The NRF Evaluation and Rating System in the World Context

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Prof Anastassios Pouris
Director: Institute for Technological Innovation
University of Pretoria

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Executive Summary

The objective of this document is to outline a number of approaches similar to the peer review system used by the National Research Foundation (NRF) (at a national level), compare and contrast them and develop relevant recommendations where the NRF approach appears to deviate from international best practice.

The systems of the National Science Foundation in the USA; of the Australian Research Council and of the Research Councils in the United Kingdom have been chosen for comparative analysis because of their declared interests to follow international best practice. In addition we outline a number of schemes which focus specifically on evaluation/rating of individuals (to the exclusion of projects) such as the “Performance Based Research Fund” in New Zealand, the National Science Council’s “Research Outcome Award” in Taiwan and the “National Researchers System” (SNI) in Mexico.

We identify that the NRF Researcher Evaluation and Rating System is not “novel” in an international context as a number of countries (e.g. Mexico, Taiwan, New Zealand and to a certain extent USA) follow similar approaches in order to avoid a brain-drain, promote research excellence, retain good academics within the university system, reduce social costs and others.

Similarly the NRF peer review system used for proposal evaluation and funding appears to follow international trends. The two systems in South Africa, i.e. the Evaluation and Rating System and the one used for proposal evaluation and funding, appear to complement each other even though they are not directly linked in all NRF programs. The rating system emphasises the performance of the applicant while the funding approach emphasises the research proposal with minimum attention to the researcher(s) performance. International experience indicates that although there are systems focusing only on the researcher’s past performance for funding purposes there are no systems which focus only on research proposals. When there is a mixed approach the researchers’ performance is a critical criterion. For example, in Australia the National Competitive Grants Program allocates 50% of weight for funding proposals on the quality of the applicant.

Probably the most important weakness of the NRF funding system is the small size of the grants awarded. We argue that the approach followed in performing the peer
review should be commensurate with the environment in which it operates and should aim (among others) to minimize its cost both internal and external to the funding organization (organizational and social). The NRF grants are substantially smaller than those in other countries (see table 1) and more importantly their value may be below their total social costs.

**Table 1: Size of Average Grants in South Africa and Selected Countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>Size of Grant (local currency)</th>
<th>Grant (local)</th>
<th>Size of Grant (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>R 110.700</td>
<td>$ 15.714</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>$ 135.000</td>
<td>$ 135.000</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>UK 82.000</td>
<td>$ 164.000</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>AU$ 298.000</td>
<td>$ 238.400</td>
<td></td>
</tr>
</tbody>
</table>

We suggest that under current conditions of grant allocation South African researchers do not have an incentive to stay in the country and foreign researchers do not have an incentive to consider coming to South Africa. Moreover the current granting system presents a disservice to the country by engaging researchers (opportunity cost) to prepare applications which subsequently will not bring the desirable results/benefits because the funding is sub-critical.

While it is evident that the obvious solution is for the NRF to appeal to the Government for additional funding, additional approaches which should be considered are measures reducing the social costs of the peer review system.

**Table 2: Success Rates in Research Application Funding**

<table>
<thead>
<tr>
<th>Country</th>
<th>Success rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>75%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>62%</td>
</tr>
<tr>
<td>South Africa</td>
<td>50%</td>
</tr>
</tbody>
</table>
Analysis of the success rates (ratio of applications received to applications funded) indicate (table 2) that South Africa (NRF) has a relatively high success rate because the NRF reduces the size of requested grants.

We argue that the latter approach (reducing the size of grants) is detrimental to the research system. A grant that is substantially less than the requested amount may have any one of the following consequences: If the project is completed successfully it would mean that the researcher had over-inflated the budget in the original proposal; most of the time however, the researcher will not be able to perform all the activities as were assessed originally (hence it will do a project, different to what has been evaluated), or the project will never be completed because of unavailability of funds.

Comparison of the NRF two-stage approach used for a) Proposal Assessment and b) for Funding with those approaches used in other countries indicates that the local approach may create unnecessary social costs and may expose the proposal to double jeopardy. The international experience indicates that the opinions of peers are accepted at face value and in a number of cases there is a grading list for the grading of the proposals. Officials of the funding bodies average the opinions of the peers and they rank the applications. When panels are utilized, they usually consist of the same peers who have already read and assessed the proposals. This way, the double jeopardy problem is avoided.
The small sizes of the NRF grants also suggest that two stage approach creates unjustifiably high social overheads or costs. In the USA, officials of the NSF have the power to allocate funds without peer review up to $200,000 in a number of programs in order to avoid high social overheads (among others).

In summary the identified international "good" practice is based on the following rules:

1) Past performance is an integral part in the assessment of “expected” performance of research activities. The same way that in other domains in life (e.g. sports) the odds favor those with good past performance, research funding bodies internationally (all countries we investigated), take cognizance and weigh past performance of researchers when they decide where to invest their limited resources.

2) Rating and rewarding individuals for past performance is an approach used internationally (e.g. Mexico, Taiwan, New Zealand) in order to promote excellence in research; retain skills in the research environment and avoid brain drain.

3) Peer review is used internationally for the assessment of research activities. However, peer review is not without its shortcomings: it is dependant on the choice of peers and it has associated organizational and social costs. Research funding bodies internationally optimize peer review by taking cognizance and limiting social costs (small grants do not need full proposals and they don’t go for peer review) and by attempting to use the best possible peers.

The major weakness of the current NRF system is the combination of small grants and the consequent high social costs. The small research grants restrict the performance of the national research system and to a certain extent they contribute to brain drain; similarly the peer review of small grants creates fatigue to both researchers who write research proposals for minimal amounts of funding and to reviewers who have to review a large number of proposals regularly.
It is important for NRF and the national research system that the NRF system evolves into an approach that limits the relevant social costs of the peer review and makes research in South Africa appealing to researchers locally and abroad.

Based on the above we recommend the following:

- The Researcher Evaluation and Rating System should be utilised to its full potential to meet the country’s research needs. Rated researchers should receive automatic funding. Such an approach will reduce substantially the social costs of peer review and it will make the research environment and the NRF system more appealing, both locally and abroad.

- The NRF should appeal to the Department of Science and Technology for additional funds to augment the size of its grants. For example, the budget of the Focus Areas Program should be augmented by at least an additional amount of R200 million a year in the short term. It is doubtful that the national objectives in S&T can be achieved when the NRF grants are sub-critical.

- The approach of substantially reducing the amounts of the requested grants should be phased out. The NRF guidelines should be clear on what constitutes qualifying expenditures and maximum amounts should be stipulated in advance so that researchers can formulate their proposals within the available budget guidelines.

- NRF should consider simplifying the approach utilized for the evaluation and funding of research proposals by unrated researchers. Peers should be chosen carefully and after that, their opinions should be accepted at face value. A grading approach, including assessment of the candidate’s past performance with a considerable weight, could further facilitate the system. NRF officials should be empowered to make final decisions on the basis of the peers’ recommendations and grades. Such an approach will resolve the issue of double jeopardy and will reduce the social costs of peer review.
Introduction

The last two decades have seen substantial growth throughout the world in higher education quality assurance systems in general and research evaluation in particular. Evaluation or assessment has emerged as a key issue in many countries where universities are faced with demands for greater accountability and the need of governments to obtain value for public money spent on higher education. By the end of the 90s more than 50 agencies existed worldwide that had roles related to quality assessment or quality assurance. In a number of these cases the agencies were mandated by government decrees and follow a design developed by ministry officials, in others the systems were developed by semi-independent government agencies and are sustained by the support and good-will of the research communities that they serve.

Peer review and bibliometrics are the main methods used for evaluation. In peer review the unit of assessment is normally the project or the individual or both. Because bibliometrics cannot usefully be applied across the board, peer review has become the principal method of university assessments. When supplemented with publication and citation data and other information this method is called “informed peer review”. Currently the peer review system is regarded as an international benchmark of best practice.

In South Africa the National Research Foundation (NRF) is a government research funding agency. NRF in its effort to promote and safeguard research excellence operates a researcher evaluation and rating system. This is a benchmarking system, based on peer review, of the recent research outputs and the impact of each applicant’s work.

The evaluation and rating system was established during the 1980s by the predecessor of NRF, the Foundation for Research Development (FRD), in response to the perception among research scientists at universities and museums at the time that the funding available to support research was being 'spread too thinly’.

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1 Pouris A (2007). “The National Research Foundation Rating System: Why Scientists let their ratings lapse” Accepted for publication in the South Africa Journal of Science
The original NRF rating approach of individual researchers in higher education at the time was based on their recent track records and outputs in research and their funding was not dependent on proposal assessment. Their level of financial support was linked to this rating allocation. A-rated researchers, for example, received substantially larger grants than B-rated researchers.

Among the benefits of the system was the fact that it reduced bureaucracy for both applicants and reviewers, who did not need to prepare and review proposals and instead relied on the view that a track record of excellence was a fairly good predictor of expected future outputs.

During 2001 the direct linkage between rating received and the funding support was discontinued. The reasons offered were firstly a lack of funding to support development programs within the NRF, and secondly the lack of ratings at that stage among social sciences and humanities researchers, who had become the responsibility of the NRF during that year.

However, funding and rating remained linked through the following:

- Five-year grants were available only to rated researchers (unrated researchers could only qualify for two-year grants);

- Unrated researchers qualify for a maximum of six years’ funding (three two-year grant cycles) and after that they would have to be rated to qualify for funding; and

- Rated researchers who allowed their ratings to lapse or lost their rating were not eligible for funding until they regain their rating status.

During 2005 a review of the NRF’s activities was conducted at the request of the Department of Science and Technology (DST). The review covered the period 1999 to 2004 and was conducted by a review panel comprising experts from the United States of America, New Zealand and South Africa. The purpose of the review was, 

*inter alia*, to provide a retrospective view on the performance of the NRF during the first five years of its existence, an assessment of the outcomes and impact of its
activities as well as recommendations regarding the strategic direction and operational execution of the NRF’s mission.

The review report includes various recommendations, one of which concerns the evaluation and rating of individual researchers, i.e. “to review the rating system, in terms of its fundamental purpose and utility.”

Higher Education South Africa (HESA) and the National Research Foundation (NRF) undertook to co-convene an in-depth review of the NRF evaluation and rating system of individual researchers in response to the above recommendation of the NRF Institutional Review in 2004.

The objective of this document is to outline a number of approaches similar to the peer review system used by the NRF (at a national level), compare and contrast them and develop relevant recommendations where the NRF approach appears to deviate from international best practice.

