“Writing a New Story
The country must write a different story in the years ahead. ......

In this new story, our nation’s energies are focused both on attacking poverty and on expanding a robust, entrepreneurial and innovative economy.”

National Development Plan: Vision 2030
National Planning Commission 2012
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**ACRONYMS**

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CoE</td>
<td>Centre of Excellence</td>
</tr>
<tr>
<td>CPUT</td>
<td>Cape Peninsula University of Technology</td>
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<tr>
<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
</tr>
<tr>
<td>CUT</td>
<td>Central University of Technology</td>
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<tr>
<td>DST</td>
<td>Department of Science and Technology</td>
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<td>DUT</td>
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<td>DVC</td>
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<td>European Research Area Board</td>
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<td>Grant Management and Systems Administration</td>
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<td>HEI</td>
<td>Higher Education Institution</td>
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<td>HQP</td>
<td>Highly Qualified Personnel</td>
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<td>SARChI</td>
<td>South African Research Chairs Initiative</td>
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<tr>
<td>SET</td>
<td>Science, Engineering and Technology</td>
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<tr>
<td>SKA</td>
<td>Square Kilometre Array</td>
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<tr>
<td>SSH</td>
<td>Social Science and Humanities</td>
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<td>Science, Technology, Engineering, Mathematics and Medical</td>
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EXECUTIVE SUMMARY

The South African Research Chairs Initiative (SARChI) was established by the Department of Science and Technology (DST) in 2006/07 as a strategic intervention designed to attract and retain excellence in research and innovation at South African universities. The National Research Foundation (NRF) is charged with implementation and oversight of SARChI, and its agreement with the DST requires reviews of the performance of SARChI to be undertaken at five-yearly intervals. The present review is the Five Year Review of the first phase of SARChI, from its inception in 2006 until March 2012.

The purpose of the review was to assess the conceptualisation, implementation and management of SARChI and its overall performance in terms of its mandate and its objectives; and to make recommendations for the future to enhance both SARChI as a programme and the performance of the Chairs.

This assessment of SARChI and its performance is based on a review of relevant documents made available to the Review Panel and key informant interviews with representatives from the DST and the NRF, samples selected by the NRF of Deputy Vice-Chancellors (Research) of universities, Chair holders and students of Chair holders, partner stakeholders and other experts. The interviews were conducted in group settings over a two-week period, at the end of which a presentation of preliminary findings and recommendations was made to the NRF. The Panel was given another four weeks in which to finalise its report. Due to time constraints, the Panel was not able to conduct or examine data collected by other means – stakeholder surveys, in-depth case studies and bibliometric research.

A base grant, subject to annual inflationary increase, of up to R2.5 million per annum was made to each Tier 1 Research Chair to cover the salaries of Chair holders, postdoctoral and student awards, research operating costs, and small equipment requirements. Improvements to the SARChI programme over the review period in response to stakeholder feedback included: i) introduction of Chairs at Tier 2 level for researchers on an upward trajectory, generally under the age of 40, with the potential to achieve Tier 1 status in the next five to ten years; and ii) eligibility for appointment at Tier 1 level of candidates from abroad who are willing to spend at least 50% of their time at a South African university.

At the inception of SARChI, the goal was to have 210 operational Chairs by 2010. The programme has delivered 89 fully operational Chairs over the five-year period, and recently announced the allocation of an additional 60 Chairs, which are yet to be filled. Despite the slower-than-expected delivery, the initiative to date has been effective, efficient and produced a number of results and benefits.

Chair holders, host universities, research students and other stakeholders are very enthusiastic about the SARChI programme and the many new opportunities it brings. The implementation of the programme has seen significant attraction and retention of talented researchers, increasing numbers of graduate students (masters, doctoral and postdoctoral) and an increasing flow of publications, including those to prestigious journals. The programme has also resulted in the development of significantly improved research capacity at host institutions and created and reinforced nodes of excellence at the major research universities as well as at a number of
newer and/or disadvantaged institutions. Some issues remain about processes that need to be addressed.

Further enhancements to the programme, however, are required to consolidate and build on the success achieved so far. Recommendations on these are summarised below. The Review Panel recommends that:

1. the SARCHi programme be continued and funded at a level commensurate with expectations;
2. the NRF setup a facilitative office headed by a senior scientist/researcher to oversee the SARCHi project, to be the contact person for SARCHi Chair holders, to promote consistency and coherence among the various discipline-based review panels, and to provide feedback to Chair holders and host institutions;
3. the prescribed ratio of research/non-research time of Chair holders of 95%/5% be revised up to 80%/20%, to allow for greater interaction with undergraduate and honours students and more contribution to research development in the department as a whole;
4. the conditions of the SARCHi grant and the processes governing the relationship between the DST, the NRF, the host institution and the Chair holder be streamlined to reduce bureaucracy, minimise rigidity and promote transparency;
5. more holistic recognition of research outputs/outcomes be developed, to include the research impact of the Chair on the discipline, the institution and society at large;
6. the monitoring of the SARCHi programme include a reflective annual report from the Vice-Chancellor of the host institution that captures the institutional impact of the Chair(s);
7. the NRF consider the pairing of local Tier 2 Chair incumbents with part-time (50%) national or international Tier 1 appointments;
8. the NRF consider dovetailing the SARCHi and the Centres of Excellence (CoE) programmes, to allow a SARCHi Chair holder to head a CoE;
9. opportunities and incentives to attract national and international postdoctoral fellows be created;
10. the SARCHi programme be widely branded to give it national and international visibility and identity;
11. the NRF (through the facilitative office in recommendation 2 above) establish annual symposia/workshops of SARCHi Chair holders and of SARCHi students, to serve as open fora for the mutual sharing of experiences and accomplishments;
12. the NRF monitor the adequacy of co-investment by host institutions in support of SARCHi Chairs;
13. the NRF monitor the implications of co-funding of SARCHi Chairs by bilateral agreements with other countries and stakeholders;
14. the NRF consider re-engineering its SARCHi systems to cope with the envisaged expansion of the programme.
To achieve the goals of Vision 2030, the country’s universities need to become centres of research excellence and nurture the next generation of critical thinkers and innovators. SARCHI is a key element in this quest.
1. INTRODUCTION

Background

The South African Research Chairs Initiative (SARChI) was established by the Department of Science and Technology (DST) in 2006 as a strategic intervention designed to reverse the brain drain from South Africa and to attract and retain excellence in research and innovation at publicly funded South African universities. The programme makes provision for the establishment of Research Chairs at South African public universities, funded by the DST, as well as Research and Development (R&D) Chairs co-funded by private enterprise.

The SARChI programme is aimed at increasing scientific research leadership, developing research capacity and stimulating the generation of new knowledge. The programme is designed to significantly expand South Africa’s scientific research base so as to support the implementation of national research and development policies and results in the realisation of South Africa’s transformation into a knowledge economy in which the generation of knowledge translates into socio-economic benefits.

Within the strategic policy framework established by the DST, the National Research Foundation (NRF) is charged with the implementation and oversight of SARChI. The initial understanding between the DST and NRF was set out in a 26-page Contract for Funding. Although signed in March 2006, the agreement has not been formally updated since. Appended to the Contract is a Strategic Concept Framework entitled South African Research Chairs Initiative – 210 Research Chairs by 2010. It sets out the initial conceptual framework, management expectations and anticipated impacts of the programme.

In terms of programme funding and financing, the NRF was expected to make awards of up to R2.5 million per annum per Research Chair. This base amount, subject to annual inflationary increase, represented the total funding per Chair, covering salaries of Chair holders who are recognised international research leaders, postdoctoral and student awards, research operating costs, and small equipment requirements. It was also understood that previous resources allocated for the period 2005–2007 would be used for awarding up to 55 Chairs by the end of the same period. The DST and the NRF agreed that in order to realise the ambition of 210 operational Chairs by 2010, a commitment of R1.61 billion over six years would be required. It was also recognised that in order to support 210 operational Chairs beyond 2010, an additional R2.88 billion would be needed to sustain and renew the initiative for the subsequent five years (2011–2015).

The agreement between the DST and the NRF requires reviews of the performance of SARChI to be undertaken at five-yearly intervals. The present review is the Five Year Review of the first phase of SARChI, from its inception in 2006 until March 2012.

Review Panel Members

The members of the Review Panel were:

- Prof Krish Bharuth-Ram (convenor), Professor Emeritus of the University of KwaZulu-Natal;
and former Head of the National Advisory Council on Innovation;

- Dr Wayne MacDonald, former Director: Corporate Performance and Evaluation Division at the Social Sciences and Humanities Research Council of Canada;
- Prof Dan Ncayiyana, Honorary Professor of Obstetrics and Gynaecology at the Universities of Cape Town and KwaZulu-Natal;
- Dr David W Strangway, President Emeritus of the University of Toronto and the University of British Columbia, Canada, and former President of the Canada Foundation for Innovation; and
- Dr John Wood, Secretary-General of Association of Commonwealth Universities, United Kingdom (UK); former Principal of the Faculty of Engineering, Imperial College, London; and former Chief Executive of Council for the Central Laboratories of the Research Councils, UK.

