiplication of agencies and committees (i.e. bureaucracy).

Inherent to the practice of democracy is a constant competition for both resources and policy focus between different

government departments and initiatives. Such competition presumes public, governmental and parliamentary involvement, and enforcement of the accountability of participating groups, sectors and departments in view of the national and public interests at stake. Resolving the apparently low profile of innovation policy within the Cabinet, the weakness of the DST in government, and the general lack of an innovation culture within state and society, will require strategies such as policy cohesion with other government initiatives (such as the National Development Plan (NDP)⁹); delivering a clear message of benefit; securing external funding sources in addition to National Treasury; and establishing binding alliances across and especially beyond government, that is, with industry and with civil society organisations. New structures may be of some help in achieving these strategies, but can also function as an excuse for not truly engaging with the deeper problem and instead acting as new sources of bureaucratic proliferation and involution.

Social innovation

The report endorses a broad conception of innovation policies, exemplified by its inclusion of 'social innovation'. Internationally, and especially in Europe, the social innovation concept is currently very popular. Successful innovation and economic growth are not only the consequence of inventing new techniques and products; to be successful they require new forms of social organisation and new ways of working and collaborating. Innovating South Africa out of its current crisis will require 'social innovation' across sectors and classes, alongside changes in material production and communication technologies.

However, it is apparent that 'social innovation' in the report is defined in a more limited sense, with a specific coupling to 'poverty reduction.' Although poverty alleviation is crucial, especially as previous priority programmes have not been particularly successful, the recommendation that an 'explicit strategy for social innovation should be developed' does not capture the full potential of the concept. Information on the proposed Social Innovation Fund is scarce, and appears to overlap with the DST's existing poverty alleviation programmes, in particular the joint project with the European Union on 'Innovation for Poverty Alleviation'.¹⁰ From a policy perspective, the Fund and the recommendations for 'social innovation' may be an important addition to previous DST documents, but how the recommendations would contribute to the overall goals needs careful elaboration

TABLE 1: Overview of some of the report's recommendations.

Category	Recommendation	Comments
New structures or revision of existing structures	9	Structures themselves do not solve problems or improve existing situations; the document places too much emphasis on structures rather than programmes of action and targets that can be assessed.
Social innovation	1	The interpretation of social innovation is limited, underdeveloped and coupled almost exclusively to poverty alleviation.
New funding or budget processes	11	Funding is still the most influential way of developing and endorsing new behaviour. The document has a number of clear and important funding recommendations, but some require further development to be adequately appreciated.
Monitoring and evaluation	3	Monitoring and evaluation is essential to good decision-making; good data drives good decisions, but only when the data and the background analysis are open to participants and decision-makers.
Human capital	6	Human capital remains one of the most important and permanent constraints within the National System of Innovation. The problem affects both the present operations of the system as well as its long-term viability, yet it is not clear whether there is any new thinking in this area.
Other	11	This group contains a spectrum of other recommendations which are vague in content and/or platitudes, which will be impossible to implement.



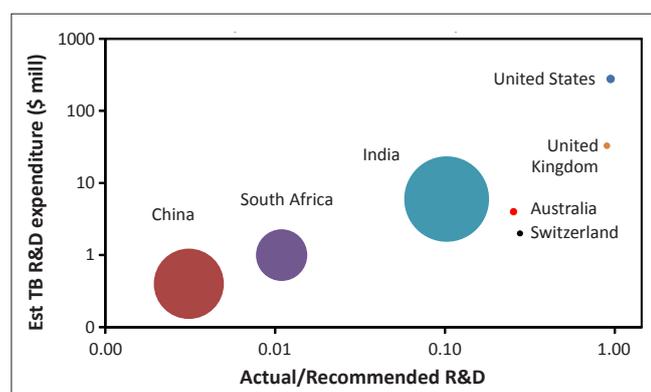
and active political endorsement by all parties and departments involved.