While there are a large number of organizations using peer review for supporting research (e.g. Defense Advanced Research Projects Agency (DARPA), Department for Environment, Food and Rural Affairs (DEFRA), Deutsche Forschungsgemeinschaft (DFG), Research Council of Norway, Wellcome Trust and others) we chose to focus on the systems of the National Science Foundation in the USA; the Australian Research Council and the Research Councils in the United Kingdom. These systems were chosen because of the expressed interest of those organizations to follow international best practices. In addition, we refer to a number of schemes which focus specifically on evaluation/rating of individuals (to the exclusion of projects) such as the “Performance Based Research Fund” in New Zealand, the National Science Council’s “Research Outcome Award” in Taiwan and the “National Researchers System” (SNI) in Mexico.

Information was retrieved from the web-sites of the relevant organizations. In certain instances telephone conversations with relevant officials clarified issues and they directed us to the appropriate resources. NRF provided us with valuable information related to their operations (see Appendix 1).

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The Dual Support System and Peer Review

The ‘dual support’ system evolved as a means of managing public support for research and development (R&D) in universities and other Higher Education Institutions (HEIs). Under the dual support approach, HEIs receive funds from two sources: The first source is the Department of Education which allocates what has been named university general funds or block grants; the second source is Research Agency funds which fund individual projects.

The founding principle³ (the Haldane Principle) was that research councils (and universities) should choose which research to support based on scientific criteria, at ‘arms length’ from political considerations. The Merrison report⁴ emphasized the rationale for the dual support system. The report states: “It is vital that support is available for such (fundamental) work, even though it may be impossible to describe it in any convincing form required by a funding body. The dual support system provides a source of fundamental support through the deployment of general university funds. As the work is recognized and more money is needed for its development, the dual support system also provides the means for additional funds to be deployed in the form of specific external grants, internal grants and contracts. At this stage the work is more costly, and the agreement of a respected cross-section of the scientific community is needed before an appreciable fraction of limited resources can be devoted to it”.

The university general funds aim to:

- Enable academic staff to keep in touch with the frontiers of their subjects, a contact which feeds back beneficially both into teaching and the research environments of a university;

- Allow new researchers to become established and build a reputation;

- Provide a continuity of research which is to some extent protected from the disruptive influences of, and the uncertain flows of external income;


• Enable a wide spread of initial and innovative investigations to be carried out from which future growth points could emerge.

Support from the research agencies aim to:

• Enable selective support at a higher level for the most promising lines of research after independent review;

• Provide central facilities and encourage co-operation and collaboration;

• Provide access to international facilities through payment of subscriptions to international organizations; and

• Encourage efforts in particular fields believed to be of national importance.

Over time the relative simplicity of the original dual-support system has been replaced by a much more complex and devolved system, whose component parts have different owners and priorities, and operate seemingly independently with few mechanisms for coordination.

Peer review is a system whereby research – or a research proposal - is scrutinized by (largely unpaid) independent experts (peers). In general, the process serves a technical function (ensuring that the science is sound) and a subjective function (is the science interesting, important and/or groundbreaking?).

Figure 1 provides a brief overview of how the process works to select science for funding and publication, although in practice, there is considerable variation in peer review processes between funding bodies and journals.

Peer review has been the subject of long debate. Some of its shortcomings are as follows:

• Peer review relies on mutual trust and honesty. That is researchers must entrust their data/ideas to referees while referees must trust that researchers are telling the truth. Because of this reliance on trust, the peer review system is open to abuse. Recent years have seen a number of high profile cases where the system has failed to detect fraudulent research (particularly in the
medical field), although these cases are thought to account for only a tiny proportion of peer reviewed research. It has been argued\(^5\) that the situation becomes more difficult in smaller scientific communities and recently a number of countries increasingly use peers from other countries to expand the pool of available expertise.

**Figure 1: Peer Review Procedure**

- Peer review can be an inefficient and expensive exercise. A recent investigation\(^6\) of the effectiveness and efficiency of the peer review system, as it is used by the research councils in the UK, identified that the total cost of assessing the average research proposal was just below eleven thousand pounds with the major cost component being the initial preparation of the proposal by the researchers (82%). The analysis estimated that the annual total peer review activity (i.e. incorporating studentships, fellowships and all


types of research grant) associated with distributing Research Council funds was about £196 million (05/06 prices). Despite this estimated social cost the panel was of the opinion that the UK system was efficient and effective.

- Peer review may perpetuate conservatism. The peer review system may discourage individuals from putting forward their more radical, or possibly more interesting ideas where such ideas challenge prevailing wisdom. Furthermore, individuals with a track record in a specific research area may be discouraged from moving into new fields. The Boden report\(^7\) in the UK identified three areas where the peer review system may be less effective i.e. in the assessment of unorthodox ideas, in assessing interdisciplinary research proposals, and in assessment of proposals submitted by early research career staff (i.e. young researchers) that may be disadvantaged by their lack of a track record.

Despite these criticisms and concerns, peer review still finds support through a number of investigations\(^8,9\) and is currently the most widely used approach for the distribution of research funds and acceptance of research publications by academic journals. The Boden\(^10\) study, having explored a number of alternatives, concluded that there was no practical alternative to peer review for the assessment of basic research. Similarly the Royal Society\(^11\) recognized that the peer review system was under pressure but concluded that peer review must continue, although within the bounds of acceptable levels of efficiency.

The recent investigation by the research councils UK (ref 4) concluded that the four options that offer greatest potential for reducing the social costs are:

- **"Consolidation"** - to increase the proportion of Research Council funding allocated to larger and/or longer grants;

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\(^8\) Grayson L (2002). "Evidence based policy and the quality of evidence: Rethinking peer review". ESRC, UK.


\(^10\) Ibid Boden M (1990)

• **Institutional-level Quotas** - to introduce quotas either for all institutions or for those with particularly poor success rates;

• **Controlling resubmissions** – to introduce processes that limit the recycling of proposals within the system; and

• **Outlines** - to deploy an outline-bid stage for responsive-mode grant schemes.”

**Peer Review at the National Research Foundation South Africa**

NRF, in its effort to promote and safeguard research excellence, has operated a researcher evaluation and rating (RE&R) system since the 1980s. This is a benchmarking system, based on peer review, of the recent research outputs and the impact of each applicant’s work. Furthermore the NRF is utilising traditional peer review for assessing the quality of research proposals in its various programs. Peers are recommended by the researchers who submit applications and by the relevant panel members. While it is expected that the panel committees will take the seniority, quality and expertise of peers into account, there is currently no formal process for accessing the research expertise of the peers used by the system.

While there is currently no funding linked directly to the outcome of RE&R system, obtaining a rating is a prerequisite for receiving long term financial support from the NRF.

The linkages between the rating system and funding support are as follows:

• Five-year grants are given only to rated researchers (unrated researchers could only qualify for two-year grants);

• Unrated researchers qualify for a maximum of six years funding (three two-year grants) and after that they would have to be rated to qualify for funding; and

• Rated researchers who allowed their ratings to lapse or who lost their rating are not eligible for funding until they regain their rating.
The funding programs of the NRF (e.g. focus areas program) are utilising peer review in order to assess the quality of the applications they receive. However, proposals by rated researchers are going directly to the relevant panels for assessment without peer reviewers reports (see below).

**Researcher Evaluation and the Rating System**

Applications for evaluation and rating are invited annually by the NRF. The application must be screened and approved by the applicant’s institutional research administration, which in turn submits it electronically to the Evaluation Centre at the NRF. The Evaluation Centre screens the application for acceptance and receipt is acknowledged. The documentation is then sent to members of subject-specific Specialist Committees. The Specialist Committees recommend at least six suitable peer reviewers.

The Evaluation Centre sends relevant documentation to peer reviewers and asks them to provide an appraisal-evaluation on the following two criteria:

- The quality of the research-based outputs over the last seven years as well as the impact of the applicant’s work in his/her field and how it has impacted on adjacent fields.

- An estimation of the applicant’s standing as a researcher in the field in terms of both a South African and international perspectives.

The set of reviewers’ reports is sent to members of the Assessment Panels (specialist committees plus an independent assessor) by the Evaluation Secretariat. The Panels assess the balance of feedback received of applicants amongst their peers and recommend a rating for applicants on the basis of the statements contained in the reviewers’ reports and the objectivity of these reports in the light of the factual information contained in the submission documentation.

More specifically the members of the specialist committee meet in order to establish a rating that reflects the opinions of the candidates peers. When the specialist committees have reached consensus about the rating of an applicants they are joined by the Chairperson and the Assessor and the formal meeting of the Assessment Panel commences. Each applicant is discussed in turn. The Convenor of
the Specialist Committee presents the rating recommended by the Specialist Committee, the Assessor puts forward his/her independent suggested rating and the Chairperson facilitates a decision in each case, playing the role of a second independent assessor if required.

The figures below show diagrammatically the peer review process and the process followed for ratings.

**Figure 2: Summary of the Process of Submission of Peer Reports**
Figure 3: Summary of process of allocating a rating

Proposal Assessment and Funding at NRF

NRF has a number of programs offering funding support. Examples include the Focus Areas Program, Thuthuka, South African Research Chairs, Free-Standing Postdoctoral Fellowships/Master’s and Doctoral Scholarships and others. While the assessment process varies somewhat depending on the needs of the particular program, the basic principle underlying all assessments is that of peer review. Typically this is handled in a two tier format: first through postal peer review, where the proposals are sent to (on average 6) experts working in the specific research field. Peers are asked to comment on the quality of the research proposal. In the second step a panel of peers working in the general research field makes the final decision. These people comment on the quality of the review and make judgments about the alignment of the proposals with certain criteria, e.g., alignment with a focus area.

Table 1 shows the headings in the application template for focus areas projects. Table 2 shows the heading of the questions that peers are asked related to the proposals submitted to the focus areas program. Both tables make clear that the emphasis is placed on the quality of the proposal.