Scope and Purpose of the Review

The scope and purpose of the review, as outlined in the Terms of Reference, were to:

1. Assess SARChI in terms of:
   - conceptualisation, implementation and management to date;
   - funding model and management; and
   - future plans.

2. Assess the Chairs overall in terms of:
   - leadership;
   - staffing;
   - commitment of institutions hosting the Research Chairs;
   - location/strategic positioning of the Research Chairs;
   - distribution of Research Chairs; and
   - future plans.

3. Make recommendations for the future on:
   - enhancement of SARChI as a programme;
   - enhancement of performance of the Chairs; and
   - goals to which the Initiative and the Chairs should strive.

4. Assess SARChI on issues pertaining to programme management, monitoring and evaluation. This entailed selectively commenting upon, but not duplicating, the Mid-Term Internal Review of the DST/NRF South African Research Chairs Initiative, which was undertaken by TechnoScene (November 2011).

Review Methods

This assessment of SARChI and its performance is based on a review of relevant documents made available to the Panel by the NRF, performance data from secondary sources and selected key informant interviews with representatives from the DST and the NRF, samples of Deputy Vice-Chancellors (Research) of universities, Chair holders and students of Chair holders, partner stakeholders and other experts (e.g. Mid-Term Internal Review Team). The names of interviewees are listed in Appendix 1.
The interviews were conducted in small group settings at the NRF offices in Pretoria and the Research Offices of the University of KwaZulu-Natal (Durban), the Nelson Mandela Metropolitan University (Port Elizabeth) and the University of Cape Town.

The document review and interviews, based on those suggested by the Review Reference Group, were conducted over a two-week period, at the end of which a presentation on the preliminary findings and recommendations was made to the NRF. The Review Panel was given another four weeks in which to finalise its report. Due to time constraints, the Panel did not implement other usual evaluative techniques, such as stakeholder surveys, in-depth case studies and comparative bibliometric analysis, which would enable assessment and comparison with findings from the document analysis and key informant interviews.

2. PROGRAMME IMPLEMENTATION

At inception in 2006, the goal of SARChI was to have 210 operational Chairs by 2010. However, by March 2012, 89 Chairs\(^1\) were operational from a total of 92 Research Chairs that had been awarded on a competitive basis across 16 South African universities in various research disciplines, encompassing the natural and agricultural sciences, engineering and applied technology, health sciences, humanities, and management and social sciences. As can be seen from Fig. 1, the variance between what was expected from the outset and what was delivered began to widen in 2008/09 and grew significantly thereafter.

\[\text{Fig. 1: DST/NRF Projected SARChI Chairs compared with Accumulative Awarded Chairs and Accumulative Operational Chairs (March 2012)}\]

\(^{1}\) While reference is made in several documents to 92 Chairs, only 89 Chairs were occupied or fully operational.
The recent announcement of 60 new Chairs, which have yet to be filled, will go a long way towards closing the performance gap. The availability of funding for the additional Chairs shows the commitment of the DST and the NRF to the programme, although its roll-out may be slower than initially envisaged. This is not surprising given the demands of competing priorities on the national fiscus.

**Programme Objectives**

The Guidelines for the Round 1 Call for Applications (NRF 2005) give a description of SARChI, together with its purpose, objectives and expected outcomes. The Guidelines set five interrelated objectives, namely:

1. To increase the number of world-class researchers in South Africa;

2. To retain qualified research scientists in the South African higher education sector and/or attract qualified research scientists back to the South African higher education sector and thereby:

   a) To help reverse the systemic decline in research outputs, research focus and research capacity at publicly funded South African higher education institutions (HEIs) and research institutions; and

   b) To strengthen and improve the capacity of publicly funded South African HEIs, science councils, museums and other research institutions (e.g. university-linked teaching hospitals) to generate and apply new knowledge;

3. To stimulate strategic research across the knowledge spectrum and thereby increase the level of excellence in research areas of national and international importance;

4. To create research pathways for highly skilled, high-quality young and mid-career researchers that effectively address historical racial, gender and age imbalances; and

5. To improve and accelerate the training of highly qualified personnel through research.

Some improvements to the SARChI programme have already been made by the NRF in response to stakeholder feedback and the conclusions of the Mid-Term Internal Review. Significant changes included the introduction of Research Chairs at the Tier 2 level and the subsequent development of criteria for appointments at Tier 1 and Tier 2.

Tier 2 level Chairs were introduced in an attempt to capture nominated applicants that were not at Tier 1 level at the time of nomination but were established researchers with the potential to advance to the Tier 1 level within a period of five to ten years. During 2009, criteria distinguishing between Tier 1 and Tier 2 Chairs were developed.

Candidates from abroad who are willing to spend at least 50% of their time at a South African higher education institution were eligible for consideration for appointment at the Tier
1 level, with the intention of attracting distinguished research leaders, including African scholars and South Africans in the diaspora.

Universities were allowed to host Research Chairs in partnership with a public research institution such as another university, a science council, a national research facility or an academic health complex. The selection criteria for the preliminary phase as well as the selection phase are spelled out in the Guidelines.

The Research Chairs were tenable for a period of five years, and renewable for further two five-year periods dependent on satisfactory reviews based on three main criteria:

- outputs, which included the number of peer-reviewed journal publications, conferences organised and conference presentations, and chapters in books,
- human capacity outputs: numbers of masters and doctoral graduates and completed postdoctoral fellowships; and
- impact on local and international research communities, indicated by improved NRF rating, etc.

The funding levels of Tier 1 and Tier 2 Research Chairs were R2.5 million and R1.5 million per annum, respectively. The funds were to cover the salary of the Chair holder, postdoctoral fellowships, postgraduate student bursaries, operating costs, small items of equipment, and limited administrative and technical support – but all within prescribed limits.

A Research Chair holder was expected to dedicate at least 95% of his/her time to conducting research, supervising an average of ten masters and doctoral students per annum and mentoring emerging researchers. The remainder of the time (5%) could be utilised for administration or undergraduate teaching.

**Profile of Operational Chairs**

The profiles of the operational Chairs, determined from recent NRF data, are listed in Table 1.

<table>
<thead>
<tr>
<th>Level</th>
<th>Gender</th>
<th>Race</th>
<th>Additionality</th>
<th>Research domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier1</td>
<td>Male</td>
<td>White</td>
<td>South African university</td>
<td>STEMM</td>
</tr>
<tr>
<td>Tier2</td>
<td>Female</td>
<td>Black*</td>
<td>External</td>
<td>SSH</td>
</tr>
<tr>
<td>80.9%</td>
<td>80.9%</td>
<td>62.9%</td>
<td>68.5%</td>
<td>67.4%</td>
</tr>
<tr>
<td>19.1%</td>
<td>19.1%</td>
<td>37.1%</td>
<td>31.5%</td>
<td>32.6%</td>
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* Under ‘Race’, the category ‘Black’ includes ‘Africans, Coloureds and Indians’.

The Chairs are largely occupied by white males, and over two-thirds of Chair incumbents come from within the existing South African university system. In terms of research domain, over two-thirds of the current operational SARCHl Chairs are from the natural sciences, technology, engineering, mathematics and medical fields (STEMM), while just under one-third come from the social sciences and humanities (SSH). In terms of the distribution of the Chairs between tiers, 80.9% are Tier 1 Chairs and 19.1% are Tier 2 Chairs. The gender distribution of the Chair holders is 80.9% male and 19.1% female.
The distribution of operational Chairs and new allocations is presented in Fig. 2. The Review Panel was encouraged by the success of Chairs hosted in some of the universities of technology, comprehensive universities and previously disadvantaged HEIs, reflecting the wider inspirational impact of the SARCHI programme.

![SARCHI Chairs](image)

**Fig. 2: Distribution of 152 awarded Chairs to South Africa’s public universities (March 2012)**

3. **OVERALL PERFORMANCE OF THE SARCHI PROGRAMME**

The overall performance of SARCHI is assessed in terms of the questions that were directed to the Review Panel by the Reference Group. The Panel’s responses to the questions are given in the form of its observations/findings, together with measures that the NRF/DST can undertake to improve the efficacy of the programme.

**Q1. Has SARCHI led to the attraction and retention of world-class researchers?**

The Review Panel was impressed by the quality of the researchers it met. It is clear that there has been significant attraction and retention of talented researchers (although largely from within the South African university system), as can be seen by the accomplishments of this group of individuals. The programme is designed to be additive, and in most cases the award of a Chair resulted in a new person being added to the institutional complement. It is clear that releasing talented local faculty members from otherwise heavy duties in undergraduate teaching has dramatically released the potential of many individual Chair holders. Some interviewees observed, however, that there has been undue focus on South African individuals occupying the Chairs.
The NRF and the DST could do much to increase the inflow of this research talent and increase the pool, for example:

- Further monitoring to ensure additionality rather than substitution needs to be adopted;
- The co-investment in the Chairs by the universities needs to be clearly articulated and very clearly documented; and
- A comprehensive branding strategy needs to be developed, which would brand the programme both in South Africa and internationally.