New budgets

Because the allocation of funding remains one of the most effective means by which the DST can influence the NSI, it is not surprising that the report makes several recommendations in respect of new budgets, or new ways of organising existing budgets (Table 1). Unfortunately, the report fails in all cases to make quantitative recommendations for public budgets, especially those proposals dealing with the priority areas of advanced manufacturing, pharmaceuticals, telecommunications, electronics (in search of economic growth), health (especially health service delivery, infrastructure and logistics), and education (especially technical training in electronics, metal manufacturing and instrumentation). Such quantitative targets would have been helpful in subsequent motivations to National Treasury, in obtaining commitments from private sources, and in outlining the organisation of mutual and public accountability during the course of the programmes.

Health research and development (R&D) is one such area requiring additional focus. South Africa has committed to attaining a target of 2% of national health expenditure on health R&D,¹¹ but has made slow progress in this regard.¹² A prior analysis has shown that South Africa's investment in R&D on tuberculosis, for instance, is 1% of what it should be based on disease incidence (Figure 1; unpublished findings).

Similarly, the report's comments on *business R&D expenditure* (BERD) are disappointing; recommendation 37 of the report states that business should be incentivised to spend more on R&D, without specifying how much more and in which sector. In a paper published in 2008,¹³ it was noted that a complacency about BERD was unjustified (as reflected in the OECD review²) given that certain high value-added sectors were not spending at the levels required in order to sustain innovation and competitive advantage. It has been argued elsewhere that although corporate deposits have stagnated during the recession, companies are still holding significant cash (R1.2 trillion) and the key to growth is to leverage the corporate balance sheet.¹⁴ A more detailed debate on actual expenditure levels within business enterprises, and how the



Bubble size is TB incidence

FIGURE 1: A comparison of South Africa's health research and development (R&D) expenditure on tuberculosis (TB) with that of other countries.

additional expenditure can be more closely monitored and evaluated, is long overdue.

Increasing innovation within business entities, including state-owned enterprises, is clearly an important objective of the DST. However, this objective too often results in the confounding of R&D and innovation; the positive impact of R&D on innovation and economic growth may hold for developed economies, but the link is contested in developing countries.^{15,16} It is apparent that the review places too much focus on domestic R&D without adequate mention of the importance of incremental and/or in-licensed technology, especially in driving innovation that addresses local problems.

The role that *broadband-based services* can play in supporting social and enterprise-level innovation is underestimated by the report. We recommend that a specific budget for the extension of broadband to all sectors of the economy be developed and implemented in the form of an infrastructure programme with clear innovative targets and commitments of partners inside and outside government.

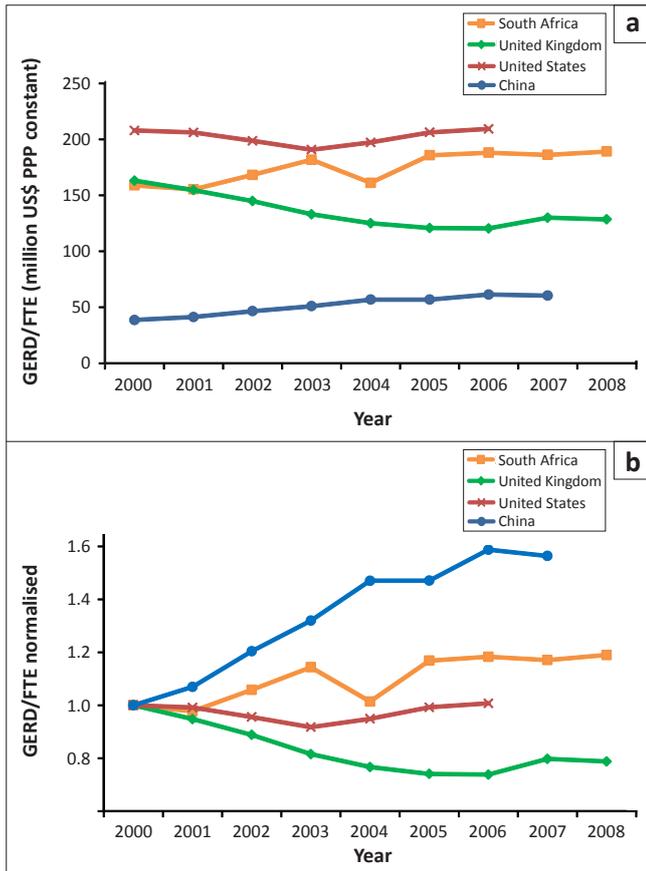
Clearly, new and highly targeted funding is important. However, higher expenditure may not itself result in an increase of outputs of the NSI, as is assumed in several parts of the report. Increased expenditure in a system limited by human capital will increase the cost of full-time equivalent (FTE) researchers, thereby raising the cost of research whilst the actual size and outputs of the system may remain stagnant. There is good evidence that this effect is already a feature of the South African NSI.¹⁷ Using the indicator of gross expenditure on R&D (GERD) per FTE researcher, it can be shown that South Africa has experienced an inflationary situation for expenditure per FTE (mainly salaries) and that this average expenditure is now high relative to even the developed countries, once adjusted for purchasing power parity (Figure 2).