Table 1: Focus Area Grant Application Template

<table>
<thead>
<tr>
<th>Problem Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rationale and Motivation</td>
</tr>
<tr>
<td>Research Aims</td>
</tr>
<tr>
<td>Work-plan: Research Activities</td>
</tr>
<tr>
<td>Work-plan: Research Methods</td>
</tr>
<tr>
<td>Potential Impact on HR Development</td>
</tr>
<tr>
<td>Potential Impact on Redress and Equity</td>
</tr>
<tr>
<td>Potential Outcomes – international acclaim, contribution to knowledge base, exploitability of outputs, effects on users sectors</td>
</tr>
<tr>
<td>Progress to date: Summary – Relevant work of applicant</td>
</tr>
<tr>
<td>Progress to date: Research outputs (for continued work)</td>
</tr>
<tr>
<td>Progress to date: students involved</td>
</tr>
<tr>
<td>Co-investigator outputs</td>
</tr>
</tbody>
</table>
Table 2: Online Review of Focus Area Applications

<table>
<thead>
<tr>
<th>Knowledge of Applicant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significance of proposed research</td>
</tr>
<tr>
<td>Approach</td>
</tr>
<tr>
<td>Feasibility (within stipulated time frames) with regard to experience and expertise of applicant(s)</td>
</tr>
<tr>
<td>Overall Assessment of the scientific merit of the proposal</td>
</tr>
<tr>
<td>Overall Scientific Merit Ranking</td>
</tr>
</tbody>
</table>

During 2006 NRF\textsuperscript{12} estimates that it received for its various programmes approximately 5000 applications and allocated 2500 grants for a success rate of 50%. This is a deteriorating situation as the previous years success rate was approximately 74%.

An important characteristic of the NRF grants is the fact that “Few if any proposals are funded fully”. NRF officials are using ad-hoc approaches to reduce the size of grants requested. The approach has been described by Dr R Drennan as follows: “The method is decided annually as follows: The Executive Director: Knowledge Fields Development, in collaboration with his/her managers and Professional Officers (POs), look at the budget, the peer reviewed demand and then decide how best to deliver on their strategy with the resources at hand. The managers and POs have just participated in all the panel meetings and have collected notes on how the peers felt about the projects. One of the items considered during the panel meetings is the size of each project budget.

For example, typical items that get cut first could be all equipment that is not central to the project, based on peer inputs; then all support for Postdocs because the NRF has a separate Free-standing postdoctoral programme which is under-subscribed and so necessary support can be found there, etc.

For audit purposes all those involved in the decision-making process agree on one methodology of doing the cuts. This method is written down and signed into action

\textsuperscript{12} Personal communication with Dr R. Drennan, Executive Director: GMSA, NRF

\textit{NRF Evaluation and Rating System in the World Context}
by the Executive Director (ED: KFD). The people concerned then sit around a table and tackle the task in concert. This ensures that all special cases are dealt with uniformly and in accordance with the agreed methodology.

The final grant list (with all details of students, running costs, etc.) is scrutinized by the managers and then goes to the ED for a final decision. Thereafter it is loaded onto the Phoenix (grant management) system and an independent reconciliation is done between the decision and the system report to be sure that no errors creep in.”

Table 3\textsuperscript{13}: Size of Grants of Selected Programs – NRF 2006

<table>
<thead>
<tr>
<th>Focus Areas</th>
<th>Average</th>
<th>Std Dev</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHALLENGE OF GLOBALISATION: PERSPECTIVES FROM THE GLOBAL SOUTH</td>
<td>90,670.14</td>
<td>83,933.38</td>
<td>1,994,743.00</td>
</tr>
<tr>
<td>CONSERVATION AND MANAGEMENT OF ECOSYSTEMS AND BIODIVERSITY</td>
<td>139,724.38</td>
<td>110,727.69</td>
<td>29,062,672.00</td>
</tr>
<tr>
<td>DISTINCT SOUTH AFRICAN RESEARCH OPPORTUNITIES</td>
<td>77,297.08</td>
<td>107,722.97</td>
<td>14,068,068.00</td>
</tr>
<tr>
<td>ECONOMIC GROWTH AND INTERNATIONAL COMPETITIVENESS</td>
<td>145,443.36</td>
<td>108,531.09</td>
<td>39,706,036.00</td>
</tr>
<tr>
<td>EDUCATION AND CHALLENGES FOR CHANGE</td>
<td>51,612.23</td>
<td>50,310.96</td>
<td>3,303,183.00</td>
</tr>
<tr>
<td>INDIGENOUS KNOWLEDGE SYSTEMS</td>
<td>149,673.43</td>
<td>161,793.90</td>
<td>11,225,507.00</td>
</tr>
<tr>
<td>INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>107,004.50</td>
<td>84,929.06</td>
<td>4,708,198.00</td>
</tr>
<tr>
<td>SUSTAINABLE LIVELIHOODS: THE ERADICATION OF POVERTY</td>
<td>126,510.92</td>
<td>122,523.78</td>
<td>9,108,786.00</td>
</tr>
<tr>
<td>UNLOCKING THE FUTURE</td>
<td>108,596.96</td>
<td>122,523.78</td>
<td>25,411,689.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>110,725.89</td>
<td>29,119.51</td>
<td>138,588,882.00</td>
</tr>
</tbody>
</table>

**Thuthuka**

<table>
<thead>
<tr>
<th>Focus Areas</th>
<th>Average</th>
<th>Std Dev</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>REDIBA</td>
<td>74,745.11</td>
<td>81,816.18</td>
<td>5,680,628.00</td>
</tr>
<tr>
<td>RiT</td>
<td>34,879.15</td>
<td>40,359.97</td>
<td>9,591,767.50</td>
</tr>
<tr>
<td>WiR</td>
<td>74,593.74</td>
<td>75,253.97</td>
<td>12,382,561.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>115,342.80</td>
<td>50,861.80</td>
<td>201,129,095.50</td>
</tr>
</tbody>
</table>

**SCHOLARSHIPS & FELLOWSHIPS PROGRAMME**

<table>
<thead>
<tr>
<th>Focus Areas</th>
<th>Average</th>
<th>Std Dev</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IRDP</strong></td>
<td>133,804.52</td>
<td>141,290.10</td>
<td>31,310,257.00</td>
</tr>
<tr>
<td><strong>Grad totals</strong></td>
<td>115,342.80</td>
<td>50,861.80</td>
<td>201,129,095.50</td>
</tr>
</tbody>
</table>

\textsuperscript{13} Source: Dr R Drennan; Executive Director: GMSA

NRF Evaluation and Rating System in the World Context
Table 3 shows the size of grants of selected NRF programs. The size of average grant ranges from just below R35,000 to a high of R155,000 for scholarships and fellowships.

**Peer Review at the National Science Foundation USA**

The National Science Foundation Act of 1950 directs the Foundation "to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels."

The Director of the NSF, in response to a National Science Board (NSB) policy endorsed in 1977 and amended in 1984, has to submit an annual report on the NSF merit review process\(^{14}\). In this report, data are presented on both the merit review outcome in the particular financial year and the process itself.

During FY 2006, NSF acted on 42,352 proposals. This resulted in 10,425 awards at a success rate of 25%. The average annualized value of the research grants, which are associated with individual researchers, was approximately US$135,000 and the median US$100,000. These do not include education and training grants, which are primarily multi-institutional and of a much larger average size. The average duration of the research grants was 2.9 years.

The National Science Foundation is following a common peer review approach for the majority of the grants it allocates. However the "Small Grants for Exploratory Research" (SGER) program and the "Accomplishment Based Renewals and Creativity Extensions" follow different approaches.

**Description of NSF Merit Review Process**

The NSF merit review process includes the steps listed below:

- The proposal arrives electronically, and NSF staff assigns the proposal to the appropriate program(s) for review. Some programs also include preliminary proposals as part of the application process. Proposals that do not comply to

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NSF regulations, as stated in the *Grant Proposal Guide*, may be returned without review.

- The program officer (or team of program officers) reviews the proposal and assigns it to at least three experts from outside the Foundation. (Small Grants for Exploratory Research (SGER) proposals do not require external review.) The review process is overseen by a Division Director, or other appropriate NSF official.

The program officer or team:

- selects reviewers and panel members, based on program officer’s knowledge, references listed in the proposal, recent publications in science and engineering journals, presentations at professional meetings, reviewer recommendations, bibliographic and citation databases, and suggestions by the authors of the proposal.

- checks for conflicts of interest. In addition to checking proposals and selecting reviewers with no apparent potential conflicts, NSF staff provides reviewers guidance and instruct them how to declare potential conflicts. All program officers receive conflict-of-interest training annually.

- synthesizes the comments of the reviewers and panel (if reviewed by a panel), as provided in the individual reviewer analyses and the panel summary

- makes a recommendation to award or decline the proposal, taking into account external reviews, panel discussion, and other factors such as portfolio balance and amount of funding available.

- a Division Director, or other appropriate NSF official, reviews all program officer recommendations. For award recommendations, a grants officer in the Office of Budget, Finance, and Award Management performs an administrative review. Large awards receive additional review. The Director’s Review Board reviews award recommendations with an average annual award amount of 2.5 percent or more of the awarding Division’s annual budget. The National Science Board reviews recommended awards with an annual award amount of
one per cent or more of the 13 awarding Directorate's annual budget. In FY 2006, NSB reviewed and approved 7 recommended awards.

To ensure that this process, which leads to funding decisions, remains robust, NSF has a variety of mechanisms in place to review the merit review process itself, as follows:

- An external Committee of Visitors (CoVs), whose membership is comprised of scientists, engineers, and educators, assesses each program every 3-5 years. CoVs examine the integrity and efficiency of merit review processes and the results from the programmatic investments.

- Advisory Committees (whose membership is also comprised of scientists, engineers, and educators) review CoV reports and directorate/office responses and provide guidance to the Foundation’s directorates and offices based on the reports.

- The Government Performance and Results Act of 1993 (GPRA) was established to provide strategic planning and performance measurement in the Federal Government. The NSF-wide Advisory Committee for GPRA Performance Assessment (AC/GPA), a single committee of external experts convened yearly to assess results, evaluates the Foundation’s portfolios and their linkages to strategic outcome goals. The AC/GPA uses Committee of Visitor reports, internal and external directorate assessments of particular programs, investigator project reports, and directorate/division collections of outstanding accomplishments from awards in order to perform the evaluation.

- An external contractor performs an independent verification and validation of the Foundation’s performance measurements.

- The National Science Board’s Audit and Oversight Committee reviews the findings presented by the AC/GPA.

- The Program Assessment Rating Tool (PART), developed by the Office of Management and Budget, is used to assess program performance of federal
agencies in four areas: Program Purpose and Design, Strategic Planning, Program Management, and Program Results/Accountability.