The accomplishments of this programme are remarkable. It is clearly one of the tools that is helping to strengthen South Africa’s knowledge economy. Attracting and keeping the best is in South Africa’s interest. It is in this context that the Review Panel has welcomed the commitment to substantially increase the programme over the next few years. The better this is known within the country and internationally, the more effective the programme will be in delivering on South Africa’s very strong intent to be a full competitor in the increasingly global knowledge economy. As the programme develops into its next stages, there will be opportunities to group Chairs together into critical mass clusters of excellence in which several incumbents could create or reinforce research teams/units focused on South Africa’s Grand Challenges in Science and Technology (DST 2008).²

Q2. Are there more research students because of SARCHI?

The Review Panel was made aware of the increasing number of masters, doctoral and postdoctoral students/fellows associated with each Chair. The programme was only five years old at the point of review, so the flow of new graduates is only just beginning. It is clear that the number of postgraduate students has increased in direct proportion to the investments in SARCHI. In some cases, students have been attracted to work with the Chair holder using other sources of support. However, the numbers that will be required to meet the goals of the National Development Plan³ (and of the SARCHI programme) are very high, and many more steps will have to follow this early success if those goals are to be met.

The Panel offers the following suggestions to enhance the flow of postgraduate students from entry into the programme to exiting to job opportunities:

i) There was universal complaint that bursary rates in all three categories (masters, doctoral and postdoctoral) are too low to be fully competitive. It is clear that the bursary rates need to become more competitive.

ii) Many Chair holders would welcome a relaxation of the rigid rule that requires at least 95% of an incumbent’s time be spent on research. There are a number of valid reasons for this. Chair holders would find an opportunity to work with undergraduate and honours students beneficial, including the opportunity that this would present to attract more students to consider postgraduate studies. By taking leadership positions in departments, Chair holders would contribute to raising the general

² DST (Department of Science and Technology. 2008. Ten-Year Innovation Plan. Pretoria: DST.
research ethos in the department (and the university) and also prepare themselves for re-integration into their department/school when their SARChI Chair tenure comes to an end.

iii) Universally, Chair holders were committed to attracting black and women students, but often these potential students face difficult personal circumstances. Efforts to attract them must continue, and every possible step must be taken to address the socioeconomic issues these young people face.

iv) It is understandable that there should be a focus on supporting South African postdoctoral fellows. However, there are interesting examples in which postdoctoral fellows attracted to study in South Africa from outside the country have become deeply interested in staying and developing a career in South Africa. Some attention should be given to using SARChI funding to support international postdoctoral fellows, as this would lead to an increasing number of qualified researchers in South Africa.

v) The Panel was concerned about the absorptive capacity of the national system of innovation to accommodate the flow of graduates through the SARChI programmes. Is there a well-articulated demand for these graduates? This points to the need to expand the number of entry-level positions in the university and college system, including the creation of new positions on the retirement of the cohort of senior academics. All opportunities to address the flow-through issues at entry and exit need to be well documented and widely shared.

Q3. Has SARChI reversed the research output decline?

The Annual Progress Reports provide good evidence that Chair holders and their colleagues are contributing to an increase in the flow of publications, including those to prestigious journals. Important as this indicator is in marking the evolution of South African research, the Panel believes that the ‘real’ output of the research is not being captured by the current system of reporting. What needs to be much better developed is a system of reporting that focuses both on the quantitative number of publications and citations and the numbers of graduating students, as well as on the wider outcomes of their research and the impact of that research on dealing with South Africa’s problems.

The Panel strongly urges that SARChI devise a new method of capturing the ‘real’ output. We heard many dramatic impact stories, some of which are captured in the vignettes on the following pages; there are no doubt many others. Chair holders consistently expressed their frustration that these impacts were not captured by the metrics that they were required to report. The Panel heard not only stories of important and significant research results that are not captured by bibliometrics, but also of real impacts of SARChI Chair holders on the research of colleagues or the department that housed the Chair. It would be very beneficial to the programme and its branding if these stories could be captured and used as a key element of the annual reporting.

There was widespread support among both university Deputy Vice-Chancellors and Chair holders for the idea floated by the Review Panel that the NRF organise an annual symposium/workshop of Chair holders. This symposium would require each Chair holder to
participate and to report on his/her ‘real’ results. The Review Panel sees this symposium as an open forum that would cross disciplinary lines and would be presented in such a way that the stories were meaningful to the wider public. The presentation and publication of these brief summaries would make an excellent source of story material to help brand the SARCHI programme.

This symposium as well as other innovative outreach initiatives could form the basis for explaining to the broader public both within South Africa and beyond the impact of this remarkable investment. Researchers want to tell their stories and the impact they are having on the future of their country. Professional communication assistance provided by the NRF would go a long way to making sure that the impacts are widely disseminated.

**Q4. Has SARCHI improved the capacity of HEIs and related entities?**

The Review Panel saw much evidence that SARCHI has improved the research capacity of HEIs in South Africa. The scale is already significant, and much has been accomplished in the first phase of the programme. The base has been laid effectively for the next expansion phase of the Chairs. Several Chair holders reported on their impact on their institutions and their colleagues. We were disappointed, however, not to see much more comprehensive reports from the universities themselves about the impact of the Chairs on their own institutions and on the changing research culture as a result of the presence of the SARCHI Chairs. This needs to be captured as part of the ‘real’ reporting. The Panel urges that Vice-Chancellors should be required to prepare and submit reports on the overall impact of the Chairs on the nature and culture of research at their university. The publication and presentation of these impacts to a wider audience would carry a great deal of influence by documenting how the Chairs are driving institutional change.

The impact of SARCHI on some of the disadvantaged and newer institutions has been dramatic, as presented enthusiastically to the Panel (and reflected in Fig. 2). The programme should be applauded for accepting applications from these institutions and allowing them to be evaluated on a fully competitive basis. The Panel saw no sign that the standards of selection had been reduced for any one university. In fact, it is essential to the success of this programme that the concept of excellence, as determined by the peer group, be the central criterion for selection. It is on this arms-length process that the credibility of the programme rests. Passing the rigorous selection process without political intervention has been a central tenet of the programme, and this must continue.

**Q5. Has SARCHI stimulated strategic research across the knowledge spectrum?**

SARCHI has been effective in stimulating a wide range of research in many different disciplines relevant to South Africa’s needs. Given South Africa’s long and complex history, there are major challenges that need to be addressed. Problem-solving requires researchers to move out of their comfort zones and to work with others with quite different backgrounds. The Panel urges the NRF to capture how effective the Chairs have been at crossing these boundaries and to report on this dimension of their activity. This would be a
reporting requirement not just for the Chair holders themselves, but also for the universities. Have the universities exploited the opportunity provided by the SARChI Chairs to drive the culture of change towards the new mode of problem-solving for South Africa’s benefit? This is a significant opportunity at both the Chair holder level and the institutional level. Of course, as the SARChI programme expands in the coming years, there will be ever-increasing opportunities to group Chairs around problems by forming stronger clusters interacting with others both within and between institutions, within South Africa and beyond. The proposed annual forum could become one vehicle for listening to what is happening, and for the NRF and universities to showcase how they are capturing the ‘real’ impacts of the Chairs. This could form the basis for seeking new ways in which the programme could drive more change. This is another ‘real’ potential benefit of the SARChI programme.

Q6. Has SARChI increased research excellence?

SARChI has created and reinforced nodes of excellence at the major research universities as well as at a number of the newer and/or disadvantaged institutions. It is appropriate to build on excellence where it already exists and to drive them towards even greater excellence. It is also appropriate to build to excellence where one or more Chairs would give a developing university the capacity to drive a programme. Sometimes very good things happen at these latter institutions, as the Panel witnessed during its review.

In all cases it is essential to reinforce, and frankly to celebrate, excellence. Excellence is an important necessary condition to drive the innovation system, but knowledge dissemination, mobilisation and use are equally important requirements. There is so much that the NRF working with the universities can do in this respect.

The NRF must work with the Chair holders and their institutions to brand the SARChI programme as one of the key drivers of excellence and relevance in the country. Some Chair holders have been able to use the credibility provided by their appointment to compete effectively for research funds from sources within South Africa and beyond; some have strengthened partnerships with some of the best research groups around the world, and some are making efforts to work with other sub-Saharan countries.

In the future, this question could be answered even better as the ‘real’ results and impacts are captured and used for branding, focusing for example on questions such as, ‘What have SARChI Chair holders and their universities done for the benefit of South Africa in order to help address the aspirations laid out in the National Development Plan?’; ‘How are they writing the new story?’

Q7. Has SARChI created research pathways for high-quality young and mid-term researchers?