Human capital development at all levels remains the Achilles heel of South Africa; whilst there are some success stories (such as university enrolment and output), there are an almost infinite number of ways in which our educational institutions can be considerably improved. The report makes a number of human capital development recommendations, of which several are repeated in the final version of the NDP.⁹ If endorsed by all parties and adequately funded, these recommendations may lead to much needed real progress.

Monitoring and evaluation

The report's recommendations include several important suggestions on the monitoring and evaluation (M&E) of R&D expenditure. These recommendations are fully supported; despite the National R&D Survey, the system is not well characterised and more effort needs to be made in providing useful indicators for policy decisions. The following recommendations should be prioritised:

- Recommendations 33 and 41: perform annual surveys of government expenditure on science and technology activities, including expenditure by all the parastatals.



(a) Gross expenditure on R&D per FTE researcher; (b) GERD/FTE normalised to the year 2000.

FIGURE 2: (a) Gross R&D expenditure (GERD) per full-time equivalent (FTE) researcher (purchasing power parity (PPP) adjusted and normalised).¹⁸

- Recommendation 32: perform annual reviews of the outputs of all the science councils and other public research or S&T-based technical service organisations.

In addition, the M&E function should be expanded to include:

- R&D expenditure according to industry sectors, reported as R&D intensity
- annual remuneration of science, engineering and technology workers in order to understand labour market dynamics and issues of supply and demand
- comparative evaluation of research funding versus output (including measures other than publications) for all higher education institutions and science councils
- government funding in support of business enterprise through all funding instruments.

In summary, the report reflects the detailed and comprehensive process which the committee followed to develop its main conclusions. However, in its attempts to be comprehensive, the report fails to articulate a set of clear key priorities, supported by quantitative evidence and specifying a set of well-defined targets. Based on the three prioritisation criteria of 'how big is the gap?', 'what will be the impact?' and 'what is the extent of policy cohesion?', an amended set of recommendations is proposed:

- *Governance:* re-invigorate existing structures to address the problem of limited adoption of innovation-based initiatives in government and industry, taking new actions to enhance the visibility of innovation in all spheres of

society and making innovation policy more prominent on the political agenda.

- *Enabling innovation:*
 - increase incentives (or uptake of existing incentives) for business innovation, especially for technology-intensive sectors such as telecommunications, advanced manufacturing and pharmaceuticals
 - increase government R&D expenditure in the critical areas of health, telecommunications, energy and manufacturing
 - extend the existing infrastructure to make high-speed broadband universally available at competitive prices
- *M&E:* expand the M&E functions of the DST and NACI to include annual labour market surveys, the extent of public sector S&T activities, R&D expenditure according to industry sector, a comparative evaluation of research outputs and government support for business enterprise.
- *Human capital development:* develop targets for growth of knowledge workers within specific disciplines (for academics), and implement a cross-cutting skills development or human capital development strategy to ensure that these targets are reached, including doubling technical training for school leavers in important sectors, such as electronics, telecommunications, welding, advanced manufacturing and health delivery.

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