The diagram below shows diagrammatically the Merit Review Process

**Diagram of the NSF Merit Review Process**

Source: NSF 2007

**Proposal Guidelines and Merit Criteria**

The proposal guidelines\(^{15}\) for the majority of the NSF programs require researchers who intend to submit proposals to provide the following information:

(1) Objectives and scientific, engineering, or educational significance of the proposed work;

(2) Suitability of the methods to be employed;

(3) Qualifications of the investigator and the grantee organization;

(4) Effect of the activity on the infrastructure of science, engineering and education; and

(5) Amount of funding required.

For all senior personnel a biographical sketch, limited to two pages, is required. The biographical sketch is required to include:

- A list of the individual’s undergraduate and graduate education and postdoctoral training;

- A list, in reverse chronological order, of all the individual’s academic/professional appointments beginning with the current appointment

- A list of: (a) up to 5 publications most closely related to the proposed project; and (b) up to 5 other significant publications, whether or not related to the proposed project. Each publication identified must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. If the document is available electronically, the website address should also be identified. For unpublished manuscripts, only those submitted or accepted for publication (along with most likely date of publication) should be listed. Patents, copyrights and software systems developed may be substituted for publications.

- A list of up to five examples that demonstrate the broader impact of the individual’s professional and scholarly activities that focuses on the integration and transfer of knowledge as well as its creation.
• A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been collaborators or co-authors with the individual on a project, book, article, report, abstract or paper during the 48 months preceding the submission of the proposal. Also those individuals who are currently or have been co-editors of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal should be included. If there are no collaborators or co-editors to report, this should be so indicated.

• A list of the names of the individual’s own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations.

• A list of all persons (including their organizational affiliations), with whom the individual has had an association as thesis advisor, or with whom the individual has had an association within the last five years as a postgraduate-scholar sponsor. The total number of graduate students advised and postdoctoral scholars sponsored also must be identified.

The National Science Foundation aims to conduct a fair, competitive, transparent merit-review process for the selection of projects. All NSF proposals are evaluated through use of two National Science Board approved “merit review criteria”. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities. For example, proposals for large facility projects also might be subject to special review criteria outlined in the program solicitation.

The two merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions, and not all apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgments.

**Merit criterion 1:** What is the intellectual merit of the proposed activity?
• How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?

• How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.)

• To what extent does the proposed activity suggest and explore creative and original concepts?

• How well conceived and organized is the proposed activity?

• Is there sufficient access to resources?

Merit criterion 2: What are the broader impacts of the proposed activity?

• How well does the activity advance discovery and understanding while promoting teaching, training, and learning?

• How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?

• To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?

• Will the results be disseminated broadly to enhance scientific and technological understanding?

• What may be the benefits of the proposed activity to society?

In making funding decisions the NSF staff is advised to give consideration to the following two issues:

• Integration of research and education and

• Integrating diversity into NSF programs, projects and activities
Small Grants for Exploratory Research (SGER)

Since the beginning of 1990, the Small Grants for Exploratory Research option has permitted program officers throughout the Foundation to make short-term (one to two years), small-scale grants without formal external review. Characteristics of activities that can be supported by an SGER award include: preliminary work on untested and novel ideas; application of new approaches to "old" topics; ventures into emerging research areas; and narrow windows of opportunity for data collection, such as natural disasters and infrequent phenomena.

Potential SGER applicants are encouraged to contact an NSF program officer before submitting an SGER proposal to determine its appropriateness for funding. As potential SGER applicants have become familiar with this practice, the SGER funding rate has steadily increased. In September 2003, NSF raised the maximum SGER award threshold from $100,000 to $200,000. Program officers may obligate up to five percent of their program budget per fiscal year for SGER awards. The average size of an SGER award in FY 2006 was around $85,000 up from $70,000 in FY 2005. The total amount awarded to SGERs in FY 2006 was approximately $40 million compared to $27 million in the previous year. This represents about 0.7 percent of the operating budget for research and education.

Accomplishment Based Renewals and Creativity Extensions

In addition to SGERs, NSF program officers may recommend accomplishment based renewals and creativity extensions. In 2006 there were 106 requests for accomplishment based renewals, 33 of which were awarded.

In an accomplishment-based renewal, the project description is replaced by copies of no more than six reprints of publications resulting from the research supported by NSF (or research supported by other sources that is closely related to the NSF-supported research) during the preceding three- to five-year period. In addition, a brief (not to exceed four pages) summary of plans for the proposed support period must be submitted. All other information required for NSF proposal submission remains the same.

A creativity extension is an extension of funding for up to two years for certain research grants. The objective of such extensions is to offer the most creative
investigators an extended opportunity to attack "high-risk" opportunities in the same general research area, but not necessarily covered by the original/current proposal. Special Creativity Extensions are initiated by the NSF Program Officer based on progress during the first two years of a three-year grant.

Research and Funding Council Peer Review in the UK

The research funding system in the UK is made up of four Funding Councils and eight Research Councils. Funding Council support for research (Quality Related or QR funding) is distributed as a block grant to institutions using the results of the Research Assessment Exercise (RAE). Awards are made on the basis of past performance and reflect a geographical distribution i.e. Higher Education Funding Council for England (HEFCE) makes awards only to English higher education institutes. Research Council funds are awarded on the basis of applications made by individual researchers, which are subject to independent, expert peer review. Awards are made on the basis of the research potential and are irrespective of geographical location.

The four Funding Councils in the UK, supported by the Department for Education and Skills (DfES) and the devolved Departments of Education are:

- Higher Education Funding Council for England (HEFCE)
- Scottish Further and Higher Education Funding Council (SFC)
- Higher Education Funding Council for Wales (HEFCW)
- Department for Employment and Learning Northern Ireland (DELNI)

Research Councils in the UK are public bodies charged with investing tax payers’ money in science and research in order to advance knowledge and generate new ideas which can be used to create wealth and drive improvements in quality of life. The eight UK Research Councils are:

- Arts and Humanities Research Council (AHRC)
- Biotechnology and Biological Sciences Research Council (BBSRC)
• Council for the Central Laboratory of the Research Councils (CCLRC)
• Engineering and Physical Sciences Research Council (EPSRC)
• Economic and Social Research Council (ESRC)
• Medical Research Council (MRC)
• Natural Environment Research Council (NERC)
• Particle Physics and Astronomy Research Council (PPARC)

Seven of the Research Councils undertake similar activities:

• fund excellent basic, strategic and applied research
• support research training and career development (PhDs and masters students and post-doctoral fellows)
• fund activities to promote knowledge transfer and provide services and trained scientists and researchers, which contributes to economic competitiveness, the effectiveness of public services and policy, and quality of life in the UK
• support public engagement and dialogue activities

The CCLRC has a different role, managing a number of large, international research facilities based in the UK as well as providing strategic advice to Government on the development of large-scale research facilities. The Government is currently consulting on plans to merge CCLRC and PPARC to create a Large Facilities Research Council.

Collectively the Research Councils support approximately 10,000 researchers and 14,000 postgraduate students in UK universities and in their own Research Institutes.

Research Councils UK (RCUK) is a strategic partnership between the eight Research Councils. RCUK was established in 2002 to enable the Councils to work together more effectively to enhance the overall impact and effectiveness of their research,
training and innovation activities, contributing to the delivery of the Government’s objectives for science and innovation. One initiative is the common electronic handling of proposals and grants (Je-S). The initial release of Je-S (JeS1), which supports electronic proposals to BBSRC, EPSRC, NERC and PPARC, went live this year. Additional Je-S functions, such as peer review, are under development. The MRC will switch over to Je-S when the system has equivalent functionality to the MRC’s own electronic application system which has already been operating for some time.

Research Councils grants are cost and funded on the basis of full economic costs (FEC). Full Economic Costs is a price which, if recovered across an organization’s full programme, would recover the total cost (direct, indirect and total overhead) including an adequate recurring investment in the organization’s infrastructure.

The Research Councils expenditure in higher education institutions during 2005-06 was estimated at £1,305 million. This amount was distributed to 16,764 proposals at an average grant amount of £82,000. The collective success rate (funded proposals to proposals received) for the Research Councils was around the 28% mark during the period.

**Description of the Peer Review in the UK Research Councils**

The Research Councils in the UK have very similar approaches to the delivery of peer review. While the tasks, sequence of tasks and management of this process varies from Council to Council and streamlined or enhanced procedures may be operated for certain types of activity the broad process is the same. The process involves the following steps:

- Provide advice to applicants prior to submission.

- Receive an application via an electronic submission system, acknowledge the application, and then undertake a fault check to ensure that all documents and data are present.

- Check applications to ensure that they are eligible and within remit before they are allocated to two or more referees for assessment. The applicant is able to nominate referees on the application form and independent referees
are also selected either by peer review Panel Members or by Research Council staff. The referee typically receives a copy of the application form and associated supporting documentation, some guidance notes on the information required and a pro-forma to complete. The information required comprises free text comments on various aspects of an application together with grades for some Councils.

- The referee replies within three to six weeks, following which the applicant is typically given an opportunity to respond to the referees’ reports. Some Councils will carry out a sift at this stage, other Councils take all applications to Committee or Panel Meetings. In the case of larger grants some Research Councils arrange for a panel of experts to visit the applicants.

- A Panel/Committee meeting is held and applications are generally introduced by one or two assessors who recommend a score or ranking. The Panel/Committee then agrees on a final score/ranking to obtain a priority list for all applications.

- Following the decision meeting, the applicant receives either a rejection letter or an award letter.

- At the end of the grant lifetime, final reports are obtained and may be assessed in a similar fashion to the refereeing of initial applications. Assessors for final reports may be external referees, peer review panel members or internal Council staff. Most Research Councils try and use an assessor or referee that was involved in the pre-award phase. Most Research Councils will not allow applicants to apply for new grants if they have any final reports outstanding.

**Assessment Criteria and Process**

Scientific assessment of research grant proposals is made by experts in the field from academia, government and industry. Research grant proposals are assessed by individual referees and by peer review panels.
While the detailed phrasing of criteria may vary from research council to research council, research grant panels judge the proposal against the following key assessment criteria\(^\text{16}\):

“Category 1: This is an absolute pre-requisite, without which an application will not be recommended for funding:

- Scientific excellence: specific objectives of the project.
- International competitiveness.
- Strategic value within the Science and Technology Facilities Council (STFC) programme.

Category 2: Supporting evidence which increases the confidence in a successful outcome. Where any of these are not met the risk and any proposed remedial or mitigation action must be identified. Where any criteria are not met any recommendation for funding would be subjected to close scrutiny by STFC. If approved for funding, STFC is likely to make an award contingent on remedial action to address the concerns highlighted before funds are committed.