SARChI has done a great deal to create pathways for young and mid-term researchers. However, it has been difficult to get students, especially young black students, into the postgraduate programmes, due mainly to a lack of clarity on continuing career opportunities for those completing the PhD programmes and postdoctoral fellowships. Much needs to be
done to ensure that these bright young minds are motivated to enter postgraduate studies, and to demonstrate that there are opportunities open to those who pursue the intensity of postgraduate study programmes. The new initiative of the NRF to support entry-level appointments at universities is a step in the right direction.

It would be useful to prepare an analysis of the projected retirements of the ageing senior academics who are presently the backbone of the research endeavour, to demonstrate that there will be career openings.

South Africa needs to increase its places for undergraduate students dramatically, as laid out in the National Development Plan, and to meet the historical imbalances of the country. As these places are created, the opportunities for upgraded research scholars should also increase sharply. Again this information should be made widely available and should demonstrate the career opportunities that are available to young researchers. The plan to expand the SARChI programme to 500 Chairs (DST 2008) will also open up a number of new opportunities, and through the branding process will increase the awareness of opportunities to contribute profoundly to the new South Africa. Allowing Chair holders to interact more effectively with undergraduate and honours students could also be a form of branding the opportunities and clearly demonstrate that there are truly interesting and satisfying career paths open to those that pursue postgraduate studies. Another approach to branding SARChI would be to broaden the links with other nodes of excellence such as the CoEs. This would demonstrate that there are multiple paths from graduate studies to a number of interesting problem-solving careers.

4 MANAGEMENT, MONITORING AND EVALUATION

Overall, the Review Panel judged the design and management of SARChI to be generally sound. The programme direction continues to be relevant, coherent and consistent with policy aims. Further enhancements to the programme, some of which are suggested below, are more akin to operational ‘tweaks’ to help consolidate and build on the success of SARChI as the programme moves forward. In this regard, the NRF is also encouraged to take note of the Tenth-year Evaluation of the Canada Research Chairs Program, including technical reports that have already been shared with the NRF, and recent efforts to revamp the annual reporting system. While the SARChI programme is moving in the right direction, the potential to maximise the full value of the Chairs collectively remains to be realised. In this section and throughout the Review report, the NRF is encouraged to explore additional and more flexible management modalities that could best unleash the energy and potential of SARChI.

6 Review of Canada Research Chairs Program Annual Reports produced by Social Sciences and Humanities Chairholders (Science-Metrix: March, 2012) including suggested changes to questionnaire recommendation.
In the 2006 Contract between the DST and the NRF, direct SARChI investment was to be a catalyst for unlocking additional resources from other sources (partners, institutions, industry, etc.). Given the number of operational Chairs delivered, the NRF disbursed roughly R660 million over the five-year period of the programme. Nearly twice that amount was leveraged indirectly by Chairs over the same period. At face value, implementation has been substantial and speaks to the engagement of all stakeholders. In fact, some Chairs suggested that leveraging alone represented nearly five to seven times the actual NRF Chair investment. There is little doubt that SARChI is having a multiplier financial effect.

Direct funding from the DST/NRF has been less than originally anticipated. Only when indirectly leveraged funds raised by Chairs are factored in does the combined amount begin to approach or exceed the expected initial investment, as summarised in Fig. 3.

**Fig. 3: Comparison of Committed, Expensed and Leveraged Financial Resources (2005/06–2011/12)**
There are several implications for the future:

i) First, it is important to temper high-level performance expectations beyond research output productivity, capacity building of highly qualified personnel (HQP) and knowledge dissemination/use for societal benefits. The results to date have been positive, and much more is likely to be achieved as programme implementation increases according to plan.

ii) Second, the appropriateness and feasibility of stretch targets, such as 500 Chairs by 2018, need careful re-assessment. Whether or not such targets are indeed feasible, the government should continue investing in SARChI to increase its results and impacts.

iii) Finally, the research business rarely remains stagnant, and neither do research and training costs. This was found to be the case in the Canadian Chairs Program, where award amounts had remained unchanged since the inception of the programme in 2000. The situation at each HEI is different, and certainly also across research domains. With respect to SARChI, if the total award is only escalated by an annual inflationary rate and strict limits are also imposed on amounts to be allocated to salaries, students, small equipment and administrative costs, significant problems may be encountered over the next five years. There is an opportunity for even greater impact if attention is paid to increasing the budget ceilings. Otherwise, there is a risk that the aims of the programme may become diluted, including the perceived prestige of the award internationally.

**Interagency and Intra-agency Connectedness**

The interface between the DST, NRF and HEIs is improving, but more could be done to achieve greater transparency. Clear communication is vital if all stakeholders are to continue working towards the same ends. A break in the link at any point – between the DST and the NRF; between the NRF and HEIs; between the NRF and partner organisations; or between universities and the Chairs, could weaken the programme, especially in developing shared understanding of the programme rationale and implementation expectations. Given the enormous potential of SARChI, clear communication between stakeholders is a necessary condition for success. The Review Panel noted that the DST has not received annual performance reporting from the NRF on a regular basis over the last five years (only two reports were identified). More could be done in this regard, which would invigorate a two-way conversation on programme objectives, targets and opportunities. Moreover, the fact that separate annual reporting is not required from institutions on the nature and extent of their progress in meeting the conditions and commitments laid out in the SARChI memoranda of understanding, or even the impact of SARChI on their institutions, deprives the analysis of important monitoring data and hobbles ongoing dialogue. In fact, some Chairs do not even report, with more than 17% of the annual progress reports for 2011/12 still outstanding. In this regard, more could be done.

Finally, it was duly noted by the Review Panel that the report of the Mid-Term Internal Review of SARChI (November 2011) has remained confidential and has not been shared widely. The same may be true for the management response (September 2012). Transparency, accountability, learning and stakeholder dialogue go hand in hand. The release of review and response documents, when feasible, is encouraged. Both are useful backdrops to an open dialogue with all stakeholders, reflecting together on what is working
and what is not; and sharing best practices, lessons and strategies that could make the programme stronger and increase its value-addition. No organisation can do so alone. Such open practices tend to build greater trust and confidence among all stakeholders.

**Programme Flexibility**

While the NRF scrutinises and closely regulates grant budgets to achieve the stated objectives, as noted in earlier sections, the rationale and bureaucratic processes were found to be overly rigid. Both Chairs and host institutions believe that funding should be negotiated within the context of a specific Chair and that stakeholder institutions should endeavour to decide together what is appropriate. Both institutions and Chairs, who often prepare the proposals on behalf of institutions, felt there was a significant variance between what was submitted and what was eventually agreed upon and implemented. Unleashing the potential of the programme rests in part on appropriate and flexible funding and management models.

The initial Contract established between the DST and the NRF refers to SARChI as a ‘grant’-funded initiative. The concept of grant has real meaning in many international jurisdictions. It is true that the NRF must be concerned with transparency, accountability and monitoring, but there is unease that the current management model may come at a very high cost to the NRF, institutions and Chair holders. Early in the programme, the management approach was relatively loose and open-ended. Has the pendulum swung too far in the opposite direction? While the NRF does need to hold universities accountable for achieving outcome results, and adequate management controls must be in place, these should be commensurate with the high-level expectations for the programme. Grant management generally assumes flexibility, especially if ambitious higher-level impacts and results are to be achieved. However, grant management should not be confused with contract-style, contribution arrangements that entail higher levels of conditionality, micro-management, and a payment system that puts unnecessary emphasis on detailed input/activity/output reporting and auditing. The balance between and weight given to budget performance and risk management, over results-based management, should be re-examined.

**Student Funding**

Greater elasticity with respect to student funding was a topic continually raised by Chairs and institutions throughout the interviews. As noted in other sections of this report, many commentators suggested that budgetary restrictions were serious, making it very challenging to pay staff salaries. It becomes necessary to only hire student researchers, but PhD students have their own constraints. It was felt that the restrictions were too heavily weighted towards student throughput and publication output. It did not go unnoticed when one stakeholder commented that “this is a student funding programme masquerading as a research programme”.

At the same time, student bursaries are currently perceived to be too small, with the result that many good students are potentially lost to the system. A few Chairs suggested a radical rethink of the stated objectives of the programme, arguing for a more holistic view of how a Chair could contribute to achieving the overall goal of HQP training and capacity building. In
other words, adopting a more comprehensive view of HQP training requires greater budgetary flexibility. As one interviewee noted, “The NRF, institutions and Chair should be seen in this area as enablers of SARChI success.” The Review Panel also noted that NRF guidelines allow for PhD funding for a maximum of three years, with the consequent frequent need for re-negotiation with the NRF for additional funding. It was also the perception of many Chairs that success in negotiating a flexible arrangement seemed to be entirely dependent upon whom one talked to at the NRF. Whatever the rationale, it may be self-defeating to the objectives of the programme for students to simply drop out of a PhD programme because funding has run out.