- Productivity of Investigator.
- Productivity of grant supported staff (where relevant).
- Quality of leadership/management.
- Suitability of Institution/Group.

Category 3: Important additional criteria, the opportunities and plans for which must be addressed in the application.

- Potential for knowledge transfer (and industrial engagement).
- Quality of outreach plan.

Category 4: Ensuring that the health and critical mass in key instrument/construction groups is maintained.

- Sustainability (of key instrument/construction groups)

The criteria have been summarized as follows: “Investigators need to convince peers it is worth doing it and why they are the right person to do it”\textsuperscript{17}.

The process followed is as follows:

- Each research grant proposal is normally assessed by at least two referees, one of whom may be nominated by the applicant. Nominated referees must not be collaborators; neither should they be from the applicant's or collaborator's home organization. The research councils reserve the right not to use nominated referees.

- Papers sent by the research councils to referees and panel members are marked "In Confidence". The "In Confidence" marking is intended to ensure that the contents of the proposal are not made known more widely than is necessary for proper consideration.

- Referees and panel members are required to disclose conflicts of interest, personal or institutional, where this arises in relation to a proposal they have been asked to assess.

- Applicants are given the opportunity to reply to referees' comments.

- Applicants who lobby or canvass members of the peer review panels or their officers about their research proposal are disqualified.

The Research Assessment Exercise

The Research Assessment Exercise is conducted jointly by the Higher Education Funding Council for England, the Scottish Funding Council, the Higher Education

\textsuperscript{17} Sepulveda P. “A Research Council Perspective of Peer Review” University Interface Manager, EPSRC accessed at: http://www.cmht.nwest.nhs.uk/directorates/peer_review/pdf/Pilar%20Supelveda.ppt#315,41.
Funding Council for Wales and the Department for Employment and Learning, Northern Ireland.

The primary purpose of the RAE is to produce quality profiles for each submission of research activity made by institutions. The four higher education funding bodies use the quality profiles to determine their grants for research to the institutions which they fund. Bourke (1997)\textsuperscript{18} suggests that the RAE fulfils three functions – a competitive source of discretionary income, a reward for the quality and/or volume of research output, and an instrument of policy.

The first RAE was undertaken in 1986. It introduced an explicit and formalized assessment process standardizing the information received from existing subject-based committees. Further exercises held in 1989 and 1992 were more comprehensive and aimed to be more transparent as well.

The fourth exercise in 1996 assessed the work of over 50,000 staff designated by higher education institutions as research active. It determined the allocation of over £4 billion over five years. Its costs (including opportunity costs) have been variously estimated at between £27 million and £37 million (estimated as 0.8% of the total funds distributed on the basis of the exercise).

The most recent RAE in 2001 was the most rigorous and thorough exercise to date. It had become the principal means by which institutions assured themselves of the quality of their research. It had also evolved into an intense competition in which higher education institutions strived not only for funding but also for prestige.

The RAE operates through a process of peer review by experts covering all subjects. All research assessed is allocated to one of 68 ‘units of assessment’ which are discipline-based. For each unit of assessment there is a panel of between nine and 18 experts, mostly from the academic community but with some industrial or commercial members.

Every higher education institution in the UK may make a submission to as many of the units of assessment as they choose. The submissions are based around members

of staff in each academic unit in which the institution is submitting. It is up to each institution to decide which subjects (and therefore which units of assessment) to submit to, and which members of staff to include in each submission.

For each member of research staff, up to four items of research output may be listed. All forms of research output (books, papers, journals, recordings, products) are treated equally; panels are concerned only with the quality of the research. Similarly, all research (whether applied, basic or strategic) is treated equally. In addition, the HEI must provide information in a number of different categories, as shown below.

**Table 6: Information provided by the HEIs, in a number of different categories**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
</table>
| Staff information   | • summaries of all academic staff  
                    | • details of research-active staff  
                    | • research support staff and research assistants |
| Research output     | • up to four items of research output for each researcher |
| Textual description | • information about the research environment, structure and policies  
                    | • strategies for research development  
                    | • qualitative information on research performance and measures of esteem |
| Related data        | • amounts and sources of research funding  
                    | • numbers of research students  
                    | • number and sources of research studentships  
                    | • numbers of research degrees awarded  
                    | • indicators of peer esteem |

In summary each submission consists of information about the academic unit being assessed, with details of up to four publications and other research outputs for each member of research active staff.

The assessment panels award a rating on a scale of 1 to 5*, according to how much of the work is judged to reach national or international levels of excellence. The table below shows the definition of each rating.
Table 7: Definitions of Ratings RAE

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5*</td>
<td>Quality that equates to attainable levels of international excellence in more than half of the research activity submitted and attainable levels of national excellence in the remainder</td>
</tr>
<tr>
<td>5</td>
<td>Quality that equates to attainable levels of international excellence in up to half of the research activity submitted and to attainable levels of national excellence in virtually all of the remainder</td>
</tr>
<tr>
<td>4</td>
<td>Quality that equates to attainable levels of national excellence in virtually all of the research activity submitted, showing some evidence of international excellence</td>
</tr>
<tr>
<td>3a</td>
<td>Quality that equates to attainable levels of national excellence in over two-thirds of the research activity submitted, possibly showing evidence of international excellence</td>
</tr>
<tr>
<td>3b</td>
<td>Quality that equates to attainable levels of national excellence in more than half of the research activity submitted</td>
</tr>
<tr>
<td>2</td>
<td>Quality that equates to attainable levels of national excellence in up to half of the research activity submitted</td>
</tr>
<tr>
<td>1</td>
<td>Quality that equates to attainable levels of national excellence in none, or virtually none, of the research activity submitted</td>
</tr>
</tbody>
</table>

Each of the four funding bodies uses the ratings to allocate research funding by formula to the institutions it funds. The formulae used by each funding body may vary, with the overlying principle of funding selectively – more funding for higher quality research.

**Peer Review in the Australian Research Council**

The Commonwealth Government provides the majority of funds through a dual-support system consisting of an institutional operating grant and a targeted grant scheme. Institutional funds are allocated as block grants and universities have discretion as to how to distribute these resources internally. The targeted Commonwealth Competitive Grant scheme is managed by various research councils and government agencies, among which the Australian Research Council (ARC) is the largest one.

The Australian Research Council Amendment Act 2006, which received Royal Assent on 30 June 2006, led to the retirement of the ARC Board and introduction of an executive management governance structure for the ARC, with the Chief Executive Officer reporting directly to the Minister.
The new governance arrangements for the ARC follow the Australian Government’s endorsement of the relevant recommendations of the Uhrig Review\(^\text{19}\). In accordance with the recommendations of the review, the Australian Government agreed that all relevant statutory authorities should be assessed against two templates designed to ensure a consistent approach to good governance.

ARC has to report annually on the following key performance indicators\(^\text{20}\):

**Key Performance Indicator 1:** Research funded through the NCGP produces high-quality outputs and outcomes in public and private enterprises

- **Measure:** Number of academic outputs from ARC-funded research (number of research articles, books etc)
- **Measure:** Value of collaborative research to partner organizations (survey based information)

**Key Performance Indicator 2:** Development, attraction and retention of high-quality researchers across disciplines, able to pursue careers within universities, industry, government and other sectors of the economy

- **Measure:** Number of researchers supported through ARC-funded projects
- **Measure:** Origin of awardees (expatriates, foreigners etc)

**Key Performance Indicator 3:** A high incidence of collaboration between ARC-funded researchers and those within other sectors of the national and international innovation system including innovative companies

- **Measure:** Number and nature of partner organisations
- **Measure:** Incidences of international collaboration

**Key Performance Indicator 4:** Increase in the scale of research activities supported through the NCGP

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• **Measure:** Financial and in-kind contributions from partner organizations (listed on ARC-funded projects)

• **Measure:** Collaborative investment by other agencies (excluding partner organizations listed on ARC-funded projects)

**Key Performance Indicator 5:** Contribution of ARC-funded research to the development of research strengths and applications in areas of national need

• **Measure:** Support for areas of national research priority

**Key Performance Indicator 6:** Appropriate level of access for Australian researchers to high-quality facilities and equipment located in Australia and overseas

• **Measures:** Number and value of proposals funded under the LIEF scheme

• **Measure:** Levels of access and utilization of infrastructure items funded under the LIEF scheme

**Key Performance Indicator 7:** Transfer of knowledge to users as shown by trends in knowledge transfer, utilization and intellectual property measures

• **Measure:** Invention disclosures, licenses, patents and start-up companies associated with ARC-funded research

**Key Performance Indicator 8:** Enhanced stakeholder awareness of, and satisfaction with, the outcomes of ARC-funded research

• **Measure:** Media coverage of the ARC and ARC-funded research

• **Measure:** Level of contact and communication with stakeholders

• **Measure:** Level of awareness of the ARC and ARC-funded research

**Key Performance Indicator 9:** Stakeholder satisfaction with the flexibility and responsiveness of the NCGP and with ARC processes for administering grants and applications

• **Measure:** Number of appeals

• **Measure:** Stakeholder satisfaction
Key Performance Indicator 10: Ministerial and Parliamentary satisfaction with the performance of the ARC against its accountability and governance requirements

- **Measure**: Parliamentary reports provided within timelines set by Parliament and its Committees

**The National Competitive Grants Program**

The **National Competitive Grants Program** (NCGP) was established in 2001 and is the primary vehicle by which the ARC pursues its mission and key objectives. Through the NCGP the ARC promotes the conduct of high quality research and research training for the benefit of the Australian community across all disciplines except clinical medicine and dentistry.

The NCGP consists of two elements – Discovery and Linkage. Together they provide a set of interrelated schemes structured to provide a pathway of incentives for researchers to build the scope and scale of their work and collaborative links with end-users.

The **Discovery Projects** scheme supports research by individuals and teams across a broad range of disciplines; builds the scale and focus of research in the national research priority areas; and supports research training to enhance Australia’s knowledge base and research capability. Research grants may be awarded for one to five years with grant sizes from Au$20,000 to Au$500,000 per annum.

In 2006, 917 projects were awarded a total of Au$273.6 million in the **Discovery Projects** selection round for funding. The average total grant size increased to Au$298,350, up from Au$282,030 in 2005. Figure 4 shows the average grant size and success rates for the period 2001 to 2006.
The Linkage Projects scheme funds collaborative projects between university researchers and collaborating organizations (including industry, government and community partners in Australia and internationally). Each year two selection rounds are conducted under the scheme, the first closing in May and the second in November.

Under the two selection rounds for funding commencing in 2006 a total of Au$114,217 880 was awarded to 400 projects at 33 universities across the country; 764 partner organizations from the private, government and community sectors pledged an additional Au$175 million in cash and in-kind support.

The majority of funding under the NCGP is allocated on the basis of peer review. Australian and international assessors (readers) assess proposals against selection criteria that include significance and innovation, approach, national benefit and researcher track record. These assessments are typically considered by the ARC College of Experts, comprising Australian researchers who are leaders in their fields.

In 2005–06 the ARC College of Experts made recommendations to the ARC Board which subsequently submitted its recommendations to the Minister for Education,
Science and Training for approval. Following the retirement of the Board, recommendations made by the College of Experts in 2006–07 will be forwarded to the Minister by the CEO.

**Grant Allocation Process**

The Panels of the ARC Research Grants Committee have two principal meetings annually to consider applications for research grants and fellowships. The first is in April and the second in August. Panel Chairs also meet in July.

The principal aims of the April meeting are to cull ineligible and uncompetitive applications and to assign assessors for the remainder.

The July meeting is to review the assessments, their number and quality.

The aims of the August meeting are to consider assessor's reports, designate successful applications and decide the level of funding for the grants.

**April meeting**

Prior to the meeting Panel Chairs designate two readers for each application, grant or fellowship.

- Readers are chosen by area of expertise rather than panel affiliation.

- Care is taken to avoid conflicts of interest. No panel member may act as reader for an application from their own institution or from anyone with whom they have any kind of association.

- Applications by panel members are dealt with by a separate independent panel.

Readers are expected at this stage to consider applications in sufficient detail to make critical assessments on quality and eligibility.

**First Meeting**

The objectives of the first meeting are to:

- identify ineligible applications;
• exclude uncompetitive applications; and

• choose appropriate assessors for the remaining applications.

Eligibility is measured against the guidelines and competitiveness, at this stage, judged on the strength of evidence provided by the applicants. The Research Grants panel is directed by the ARC to cull 30% of applications and the Fellowships panel is directed to cull 50%.

Fellowship applications are rated by a designated formula according to the quality of the:

1. applicant, (50%)

2. project, (25%) and

3. research environment and commitment of the host institution.(25%)

**Designation of assessors**

Assessors are designated by the panels based on

• nominations by the applicant,

• the panel members' own knowledge, or,

• consultation with the ARC Grants Application Management Scheme (GAMS).

GAMS is an electronic database used to facilitate all features of the grant process. It lists over 20,000 possible assessors and is accessible to all panel members throughout the assessment cycle.

Large Grant and Senior Research Fellowships applications are assigned seven assessors and Research Fellowship (APD, ARF, QEII) applications five. In all cases one applicant is chosen from the applicants' nominees.

**July meeting**

The sub-panel chairs meet at the beginning of July to review the quality of the assessors' reports. The aims of this review are to:
• identify problems such as breach of confidentiality,
• contact assessors who have failed to respond, and
• seek additional assessments.

A minimum of three useable reports is required. Since all assessors' reports, suitably edited, have to be forwarded to applicants for rejoinders prior to the second principal meeting at the end of August additional assessments are usually sought in haste from local assessors.

**August meeting**

The objective of the second meeting is to prepare final recommendations for funding of applications. Procedures for grants and fellowships are somewhat different.

Recommendations for grants are prepared in a three step procedure.

• Each panel is presented with a total budget.

• The panel ranks applications on the basis of assessments.

• The budget is distributed according to the ranking until exhaustion.

Panel ratings can differ from the average assessor ratings for several well-defined reasons, e.g., assessor reports which are clearly inconsistent with other reports are discounted, the opinion of assessors with an apparent bias, one way or another, toward the application are ignored, the rejoinders of the applicants justify modification of the ratings.

The final panel rating is determined by a 60% weighting for quality of the project and 40% for quality of the researchers, consistent with the interpretation of the assessors' reports.

The total number of fellowships is determined in advance. There are no quotas for particular disciplines. Selection is entirely on merit.

Recommendations for each category of fellowship are prepared in three steps;

• each discipline panel prepares a merit ranking
• the complete committee meets to arbitrate between panels and prepare a combined merit ranking

• Fellowship offers and reserves are decided according to the combined ranking.

The arbitration process for each category is in two steps

• a uniform quota from each panel's ranking is adopted,

• each panel then presents its two next best candidates and the committee decides relative ranking after extensive discussion. This procedure is repeated until the required number of candidates and reserves has been selected.

Other Evaluations Systems

Performance-Based Research Fund (PBRF) in New Zealand

"The purpose of conducting research in the tertiary education sector is twofold: to advance knowledge and understanding across all fields of human endeavor; and to ensure that learning, and especially research training at the postgraduate level, occurs in an environment characterized by vigorous and high-quality research activity” states the PBRF site in New Zealand.

The primary goal of the Performance-Based Research Fund (PBRF) is to ensure that excellent research in the tertiary education sector is encouraged and rewarded. This entails assessing the research performance of tertiary education organizations (TEOs) and then funding them on the basis of their performance.

The PBRF has three components:

• a periodic Quality Evaluation using expert panels to assess research quality based on material contained in Evidence Portfolios21;

21 Evidence Portfolios: Collection of information on the research outputs, peer esteem, and contribution to the research environment of a PBRF-eligible staff member during the assessment period that is reviewed by a peer review panel and assigned to a Quality Category.
• a measure for research degree completions; and

• a measure for external research income.

In the PBRF funding formula, the three components are weighted 60/25/15 respectively.

The PBRF is managed by the Tertiary Education Commission Te Amorangi Maturanga Matua (TEC).

The first Quality Evaluation was held in 2003. The second Quality Evaluation was conducted during 2006.

In the 2007 funding year, the funding allocated by means of the three PBRF performance measures is almost NZ$231 million (based on current forecasts) and is derived from 100% of the former degree “top up” funding, together with additional funding from the government totaling NZ$67 million per annum.

Performance in the 2006 Quality Evaluation determined the allocation of 60% of this funding until the next Quality Evaluation (planned for 2012). Overall, the PBRF will determine the allocation of approximately NZ$1.5 billion over the next six years.

Under the approach adopted, the maximum quality score that can be achieved by a TEO, subject area or nominated academic unit is 10. In order to obtain such a score, however, all the PBRF-eligible staff in the relevant unit of measurement would have to receive an “A” Quality Category. Given the nature of the assessment methodology adopted under the 2006 Quality Evaluation, and the very exacting standards required to secure an “A”, such an outcome is extremely unlikely.

The standards required for achieving an “A” Quality Category, as stated in the PBRF Guidelines 2006 and applied by the 12 peer review panels were exacting. Many staff who produced research outputs of a world-class standard did not secure an “A” because they did not demonstrate either the necessary level of peer-esteem or a contribution to the research environment to the standard required.

Two other factors also contributed to some high-caliber researchers receiving a “B” rather than an “A”:
a) The assessment period covered only six years. In some cases, major research outputs were produced just before, or just after, the assessment period, with the result that the researcher in question received a lower score for their Research Output component than might otherwise have been the case.

b) The Evidence Portfolios of some high-caliber researchers did not provide sufficient detail of their Peer Esteem and/or Contribution to Research Environment.

The PBRF funding generated by way of the staff who participated in the Quality Evaluation is determined by the Quality Category assigned to their Evidence Portfolios by the relevant peer review panel. These Quality Categories are then given a numerical weighting known as a “quality weighting”. The quality weightings used in the 2006 Quality Evaluation appear in Table 8.

**Table 8: Quality-Category Weightings**

<table>
<thead>
<tr>
<th>Quality Category</th>
<th>Quality Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>C(NE)</td>
<td>1</td>
</tr>
<tr>
<td>R</td>
<td>0</td>
</tr>
<tr>
<td>R(NE)</td>
<td>0</td>
</tr>
</tbody>
</table>

Four universities received 75% of the funding (Table 9)
Table 9: 2007 PBRF Indicative Funding