Another relevant issue is the number of postgraduate students available. In any given year, the numbers may vary significantly, with Chair holders permitted to make adjustments to the annual budget in consultation with the NRF. Some stakeholders suggested that a budgetary cycle of five years might be more appropriate. Throughout the interviews, the difficulty of finding postgraduate students was consistently underscored. This was attributed to the low values of financial support and limited job opportunities for PhD graduates in the various fields. It was even more difficult to attract and retain black students in the masters and doctoral degree programmes, because of the restrictions on bursary funds. Again, more flexibility could be considered to make the bursaries more effective and competitive. It was highlighted that if black students could be kept in research programmes beyond the second year, there was a higher probability that they would stay in the programmes longer. It was also noted that many postgraduate students associated with the Chairs are not funded by the Chairs, and not all the equipment budget is needed. If funds could be flexibly shifted; this was seen as a proactive way to unleash more opportunities to increase the results achieved in the programme.

Finally, one other approach worth considering is to look more closely at possible joint postdoctoral arrangements. An arrangement between a South African HEI and, for example, the Perimeter Institute for Theoretical Physics in Canada might see each institution paying for only the time the candidate spends at that institution. Publications of the postdoctoral fellow would carry both affiliations. Flexibility in moving bursaries might also be feasible (e.g. moving PhD funding to a postdoctoral fellowship).

**Chair Renewals, Ratings and Evaluations**

As noted earlier, both institutions and Chairs consistently acknowledged the NRF’s efforts to improve programme responsiveness and management. A significant number of Chairs (over 90% of the 66 reviewed Chairs) have been renewed for a further five years. The Review Panel found a number of instances where there was an apparent mismatch between NRF rating evaluations and SARChI Chair review comments.

When comparing the current NRF rating level of Chair holders as at July 2012 with their rating at the start of the Chair, based on the 89 operational chairs, it was observed that approximately two out of five Chairs (39.0%) had no rating change over the five-year period. Just over a quarter (26.0%) saw their ratings adjusted. Most of these Chairs (20) had their ratings increased either within category or between categories. In contrast, the rating of three Chairs declined. For the remainder of the Chairs, just over a third (34.8%), the situation was unclear. This was due to the inability to determine whether a rating change
had occurred, as no rating was assigned at the time of application. Four Chairs were upgraded from Tier 2 to Tier 1.

In the future, more attention needs to be directed towards the evaluation rating process and criteria for both applications and renewals to ensure both relevance and consistency.

**Role of Institutions and Grant Management Agreements**

All institutions and Chair holders sign a Grant Management and Conditions of Grant agreement with the NRF; host institutions are required to ensure that the necessary facilities are in place in terms of infrastructure, office space, access to research laboratories and research equipment. Chair holders coming from abroad have been promised much by the host institutions, which requires flexibility on the part of institutions, as well as the NRF holding institutions accountable for pledged funds. The universities are committed and predisposed to providing support and facilities for the Chairs, but this has not always been evident. There is frustration that the Chair generates money for the institution, but this is not re-invested, as reflected in comments such as, “...the institution gives great moral support, but no funding”.

Key stakeholders within the institution (Head of School, Dean of Faculty, Deputy Vice-Chancellor (DVC): Research) all say that other parties should take responsibility. Hopefully, this will be addressed in future through the NRF’s making the reporting line of a SARChI Chair directly to the DVC: Research. Moreover, as noted in previous sections, requiring institutions to submit annual progress reports not only on administrative considerations, but also on the impact of the grant on the institution should mitigate the possibility of serious misalignment between the expectations of the Chair holders, institutions, the NRF and the DST.

The Review Panel was pleased to note that the DST had initiated a bilateral arrangement with Switzerland for SARChI Chairs to be jointly funded by the two countries. In terms of this arrangement, the Chairs are held in South Africa, and the Chair holders are paid at the level of a senior professor when in South Africa, and at the level of a Swiss professor while in Switzerland. This is an important breakthrough that will distinguish SARChI internationally, with host institutions negotiating the operational details with respect to timing with a research group in each country. The only risk of such an arrangement is that it might add to the NRF’s existing administrative burdens; such arrangements might carry a high price, especially if there are significant variations in conditions negotiated across various national jurisdictions.

The NRF should also closely monitor other partner arrangements. For example, the short-term nature of Research and Development Chairs (funded by FirstRand Foundation, Rand Merchant Bank and the Anglo American Chairman’s Fund in partnership with the DST) might be problematic if expectations are not met. Given the diverse ideas around the expected results, these special arrangements might not be sustainable, could provoke high administrative overheads, and might miss the targets, thus causing partners to leave the programme disappointed. Given the diversity of the Chairs and the possible situations, the NRF should explore better ways of negotiating and deciding together with partner
institutions – whether South African universities, foundations or international organisations – what terms would be appropriate, especially in view of differing contexts and expectations. Furthermore, the NRF is particularly encouraged to pursue follow-on discussions with the DST over possible other international commitments that might be foreseen. This should include a dialogue on management processes to ensure simplicity and/or avoid increasing the NRF’s current administrative burden.

**Performance Measurement Strategy**

Given the context and the available resources, SARChI has generally been doing well over the past five years. The programme has succeeded in removing the administrative burden of continuously applying for other funding. At times, the Review Panel caught glimpses of the successful impact of Chairs at a higher level on institutions and beyond. There is a need to capture these achievements, especially knowledge mobilisation and use, on a more consistent basis. The 2010 SARChI Monitoring and Evaluation Framework is a good start towards clarifying performance expectations. What is now needed to complement the framework is a Performance Measurement Strategy that sets out clear programme outcome targets, indicators, data sources, frequency, baseline measures, dates for the achievement of outcome targets, organisation and position responsible for data collection, and data management system used. A similar document prepared by Canada’s Research Chairs Program Secretariat may provide some inspiration as to what might be included in such a strategy for SARChI.

**Performance Reporting**

The programme is designed to achieve ambitious research, capacity development and societal objectives. The formats for annual progress reporting have changed over time, but there have been limited opportunities to conduct detailed longitudinal analysis. Annual progress reporting largely captures input, research process, and financial and output performance. Similar observations were made in the Mid-Term Internal Review (November 2011). Reporting is both an intra-agency and inter-agency issue. The overall utility of current progress reporting was raised throughout the key informant interviews, and some asked whether the submitted reports were even being read. The lack of feedback tended to suggest that their utility was more intended to serve bureaucratic needs rather than fostering a dialogue with Chairs and institutions. If problems and issues remain unresolved, whether reported upon or not, they can lead to a lack of clarity regarding overall programme expectations. Reporting can be simplified, however. It can go further to answer the question, ‘So what?’ This requires further reflection on appropriate tools to capture outcomes and impact information, especially knowledge mobilisation and the use of new knowledge research on behalf of the common good.

What else can be done? Recent efforts at the Social Sciences and Humanities Research Council of Canada (SSHRC), following the Ten Year Evaluation of the Canada Research Chairs Program, have focused on revising the annual reporting of Chairs. A dialogue between the NRF and SSHRC on data-monitoring standards might go a long way towards comparability, inter-operability and even benchmarking of research and training performance. It might break new ground in facilitating the examination of policy, programme and management issues from a comparative international perspective.
How can we cure malaria?
The SARChI Chair has facilitated the establishment of an integrated modern Drug Discovery & Development Centre (also known as H3-D), the first of its kind, and the only one, in Africa. The H3-D Centre is focused on harnessing modern pharmaceutical industry skills and expertise in the drug-discovery value chain. A major success has been the first-ever malaria clinical candidate to be discovered in Africa and researched on African soil.
Prof Kelly Chibale, Chair in Drug Discovery and Development, UCT

Vignettes of SARChI Research Impact

How can we better respond to natural and man-made disasters?
Georges Mavonga Tuluka of the Goma Volcanic Observatory in the war-torn Democratic Republic of Congo (DRC) started his PhD within my SARChI programme in 2007, funded by Belgian Technical Cooperation (BTC). Despite having a wife and six children, he was determined to improve his qualifications. Georges investigated the hazard posed by earthquakes in the DRC, and seismic precursors to volcanic eruptions. An able and diligent student, he graduated with a PhD in 2010 and returned to Goma.

Not only did he publish a set of papers in international refereed journals, but he also used the results of his research to advise the International Commission for the Red Cross on the resettlement of refugees, and a mining company on the construction of slimes dams. He is compiling and harmonising the seismic catalogue for Central Africa for the International Year for People of African Descent.
Prof Ray Durrheim, Chair in Earthquakes and Mining Seismology

Chair in Quantum Information Processing and Communication
The SARChI Chair in Quantum Information Processing and Communication (QIPC) has given South Africa the opportunity to participate in the nano-ICT revolution. The QIPC research network spans a global research initiative supported by various governments (America, Canada, European Union, Singapore and Australia) and large ICT firms (including Toshiba, HP and IBM). We have been able to imprint South Africa as a global player in QIPC research. The Centre for Quantum Technology (CQT) implemented two global milestones, namely: the first municipal-owned quantum network (QuantumCity) and the first globally significant event to be secured by quantum cryptography, namely the 2010 FIFA World Cup. These initiatives received international recognition and spurred the CQT to spin off a company to focus on cryptography solutions. We attracted a fair amount of media coverage (http://146.230.89.94:8081/CQT/private/news-articles/CQT%20Media.pdf and http://seagull.ukzn.ac.za/~mirzaa/Abduls_Website/News:]. The Technology Innovation Agency (TIA) subsequently approached us to apply for a technology platform in order to pursue applied research in QIPC. Other departments, including State Security, touched base with us regarding applications of the technology. This has catalysed the uptake of QIPC in both the research and applied fields, and encouraged the expansion of the skills base through increased student numbers and broadening of the research areas to include, for example, Quantum Biology.
Abdul Mirza, PhD student, UKZN
5. LOOKING TO THE FUTURE

South Africa has huge potential to develop its knowledge-driven economy and to act as a stabilising force in southern Africa by working in conjunction with neighbouring countries to overcome challenges such as sustainable agriculture, energy and climate change, and to foster good health, including the achievement of the Millennium Development Goals. The government has stated this in its Ten-Year Innovation Plan (DST 2008).

The purpose of the Ten-Year Innovation Plan is to help drive South Africa’s transformation towards a knowledge-based economy, in which the production and dissemination of knowledge leads to economic benefits and enriches all fields of human endeavour. By 2018, South Africa anticipates that it will have:

- 210 Research Chairs in public universities and research institutions across the country by 2010 and 500 by 2018 (58 were in place in 2006)
- About 6000 PhDs produced per year in all disciplines
- About 3000 SET PhDs/doctorates produced per year
- An optimal ratio of technicians to researchers, commensurate with the country’s requirements
- A 1.5% share of global research publications (2006: <1%)
- 2100 Patent Cooperation Treaty international applications originating in South Africa.

While these are sound and laudable objectives, the context in which they are to be exploited needs to be further examined. Major economies of the world are realising that the research and innovation landscape is evolving. Reports such as Rising above the Gathering Storm and Rising above the Gathering Storm, Revisited from the United States of America (USA), and the reports of the European Research Area Board (ERAB) entitled Preparing Europe for a New Renaissance and Global Trends 2030 all give credence to the changes taking place. The first annual report of the ERAB sums this up: “Our world is changing. We face mounting challenges: of global warming, scarce water, energy shortages and healthcare to name but a few. Their solution will require new ideas, discoveries, talents and innovations – the fruits of research. To achieve them, we must start by changing the way we do research.”

Fundamental to providing this research and innovation ecosystem is highly skilled human capacity. Without that nothing will happen, so the SARChI initiative is a vital component. But is it fit for purpose for achieving all that the South African government expects of it? Top-down managed programmes often result in mediocrity, while bottom-up ideas do produce new breakthroughs, but the success rate is low. Is this an efficient approach given other pressures on the South African economy?

**Excellence is King**

The SARChI programme has to decide on the balance between human capacity building and undertaking world-leading research. There should be no compromise on excellence in either area. Unfortunately the current criteria for assessing excellence are limited and seem

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entirely related to the numbers of papers and citations and the number of students processed. These are only one measure and do not give any real evidence of the true research output.

The current criteria for evaluation and rating (April 2012) are far wider-reaching for most disciplines, but there is little evidence of their use in assessing individual SARChI Chairs. For example, changing the research culture of a department, or indeed a whole university, is a real output that far exceeds an individual’s paper output in most cases. Examples of meaningful criteria include influencing public policy, contributing to industrial practice, or being acknowledged by international peers through invitations to give keynote talks or sit on international review panels.

With respect to students, focusing primarily on numbers can lead to a lowering of standards. A few well-motivated and talented individuals will be of more importance to the national economy than many who are not at the cutting edge and are content with sub-standard work. Most world-leading research groups are teams, with a leader, but backed by a significant number of junior and senior postdoctoral fellows who are the engine room for new ideas and training. The current system seems still to focus just on the individual Chair holder from whom much is expected. It is recommended that the positions and status of postdoctoral fellows be reviewed.

Creating a culture of excellence is difficult when starting from scratch. During the interviews, we heard examples where students had spent short periods of time in leading international laboratories. Their experience raised the bar for all with respect to what could be expected and achieved. Students need to be encouraged to present their work to a critical audience as soon as possible, to write papers and to aid in grant-application writing. The panel saw some evidence of SARChI Chairs being criticised for not putting their own names as first authors on papers. While in some cultures this is done as a sign of respect for the leader, it is more common that the students come first, since they will have done the work and need to be encouraged and given confidence. It would be contrary to the aims of the programme for students just to be seen as ‘research slaves’. A series of one-day meetings where students could present their work to their peers as part of their development could be considered (as is done in the CoE programme). Many countries have discipline-based conferences solely for students and postdoctoral fellows. These can lead to long-term collaborations in the future.

In almost every case we heard, the level of student stipends was not considered competitive. Other scholarships were cited (e.g. SKA bursaries), which were being taken up by the better students. One comment was that it was more efficient for the SARChI Chair to utilise these other resources, since there was greater freedom and less constraint. There were also comments about the focus on South African students. While this is understandable, vibrant research groups are normally populated by several nationalities, and indeed a mix of cultures and approaches is essential if new ways of thinking are to be encouraged.

**Critical Mass**

While a certain number of SARChI Chairs will be individuals with their team, if the aspirations of the scheme are to be fully realised, then teams of critical mass are needed. This is
especially true where Tier 2 Chairs are isolated in disadvantaged universities. We recommend that such Chairs have links with others, especially international mentors and partners, with the possibility of international Tier 1 Chairs being connected with them on a 50% basis.

Networking is vital – within an institution, nationally and internationally. Serendipitous meetings at conferences lead to international collaborations if the personal chemistry between researchers is sympathetic. Some examples were cited to the Review Panel where Chairs were criticised for such collaboration, which suggested that the review system needs drastic changes. In certain critical areas, the organisation of a series of so-called ‘n+n’ meetings (where up to ten Chairs in a certain field meet with similar numbers from a few other countries to discuss collaborative research) could further encourage interchange.

The Review Panel saw great merit in the suggestion that the SARChI programme dovetail with the CoE programme, and the Chairs should be based within CoEs where appropriate. This will result in the realisation of critical mass and the exchange of ideas.

There is a need to understand how to lead and manage teams as they grow in size and complexity, especially where different disciplines are concerned. Training is required to bring together large international teams. This is especially true for large research infrastructures, which may be virtual but involve teams from around the world in sharing data and building models; for example, in areas such as climate change and health. In such an environment, a SARChI Chair might be asked to provide managerial leadership, which would significantly affect his/her own research output. Yet the immense benefits for South Africa resulting from such an invitation need to be recognised.

**Take Risks**

Is it better for a SARChI Chair holder to take a big risk in research that might not produce anything useful, or to play safe and churn out a load of run-of-the-mill papers? Given the present evaluation criteria, the answer favours the latter approach. Yet the big breakthroughs will come from taking big risks. It is difficult to encourage more risk-taking when funders look for measurable outputs, yet the benefits in getting this right can lead to Nobel prizes. Is this a step too far for South Africa at this stage? Perhaps applicants should be asked for at least one ‘stretch’ idea that takes them out of their comfort zone. Whatever is decided, Chairs need to know what they will be judged on from the start.

**The Innovation Ecosystem**

The linear R&D model advocated by the Organisation for Economic Co-operation and Development is now outdated, giving way to something more comprehensive and inclusive. Innovative research is no longer a simple continuum. It is increasingly seen to have multiple contributory pathways from a variety of sources.

The concept of an ‘innovation cycle’, where inputs come from several different sources, needs development within the South African context. New ideas are but one input, and standards, legislation, tax incentives, social changes etc., are all drivers that need to be understood if real economic benefit is to be derived from the investment in Chairs and other initiatives. SARChI Chairs will need to get out of their comfort zone to exploit the richness of their
experience in this environment. Encouragement should be given to consultancies, and to undertaking work for public and private bodies, say up to a maximum of 20% of the time. Again, these contributions need to be acknowledged in any subsequent evaluation.

**Shout out aloud**

There is a real need to make sure that the successes of the SARChI Chairs, both individually and as a whole, are heard by the general public. This needs proactive publicity management, using professional media expertise to place stories where they will have maximum impact. Media management in this way not only raises the profile of the individual Chairs but also of the programme. This is vital, politically, if the case for increasing the number of Chairs is to be supported against other competing claims on funds. A target should be set to make sure that, say, two top-line news items appear on South African television each week. Broadcasters should be encouraged to interview Chairs, not just on their expertise, but on their thoughts on how the innovation ecosystem, etc., could be driven forward. For those with talent in this area, it might be worth considering media training as part of the SARChI package. While this may be seen as a luxury, ensuring that the SARChI brand is recognised both internally within the country and externally will pay real dividends, especially in the recruitment of international applicants for Chairs in the future.

**Computerised phonetics**

Part of the SARChI project on Migration, Language and Social Change focuses on accent change as a reflection of social change and as a social force in its own right. Whereas phoneticians of yesteryear (like the semi-fictional Henry Higgins) had to analyse minute differences of accent by ear, socio-phoneticians are increasingly turning to computers for rigorous analysis of the properties of the sound waves of speech. Acoustic measurements, expressed in terms of the Hertz of energy peaks of vowels (formants) that are clearly visible in the wave form, enable large-scale and fine-grained accounts of language change. The graduate students in Linguistics are all from the Humanities, but as part of a young computer-savvy generation have all taken to their induction into the hard sciences like ‘ducks to water’.