<table>
<thead>
<tr>
<th>TEO</th>
<th>Quality Evaluation</th>
<th>Research Degree Completions</th>
<th>External Research Income</th>
<th>Total</th>
<th>Percentage of Total PBRF Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Auckland</td>
<td>$37,442,726</td>
<td>$9,265,406</td>
<td>$3,153,591.00</td>
<td>$69,861,723</td>
<td>30.28%</td>
</tr>
<tr>
<td>University of Otago</td>
<td>$20,944,018</td>
<td>$9,502,337</td>
<td>$8,051,660.00</td>
<td>$38,498,022</td>
<td>21.02%</td>
</tr>
<tr>
<td>Massey University</td>
<td>$20,122,794</td>
<td>$9,964,081</td>
<td>$4,494,520.50</td>
<td>$34,581,396</td>
<td>14.99%</td>
</tr>
<tr>
<td>University of Canterbury</td>
<td>$14,460,664</td>
<td>$6,964,796</td>
<td>$1,958,693.38</td>
<td>$23,314,195</td>
<td>10.15%</td>
</tr>
<tr>
<td>Victoria University of Wellington</td>
<td>$13,492,715</td>
<td>$5,057,856</td>
<td>$2,123,526.75</td>
<td>$20,674,100</td>
<td>8.96%</td>
</tr>
<tr>
<td>University of Waikato</td>
<td>$8,840,939</td>
<td>$4,076,649</td>
<td>$1,910,509.13</td>
<td>$14,827,497</td>
<td>6.42%</td>
</tr>
<tr>
<td>Lincoln University</td>
<td>$4,323,681</td>
<td>$1,179,007</td>
<td>$2,110,640.75</td>
<td>$7,613,358</td>
<td>3.30%</td>
</tr>
<tr>
<td>Auckland University of Technology</td>
<td>$3,797,089</td>
<td>$1,042,030</td>
<td>$4,880,716.31</td>
<td>$5,328,345</td>
<td>2.31%</td>
</tr>
<tr>
<td>Unitec New Zealand</td>
<td>$2,154,291</td>
<td>$210,203</td>
<td>$775,689.67</td>
<td>$2,450,184</td>
<td>1.06%</td>
</tr>
<tr>
<td>Otago Polytechnic</td>
<td>$462,783</td>
<td>$83,185</td>
<td>$15,700.10</td>
<td>$567,688</td>
<td>0.24%</td>
</tr>
<tr>
<td>Waikato Institute of Technology</td>
<td>$335,576</td>
<td>$90,458</td>
<td>$53,158.25</td>
<td>$489,192</td>
<td>0.21%</td>
</tr>
<tr>
<td>Manukau Institute of Technology</td>
<td>$411,272</td>
<td>$0</td>
<td>$20,843.03</td>
<td>$432,115</td>
<td>0.19%</td>
</tr>
<tr>
<td>Christchurch Polytechnic Institute of Technology</td>
<td>$347,531</td>
<td>$0</td>
<td>$5,655.80</td>
<td>$353,187</td>
<td>0.15%</td>
</tr>
<tr>
<td>Christchurch College of Education</td>
<td>$192,109</td>
<td>$26,857</td>
<td>$7,683.17</td>
<td>$226,579</td>
<td>0.10%</td>
</tr>
<tr>
<td>Te Wānanga O Aotearoa</td>
<td>$170,794</td>
<td>$27,589</td>
<td>$10,560.64</td>
<td>$208,943</td>
<td>0.08%</td>
</tr>
<tr>
<td>Open Polytechnic of New Zealand</td>
<td>$141,503</td>
<td>$0</td>
<td>$45,348.50</td>
<td>$206,847</td>
<td>0.09%</td>
</tr>
<tr>
<td>Te Whare Wānanga O Awanarangi</td>
<td>$184,321</td>
<td>$0</td>
<td>$5,729.86</td>
<td>$190,051</td>
<td>0.08%</td>
</tr>
<tr>
<td>Whitecliff College of Arts and Design</td>
<td>$31,426</td>
<td>$117,880</td>
<td>$0.00</td>
<td>$149,306</td>
<td>0.06%</td>
</tr>
<tr>
<td>Eastern Institute of Technology</td>
<td>$147,566</td>
<td>$0</td>
<td>$910.48</td>
<td>$148,476</td>
<td>0.06%</td>
</tr>
<tr>
<td>Dunedin College of Education</td>
<td>$62,531</td>
<td>$33,441</td>
<td>$6,808.94</td>
<td>$102,753</td>
<td>0.04%</td>
</tr>
<tr>
<td>Nelson Marlborough Institute of Technology</td>
<td>$78,873</td>
<td>$0</td>
<td>$0.00</td>
<td>$78,873</td>
<td>0.03%</td>
</tr>
<tr>
<td>Whakatana Polytechnic</td>
<td>$58,753</td>
<td>$0</td>
<td>$5,341.92</td>
<td>$64,095</td>
<td>0.03%</td>
</tr>
<tr>
<td>Northland Polytechnic</td>
<td>$50,418</td>
<td>$0</td>
<td>$1,751.45</td>
<td>$52,170</td>
<td>0.02%</td>
</tr>
<tr>
<td>Aotearoa Polytechnic</td>
<td>$91,956</td>
<td>$0</td>
<td>$38,575.60</td>
<td>$55,531</td>
<td>0.02%</td>
</tr>
<tr>
<td>Carey Baptist College</td>
<td>$47,822</td>
<td>$0</td>
<td>$0.00</td>
<td>$47,822</td>
<td>0.02%</td>
</tr>
<tr>
<td>Bible College of New Zealand</td>
<td>$23,911</td>
<td>$6,360</td>
<td>$1,427.19</td>
<td>$33,699</td>
<td>0.01%</td>
</tr>
<tr>
<td>Bethlehem Institute of Education</td>
<td>$20,495</td>
<td>$0</td>
<td>$7,967.87</td>
<td>$28,463</td>
<td>0.01%</td>
</tr>
<tr>
<td>AIS St Helens</td>
<td>$20,495</td>
<td>$0</td>
<td>$0.00</td>
<td>$20,495</td>
<td>0.01%</td>
</tr>
<tr>
<td>Good Shepherd College</td>
<td>$20,495</td>
<td>$0</td>
<td>$0.00</td>
<td>$20,495</td>
<td>0.01%</td>
</tr>
<tr>
<td>Masters Institute</td>
<td>$0</td>
<td>$0</td>
<td>$0.00</td>
<td>$0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Pacific International Hotel Management School</td>
<td>$0</td>
<td>$0</td>
<td>$0.00</td>
<td>$0</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>$138,427,526</strong></td>
<td><strong>$57,679,137</strong></td>
<td><strong>$34,606,881</strong></td>
<td><strong>$230,712,544</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Research Outcome Awards in Taiwan

The National Science Council (NSC) is the major research funding source for university researchers in Taiwan. All full time faculty members of Universities, regardless of their disciplines, are eligible to apply for the Research Outcome Awards. The award is based on the review of the applicant’s research work which can be in the form of research articles, books, or reports for NSC funded research projects. The Research Outcome Award is stipend money which equals about NT$144,000 (US$4,500) and can go to successful applicants annually. The award is available to all researchers – junior and senior. Researchers can apply repeatedly for the award independently of their success the previous year. The average approval rate of this type of grant is approximately 65%.

The original purpose of establishing the Research Outcome Awards was to provide faculty members additional income besides the standardized salaries. Because of the openness of the Award and the fact that it is based on rigorous peer review it is considered to be prestigious and it is evidence of high quality research (Tien 2007). During 2001 the award has been combined with the NSC Research Projects Grant. Researchers have the option to apply only for the award on the basis of their past research portfolios or for project funding and the award on the basis of research proposals and previous research performance.

The National Researchers System (SNI) in Mexico

Since the 1980s, the Mexican government has taken steps to strengthen quality assurance at the higher education sector. This has been the result of the financial crisis of the 1980s. The crisis caused a 50 percent decline in the purchasing power of faculty salaries, forcing many qualified academics to quit their jobs or to take on additional employment. This resulted in severe staffing problems and deterioration in teaching conditions at a time of increasing enrollments. This led to public concerns and government demands for improving the quality of higher education.

Mexico has initiated several quality assurance approaches for its higher education system since then. In the public sector, institutions have had some form of internal review since the early 1990s, initially through annual self-assessment and later through more detailed institutional development plans. At the same time, mechanisms for external evaluations based on external peer reviews of academic programs have also been put into place. In several professional specialties, accreditation councils have also been established.

An important monitoring system includes a statistical reporting system--designed to offer overall planning and evaluation information. Similarly procedures have been introduced for evaluating individual academics--in both research and teaching--and standardized examinations of student knowledge and skills have been developed.

In the 1980s, Mexico developed a National Researchers System (SNI), whereby individual academics are evaluated for their research productivity and are given recognition as well as monetary rewards. This system, developed initially as a way to supplement the wages of highly productive academic staff, had an important early impact nationwide on Mexican higher education.

SNI is administered by the National Council on Science and Technology (Conacyt). Conacyt is the most important public organization in the country promoting and supporting science and technology activities. It reports directly to the President of Mexico and is responsible for coordinating, orienting, systematizing and promoting scientific and technological activities.

The SNI identifies two categories: Candidates and Researchers. The first category is made up of students in the last year of their doctoral studies and students who have recently completed their doctorates.

The second category -- researchers -- is divided into three levels. The first level includes researchers with doctorates who have already demonstrated their productivity and are involved in innovative, high-quality research projects. The second level is made up of researchers who have consistently carried out research recognized for its originality, whether as an individual or as part of a group. Finally, the third level is reserved for researchers who have made important contributions to the fields of science or technology, the value of which has been recognized by the
national and international academic community and who have also done outstanding work as educators at the highest level.

In all cases, the SNI provides some degree of economic support to beneficiaries that allow them to devote themselves full-time to their work in science or technology, without having to become distracted from this fundamental task. Benefits are multiples of the official minimum salaries, graded according to level and are tax free\textsuperscript{23}.

The SNI classifies its researchers into four knowledge areas:

- Area I, physical and mathematical sciences;
- Area II, the biological, biomedical, and chemical sciences;
- Area III, social sciences and the humanities; and
- Area IV, engineering and technology.

Only a small proportion of Mexican academics, 3 percent of the total number and about 10 percent of the full-time faculty, are part of the SNI system. The National System of Researchers has 6,356 members.

Selection occurs through a peer review system and maintaining membership is based on continuing productivity. Membership in the SNI system confers prestige in addition to providing more income. Recent justification for the establishment of the SNI system is the fact that it encourages the best Mexican academics to remain in Mexico.

Discussion and Recommendations

This document outlines a number of approaches used for the support of academic research and development internationally. While each country has its own peculiarities and preferences certain issues have universal validity. For example the use of peer review is universal; the quality of the past work of the candidate is an important criterion in the award of grants internationally; the size of grant determines the extent of peer review; the requested amounts are rarely reduced by the granting institution etc.

If we wished to summarize, the identified international “good” practice is based on the following rules:

4) Past performance is an integral part in the assessment of “expected” performance of research activities. The same way that in other domains in life (e.g. sports) the odds favor those with good past performance, research funding bodies internationally (all countries we investigated), take cognizance and weigh past performance of researchers when they decide where to invest their limited resources.

5) Rating and rewarding individuals for past performance is an approach used internationally (e.g. Mexico, Taiwan, New Zealand) in order to promote excellence in research; retain skills in the research environment and avoid brain drain.

6) Peer review is used internationally for the assessment of research activities. However, peer review is not without its shortcomings: it is dependant on the choice of peers and it has associated organizational and social costs. Research funding bodies internationally optimize peer review by taking cognizance and limiting social costs (small grants do not need full proposals and they don’t go for peer review) and by attempting to use the best possible peers.
Below we discuss a number of issues which are relevant to NRF:

**The NRF Rating System**

The NRF rating system has been the subject of discussion and debate since its inception. Currently rated researchers qualify for longer duration funding (only in certain NRF programs) and proposals of rated researchers are not sent to peers for review but are discussed directly by the relevant panels. In the university environment the rating system is utilized as an indicator of researchers’ quality and a number of institutions base their promotions, performance bonuses and salaries on the researchers’ rating by the NRF.

Often it has been argued that the NRF rating system is “novel” and hence it does not comply with international standards. As we have outlined in the previous section a number of countries (i.e. Mexico, New Zealand, Taiwan and for relatively small grants in the USA, (SGER)) utilize similar approaches as policy instruments aimed at promoting and supporting excellent research in their countries or in order to minimize the relevant social costs. Furthermore the quality of the applicant is an important factor in all funding decisions. In Australia the National Competitive Grants Program allocates 50% of weight for funding proposals on the quality of the applicant. Similarly the NRF rated researchers’ proposals do not go through to peer review but are adjudicated directly in the panels.

Probably the major difference between the South African approach and those followed abroad is that the South African system in its evolution has lost its direct linkages with NRF funding.

In the South African context the rating system has the potentials to become a powerful policy instrument by linking financial support to it. For example, rated researchers could receive research funding depending on their rating without having to prepare research proposals. The automatic grant could vary depending on the researchers’ scientific discipline and the county’s priorities. In a possible variation of such a system researchers could have the opportunity to refuse the automatic grant in advance and follow the normal NRF process if they believe that they could raise more funds this way. However, they should not have the opportunity to reverse to automatic grant during the particular year.
Such an instrument will have the potentials to provide incentives to excellent researchers to remain in the country or foreign researchers to move into the country (similar to the efforts in Mexico and Taiwan). In addition the instrument will provide incentives to researchers to aim towards excellence and will contribute towards making the academic profession a desirable objective for students. Furthermore such an approach has the potential to reduce the social costs of funding research in the country by not requiring researchers to write proposals (or requiring short proposals) in order to receive funding (see Accomplishment Based Renewals and Creativity Extensions in the USA).

**Size of grants and social costs**

As we have discussed the award of grants creates a number of costs. These include administrative costs, reviewers’ related costs, cost to prepare the proposal, etc. Similarly grants are expected to bring certain benefits to researchers and society at large. Obviously the size of expected benefits should be larger than the expected costs in order to justify such a complex undertaking.

A recent investigation\(^2^4\) of the effectiveness and efficiency of the peer review system, as it is used by the research councils in the UK, identified that the total cost of assessing the average research proposal was just below eleven thousand pounds (approximately $22,000) with the major cost component being the initial preparation of the proposal by the researchers (82%).

Table 10 shows the average size of grants in South Africa, USA, UK and Australia.

**Table 10: Size of Average Grants in South Africa and Selected Countries**

<table>
<thead>
<tr>
<th>Country</th>
<th>Size of Grant (local)</th>
<th>Size of Grant(^2^5) (US$)</th>
</tr>
</thead>
</table>


\(^{2^5}\) Recent exchange rates have been used for the conversion to US dollars. We also considered the conversion with the use of purchasing power parities (PPP). In such a
It becomes apparent that the average South African grant is one tenth of the value of grants in the other countries. More importantly however, if we assume that the social costs of funding research are the same internationally, the value of the South African grants is below their estimated costs (US$22,000). The consequences are obvious. Under current conditions South African researchers do not have a financial incentive to stay in the country and foreign researchers do not have an incentive to consider coming to South Africa. Moreover the current granting system constitutes a disservice to the country by engaging researchers (opportunity cost) to prepare applications (82% of the cost) which subsequently will not bring the desirable results/benefits because the funding remains sub-critical.

While the obvious recommendation is the increase in the size of grants an additional approach which should be considered is to drastically reduce the social costs involved in preparing applications. Precisely for these reasons, the NRF does not send the proposals from rated scientists for peer review. However, the major cost (82%) is locked up in the writing of proposals. NRF should seriously consider supporting the research of rated researchers without requesting research proposals. Researchers, for example, should have to submit only their annual research outputs in order to receive continuation of their funding (see USA approaches).

**Success/Failure Rates**

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case the value of the average South African grant is approximately the equivalent of US$ 44,000. It is debatable though that PPP conversion if the appropriate approach. Research is an international activity, many researchers live in more than one country; scientific equipment is priced internationally; researchers abroad use market exchange rates to compare countries’ desirability and so on.
The success/failure rates of applications are also of policy interest. High failure rates in the application process create substantial costs which have to be recovered by the successes in the small number of projects which are eventually supported financially. The success rates are as follows: South Africa 50%; USA 25%; UK 28% and Australia 25%.

Success rates at DFG in Germany range between 46% and 51% depending on the discipline. Reported rates in Austria (37.7%) and Switzerland (62%) are also higher than in USA and in UK. By contrast, in 2004, Norway (at 10% in its division of science) and Finland (19%) had relative lower rates. In Canada, NSERC has a high success rate by number (75%) in their Discovery Grants programme reflecting a practice of funding many grants but at a reduced level of resource. The success rate in NSERC by value is much lower than it is by number, although at 43% it is still relatively high. In general however, success rates across many of these organizations have been declining26.

South Africa has a relatively high success rate in comparison with the other countries.

It should be emphasized that a high success rate is beneficial in a research system only if the criterion of minimum size of grant is satisfied. If the size of grants is sub-critical no project will be completed successfully and society will not be able to benefit from the research undertaken.

The Research Councils UK (2006) report argued that success rates above 25% are adequate and that lower percentages may make the system unstable. Obviously NRF should consider reducing the applications’ success rate in order to increase the size of grants. Even then however, the grants will not be comparable with those offered abroad. NRF should appeal to government to increase the size of its budget related to grants.

Proposal Assessment for Funding at NRF

We already have discussed the small size of grants at the NRF. An additional concern is related to the approach that is followed in deciding which projects to be funded and to what extent. Both issues underpin the fairness and transparency of the process.

The current process of asking peers to express an opinion on the proposal and then a panel consisting of different experts assessing the peers’ reports creates a conundrum. The applicant not only runs the inherent danger that the chosen peers are not appropriate, are biased, have conflicting opinions etc., but also that, even though the peers are supportive of the proposal, the panel may ignore the reviewer reports on the basis that the peer did not write an extensive justification or that his arguments were not convincing. It is debatable whether a peer (particularly a good researcher) will have the time to act as referee for a proposal and at the same time will spend additional time to present his opinion in a way that a panel will find to their liking. It can be argued that only researchers with vested interests and with intimate knowledge of the NRF system will spend the necessary time to write a convincing reference. However these are the characteristics that are not desirable for a peer review system.

Similarly it is interesting to outline the experience of a researcher who argued that the review document of an international leader in the field (in the focus areas program) was discounted (on the basis that the report was not detailed) while the opinion of an unrated junior local researcher was accepted and her proposal was not funded. The approach of assessing the reviewer reports as well as putting all opinions (of international researchers and local junior researchers) at the same level is questionable. Reviewers should be chosen for their scientific expertise and they all should be of the same scientific quality. It is not valid to ask the opinion of a junior researcher and of a Nobel prize winner and average their opinions. Care should be taken to choose good quality reviewers in advance. When their responses are received they should be valued as being of equal importance.

The international experience indicates that the opinions of peers are accepted at face value (unless there is conflict of interest which is supposed to have been identified in advance) and in a number of cases there is a grading list for the grading of the proposal. Officials of the funding bodies average the opinions of the peers and they rank the applications. When panels are utilized, they usually consist of the original
peers who have already read and assessed the proposals and the effort is to reach consensus. This way double jeopardy is avoided.

The small size of the NRF grants also suggests that two-stage approach creates substantially more social overheads which are not justifiable. As we have discussed, in the USA officials of the NSF have the power to allocate funds without peer review up to US$200,000 in a number of programs. NRF could similarly empower its officials to make decisions on the basis of the peers’ comments and grades.

The issue of the approach that is followed in order to reduce the size of the grants is also of policy importance. Fairness and transparency dictate that the approach followed in the allocation of resources should be known in advance and should be taken by the highest authority within the organization (probably the Board). In the majority of the countries we examined the amount requested is sacrosanct.

If there are funding items that should not be included in a proposal (e.g. because they can be requested from other sources) this should be stated in the terms of reference of the proposals. Similarly across the board cuts penalize the researchers who state their needs fairly and benefit those who over-inflate their requirements. Even cuts according to ratings (proposals with higher rating receive smaller cuts) do not make sense. Either the researcher receives the funding that he/she requires in order to perform the task that he/she proposes to do or she does not. The offering of a grant less than the requested amount will mean that the researcher had over-inflated the original proposal or that he/she will not perform the activities as were assessed originally (hence he/she will do a different project which has not been evaluated) or that the project will never be completed because of unavailability of funds.

Finally the issue of the quality of the individual researcher using as a criterion for funding proposals should be emphasized. The current NRF criteria understate the importance of the past performance of the applicant. As we have discussed, the quality of the applicant is an important criterion used internationally. NRF should make sure that indicators of past performance are explicitly included and weighted in proposals of non-rated researchers.

Based on the above we recommend the following:
• The Researcher Evaluation and Rating System should be utilised to its full potential to meet the country’s research needs. Rated researchers should receive automatic funding. Such an approach will substantially reduce the social costs of peer review and will make the research environment and the NRF system more appealing locally and abroad.

• NRF should appeal to the Department of Science and Technology for additional funds to augment the size of its grants. The Focus Areas Program should be augmented by at least an additional amount of R200 million a year in the short term. It is doubtful that the national S&T objectives can be achieved as long as the NRF grants remain sub-critical.

• The approach of reducing the size of the requested grants should be phased out. The NRF guidelines should be clear on what are the supported expenditures. Maximum amounts should be stipulated in advance so that researchers can formulate their proposals within the available budget.

• NRF should consider simplifying the approach utilized for the evaluation and funding of research proposals by unrated researchers. Peers should be chosen carefully and their opinions should be accepted at face value. A grading approach, including assessment of the candidates’ past performance with a considerable weight, could further facilitate the system. NRF officials should be empowered to make the final decisions on the basis of the peers’ recommendations and grades. Such an approach will resolve the issue of double jeopardy and will reduce the social costs of peer review.

Appendix 1: Information Requested from NRF

• Please provide a brief description of the process followed a) for the evaluation and rating of researchers and b) the award of funds (e.g. through the focus areas program)

• What the criteria for evaluation of a) researchers and b) proposals that you utilize (suggest to your referees and panels)?
• How many proposals did you received per year for the period 1996-2006 a) for individuals’ rating and b) for funding? (indicate actual number of proposals received and total funds requested)

• How many proposals did you fund per year for the period 1996-2006 (indicate actual number and total amount funded)

• How many proposals were fully funded per year over the period? (i.e. the amount awarded was within 10% of the requested one)

• Please indicate the average size of the proposals (funded amount) per year over the period.

• What was the programmatic budget per year for the period 1996-2006 (indicate funds available for agency purposes (available for disbursement) and administrative costs - indicate overhead costs directly related to the programs and indirect costs as well)

• Do you assess the quality of referees (e.g. quality, seniority, expertise) before you ask for assessments? If yes how do you do it?

• What is the percentage of foreign peers used per year over the period?

• Do you benchmark your activities with those of similar organizations abroad? If yes with which ones? how are you doing it (please describe)

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