Prof Rajend Mesthrie,
Chair in Migration, Language & Social Change, UCT

**Holistic approach to minerals beneficiation**

The SARChI Chair in Minerals Beneficiation has moved minerals beneficiation research from a narrow focus on separate processes to a novel holistic view of the entire minerals beneficiation chain (including environmental, economic and social effects). This has been done by establishing exciting new transdisciplinary staff collaborations and undertaking innovative interdisciplinary research based on strong scientific and technical foundations, allowing new knowledge-creation both in fundamental science and in integrative systems thinking. This approach is drawing attention internationally and has laid the platform for moving the minerals industry into a more sustainable paradigm.

Prof Jean-Paul Franzidis, Chair in Minerals Beneficiation, UCT
**Evaluation**

It was evident to the Review Panel that evaluation is a weak part of the scheme. Several of the preceding comments have referred to examples of evaluation that has been too rigid, narrow and constraining, such that Chair holders feel that they have to ‘play the system’. The “Monitoring and Evaluation Framework Document” of 2010 does reflect good practice, but this does not seem to be what actually happens in practice. In looking at comments in the Mid-term Internal Review of the DST/NRF South African Research Chairs Initiative, the Review Panel was struck by the very different standards applied, little praise for achievements and a considerable amount of negative criticism. Although we cannot comment on individual cases, the Review Panel felt that certain individuals had been treated most unfairly, although we appreciate that we heard only one side of the story.

We would recommend that the NRF appoint a science director (a senior scientist/researcher), who could act as professional head and both instruct and monitor the performance of individual evaluation panels. Such a director should be supported by an international advisory board to identify emerging areas. The director ought to be able to initiate reports on topics of strategic importance to South Africa, similar in nature to the role of the National Academies in the USA.

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**Interactive maths education**

The First Rand Foundation Chair in Mathematics Education at Rhodes University has four research projects, one of which is the In-School Support Project. This project provides continued on-site support for our participating teachers based on their requests. Recently teachers on our project requested support with an investigative mathematics project for Grades 10 and 11 in line with the requirements of the Department of Basic Education. Because this request came at the time of the 2012 London Olympics, we thought it would be exciting for learners if we designed tasks that were both mathematically challenging and relevant to the Olympics. The Grade 10 learners were asked to construct a track that would fulfil certain mathematical features. The Grade 11 learners were asked to design a Mathematics Olympiad Logo with at least three mathematical shapes, with elements of reflective symmetry and at least three different types of graphs. At the end of the three-week period assigned for the tasks, each participating teacher was required to present samples of learners’ work to a Chair session, including a ten-minute presentation of the processes that the learners went through. The responses were overwhelming. The photo below shows one of the teachers presenting her Grade 11 learners’ work.

Dr Michael Mholo, First Rand Foundation Chair in Mathematics Education, RU
6. SUMMARY OF FINDINGS AND RECOMMENDATIONS

In summary, the findings of the Five-year Review Panel are that despite the slower-than-expected roll-out of the ambitions of the programme (210 Chairs by 2010), the SARCHI programme had been effective and efficient in its first phase, and had produced a number of results and benefits. Chair holders, host universities, research students and other stakeholders are very enthusiastic about the SARCHI programme and the many new opportunities it offers. The implementation of the programme has seen significant attraction and retention of talented researchers, increasing numbers of graduate students (masters, doctoral and postdoctoral) and an increasing flow of publications, including those to prestigious journals. In addition, the programme has resulted in the development of significantly improved research capacity at host institutions and created and reinforced nodes of excellence at the major research universities as well as at a number of newer and/or disadvantaged institutions.

If the aspirations of the scheme are to be fully realised, then teams of critical mass are needed. This is especially true where Tier 2 Chairs are isolated in disadvantaged universities. Such Chairs should have links with others, within a Centre of Excellence or possibly with international Tier 1 Chair holders being connected with them on a 50% basis.

There is a real need to make sure that the successes of SARCHI Chairs, both individually and as a whole, are heard by the general public. This needs proactive publicity management, using professional media to place stories where they will have maximum impact.

Some issues about processes remain that require addressing:

- Student bursary levels are currently perceived to be too low, with the result that many good students are potentially lost to the system. Some Chairs have argued for a more holistic view regarding how a Chair can contribute to achieving the overall goal of HQP training and capacity building. This would require greater budgetary flexibility, in particular if students from disadvantaged socio-economic backgrounds are to be attracted and retained.
- The rigidity in evaluation, with its primary focus on publications and graduating students, is too narrow and constraining and fails to capture the true results of the research investment and its impact on the wider society. The Monitoring and Evaluation Framework Document (2010) does reflect good practice, but there is little evidence of its use in assessing individual SARCHI Chairs.
- The Chairs have much to contribute outside of their research laboratories. Encouragement should be given to consultancies, and undertaking work for public bodies. These contributions need to be acknowledged in any subsequent evaluation.
- If the aspirations of the scheme are to be fully realised, then teams of critical mass are needed. This is especially true where Tier 2 Chairs are isolated in disadvantaged universities.
The Review Panel recommends that:

1. the SARChI programme be continued and funded at a level commensurate with expectations;
2. the NRF set up a facilitative office headed by a senior scientist/researcher to oversee the SARChI project, to be the contact person for SARChI Chairs, to promote consistency and coherence among the various discipline-based review panels and to provide feedback to Chairs and institutions;
3. the prescribed ratio of research/non-research time of Chair holders of 95%/5% be revised up to 80%/20%, to allow for greater interaction with undergraduate and honours students, more contribution to research development in the department as a whole, and undertaking consultancies and work for public bodies;
4. the conditions of the SARChI grant and the processes governing the relationship between the DST, NRF, host institution and the Chair be streamlined to reduce bureaucracy, minimise rigidity and promote transparency;
5. a more holistic recognition of research outputs/outcomes be developed, to include the research impact of the Chair on the discipline, the institution and society at large;
6. the monitoring of the SARChI programme include a reflective annual report from the Vice-Chancellor of the host institution that captures the institutional impact of the Chair(s);
7. the NRF consider the pairing of local Tier 2 incumbents with part-time (50%) national or international Tier 1 appointments;
8. the NRF consider dovetailing the SARChI and Centres of Excellence (CoE) programmes, and allowing a SARChI Chair holder to head a CoE;
9. opportunities and incentives to attract national and international postdoctoral fellows be created;
10. the SARChI programme be widely branded to give it national and international visibility and identity, and the achievements and societal impacts of the programme be widely reported in the public domain;
11. the NRF (through the facilitative office in recommendation 2 above) establish annual symposia/workshops of SARChI Chair holders and of SARChI students, to serve as open fora for the mutual sharing of experiences and accomplishments, and to collect the success stories of the SARChI programme for the benefit of the academic fraternity and the community at large; the NRF monitor the adequacy of co-investment by host institutions in support of SARChI Chairs;
12. the NRF monitor the implications of co-funding of SARChI Chairs by bilateral agreements with other countries and stake holders; and
13. the NRF consider re-engineering its SARChI systems to cope with the envisaged expansion of the programme.

To achieve the goals of Vision 2030, the country’s universities need to become centres of research excellence and nurture the next generation of critical thinkers and innovators. SARChI is a key element in this quest.
7. **SUMMATIVE COMMENTS**

The Review Panel has been greatly impressed by much of what it has seen and heard. The South African Research Chairs Initiative has been an imaginative and largely successful innovation in the quest for increased knowledge production and the incubation of the next generation of researchers and scholars. In particular:

- SARCHi is contributing to the attraction and retention of world-class researchers in South Africa and has created nodes of excellence at various higher education institutions across the country, and
- Chair holders, host universities, research students and other stakeholders are very enthusiastic about the SARCHi programme and the opportunities it brings.

The SARCHi programme has great potential to reach new heights and deliver even more impressive outcomes with the adoption of the recommendations outlined above.

The *National Development Plan: Vision 2030*, in its preamble, states:

**“Writing a New Story**

The country must write a different story in the years ahead. ...

In this new story, our nation’s energies are focused both on attacking poverty and on expanding a robust, entrepreneurial and innovative economy...”

To achieve the goals of *Vision 2030*, the country’s universities need to become centres of research excellence and nurture the next generation of the nation’s critical thinkers and innovators.

Given the success that the programme has already achieved, SARCHi is a key element in the writing of our new story.

**Acknowledgements**

The Review Panel gratefully acknowledges the outstanding logistical support it received from Ms Anke Rädel and her team, and thanks Prof Gansen Pillay (Deputy CEO and Managing Director, NRF Research and Innovation Support and Advancement) and Dr Albert van Jaarsveld (NRF CEO) and their executive team for this opportunity to contribute to the development of research excellence and scholarship in South Africa.
APPENDIX 1: LIST OF INTERVIEWEES

1.1 Members of DST Ministerial Review Committee on the National System of Innovation
Prof Cheryl de la Rey, Vice-Chancellor, University of Pretoria
Prof Wieland Gevers, former President, Academy of Science of South Africa

1.2 Member of the National Planning Commission
Prof Jerry Coovadia, Director at Doris Duke Medical Research Unit, UKZN

1.3 NRF Officers
Dr Romilla Maharaj, NRF Executive Director: Human and Institutional Capacity Development
Dr Linda Mtwisha, NRF Programme Director: South African Research Chair Initiative (SARChI)
Dr Bernard Nthambeleni, NRF Executive Director: Grants Management & Systems Administration (GMSA)
Mr Sibongile Sowazi, NRF Grant Director: GMSA: SARChI & CoE

1.4 Representative of Department of Science and Technology
Dr Thomas Auf der Heyde, Deputy Director-General: Human Capital and Knowledge Systems

1.5 Representative from FirstRand Foundation/Tshikululu
Mr Adam Boros, Client Relations Manager, Tshikululu

1.6 Deputy Vice-Chancellors (Research) of universities hosting Chairs

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Prof Ramesh Bharuthram</td>
<td>UWC</td>
</tr>
<tr>
<td>Prof Stephanie Burton</td>
<td>UP</td>
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<tr>
<td>Prof Peter Clayton</td>
<td>RU</td>
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<tr>
<td>Prof Eugene Cloete</td>
<td>SU</td>
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<tr>
<td>Prof Adam Habib</td>
<td>UJ</td>
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<tr>
<td>Prof Prins Nevhutulu</td>
<td>TUT</td>
</tr>
<tr>
<td>Prof Cheryl Potgieter (Dean of Research)</td>
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<tr>
<td>Prof Doug Rawlings</td>
<td>SU</td>
</tr>
<tr>
<td>Prof Mamokgeti Setati</td>
<td>UNISA</td>
</tr>
<tr>
<td>Prof Mbudzeni Sibara</td>
<td>UL</td>
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<tr>
<td>Prof Frikkie van Niekerk</td>
<td>NWU</td>
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By teleconference

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<tr>
<td>Prof George Ekosse</td>
<td>WSU</td>
</tr>
<tr>
<td>Prof Helen Laburn</td>
<td>UW</td>
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<tr>
<td>Prof Danie Visser</td>
<td>UCT</td>
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### 1.7 Sample of Chair holders

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Prof Leonard Barbour</td>
<td>Functional Nano-structural Materials</td>
<td>SU</td>
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<tr>
<td>Prof Jonathan Blackburn</td>
<td>Functional Proteomics</td>
<td>UCT</td>
</tr>
<tr>
<td>Prof Reinhardt Botha</td>
<td>Nano-photonics</td>
<td>NMMU</td>
</tr>
<tr>
<td>Prof Frank Brombacher</td>
<td>Immunology of Infectious Diseases in Africa</td>
<td>UCT</td>
</tr>
<tr>
<td>Prof Kelly Chibale</td>
<td>Drug Discovery</td>
<td>UCT</td>
</tr>
<tr>
<td>Prof Alan Christofilfs</td>
<td>Bioinformatics &amp; Public Health</td>
<td>UWC</td>
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<tr>
<td>(took over Chair in year 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof Maureen Coetzee</td>
<td>Medical Entomology &amp; Vector Control</td>
<td>UW</td>
</tr>
<tr>
<td>Assoc Prof Marc Combrinck</td>
<td>Clinical Neurosciences Research</td>
<td>UCT</td>
</tr>
<tr>
<td>Prof Philip Crouse</td>
<td>Fluoro-material Science &amp; Process Integration</td>
<td>UP</td>
</tr>
<tr>
<td>Prof Felix Dakora</td>
<td>Agrochemurgy &amp; Plant Symbioses</td>
<td>TUT</td>
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<tr>
<td>Prof Robert de Mello Koch</td>
<td>Fundamental Physics &amp; String Theory</td>
<td>UW</td>
</tr>
<tr>
<td>Assoc Prof Keertan Dheda</td>
<td>Lung Infection &amp; Immunity in Poverty Related Diseases</td>
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<tr>
<td>Prof Ray Durrheim</td>
<td>Earthquakes and Mining Seismology</td>
<td>UW + CSIR</td>
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<tr>
<td>Prof Jean-Paul Franzidis</td>
<td>Minerals Beneficiation</td>
<td>UCT</td>
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<tr>
<td>Prof Carolyn Hamilton</td>
<td>Social Anthropology</td>
<td>UCT</td>
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<tr>
<td>Prof Susan Harrison</td>
<td>Development Planning and Modelling</td>
<td>UCT</td>
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<tr>
<td>Prof Diane Hildebrandt</td>
<td>Sustainable Process Engineering</td>
<td>UW</td>
</tr>
<tr>
<td>Prof Catherine Hoppers</td>
<td>Development Education</td>
<td>UNISA</td>
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<tr>
<td>Prof Astrid Jarre</td>
<td>Marine Ecology &amp; Fisheries</td>
<td>UCT</td>
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<tr>
<td>Prof Sunil Maharaj</td>
<td>Gravitating Systems</td>
<td>UKZN</td>
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<tr>
<td>Prof Christopher McQuaid</td>
<td>Marine Ecosystems &amp; Resources</td>
<td>RU</td>
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<tr>
<td>Prof Ernesta Meintjes</td>
<td>Brain Imaging</td>
<td>UCT</td>
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<tr>
<td>Prof Rajend Mesthrie</td>
<td>Migration, Language &amp; Social Change</td>
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<tr>
<td>Assoc Prof Kevin Naidoo</td>
<td>Scientific Computing</td>
<td>UCT</td>
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<tr>
<td>Prof Thambi Ndung’u</td>
<td>Systems Biology of HIV/AIDS</td>
<td>UKZN</td>
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<tr>
<td>Prof Phuti Ngeope</td>
<td>Computational Modelling of Materials</td>
<td>UL</td>
</tr>
<tr>
<td>Prof Lungisile Ntsaba</td>
<td>Land Reform &amp; Democracy in South Africa: State and Civil Society Dynamics</td>
<td>UCT</td>
</tr>
<tr>
<td>Prof Edgar Pieterse</td>
<td>Urban Policy</td>
<td>UCT</td>
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<tr>
<td>Prof Dorrit Posel</td>
<td>Economic Development</td>
<td>UKZN</td>
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<tr>
<td>Prof Neerish Ravaprasadu</td>
<td>Nanotechnology</td>
<td>UZ</td>
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<tr>
<td>Prof Daya Reddy</td>
<td>Computational Mechanics</td>
<td>UCT</td>
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<tr>
<td>Prof Heinrich Schwoerer</td>
<td>Photonics, Ultrafast and Ultra-intense Laser Science</td>
<td>SU</td>
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<tr>
<td>Prof Soraya Seedat</td>
<td>Post-traumatic Stress Disorder</td>
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<tr>
<td>Prof Clifford Shearing</td>
<td>Security and Justice</td>
<td>UCT</td>
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<tr>
<td>Prof Abdulkader Tayob</td>
<td>Islam, African Publics &amp; Religious Values</td>
<td>UCT</td>
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<tr>
<td>Prof Andries van der Walt</td>
<td>Property Law</td>
<td>SU</td>
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<tr>
<td>Prof Fanus Viljoen</td>
<td>Geometallurgy</td>
<td>UJ</td>
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<tr>
<td>Prof Anna-Lise Williamson</td>
<td>Vaccinology</td>
<td>UCT</td>
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1.8 Service providers for the Mid-term Internal Review of the DST/NRF South African Research Chairs Initiative Programme (November 2011)
Dr Anthon Botha and Dr Gerhard von Gruenewaldt (TechnoScene)

1.9 Sample of postgraduate students/postdoctoral fellows of Chair holders

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<tr>
<th>Name</th>
<th>Degree</th>
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<tbody>
<tr>
<td>Benjamin Akpor</td>
<td>Postdoctoral</td>
<td>TUT</td>
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<tr>
<td>Rekha Dunpall</td>
<td>Masters</td>
<td>JZ</td>
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<tr>
<td>Tando Kili</td>
<td>Masters</td>
<td>UP</td>
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<tr>
<td>Sue-Mari Maass</td>
<td>Postdoctoral at SU</td>
<td>Ex-SU now employed at UNISA</td>
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<tr>
<td>Rosinah Mahlangu</td>
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<td>Stefanie Malan-Müller</td>
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<td>Michael Mhlolo</td>
<td>Postdoctoral</td>
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<tr>
<td>Abdul Mirza</td>
<td>Doctoral</td>
<td>JKZN</td>
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<tr>
<td>Tariro Mutongwizo</td>
<td>Doctoral</td>
<td>UCT</td>
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<tr>
<td>Shankari Nair</td>
<td>Masters</td>
<td>UCT</td>
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<tr>
<td>Michael Rogan</td>
<td>Doctoral</td>
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