

Inside the Black Box

Research Grant Funding and
Peer Review in Australian
Research Councils

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ABSTRACT

This thesis considers the effects of research funding process design in the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC). The program delivery mechanisms that the ARC and NHMRC use differ in detail and each council claims to be using the best selection model possible. Neither council provides evidence that peer review is the best possible way of delivering government funding for research and neither can produce empirical evidence that they use the best possible peer review model to determine excellence.

Data used in this thesis were gathered over several years, forming a comparative case study of the Australian Research Council and the National Health and Medical Research Council, with illustrative data from comparable international organizations in the UK and USA. The data collection included: a survey of applicants, semi-structured interviews with experienced panel members and former staff, observation of selection meetings, and examination of publications by and about the research councils.

Researchers firmly believe in peer review and their confidence enables the system to function. However, the mechanisms of grant selection are not well understood and not well supported by applicants, who criticize the processes used to assess their work, while supporting the concept of peer selection.

The notion of excellence is problematic; judgements of excellence are made within frameworks set by the research councils and vary across disciplines. Allocation of research funding depends on peer review assessment to determine quality, but there is no single peer review mechanism, rather, there exist a variety of processes.

Process constraints are examined from the perspectives of panel members, peer reviewers, council staff and applicants. Views from outside and inside the black box of selection reveal the impacts of process design on judgements of excellence and decision-making capacity. Peer reviewers in selection panels are found to use a range of differentiating strategies to separate applications, with variance evident across disciplines and research councils. One dominant criterion emerges in both the ARC and NHMRC processes, track record of the applicants.

Program delivery mechanisms enable and constrain selection but every peer panel member has to make selection decisions by defining discipline standards and negotiating understandings within the panel. The extent to which peers can do this depends on the number of applications assigned to them, the size of the applicant field, and the processes they have to follow. Fine details of process design, panel rules and interactions are the tools that shape funding outcomes.

Research councils believe they are selecting the best, most meritorious proposed research. However, I show in this thesis that the dominant discriminator between applicants in Australian selection processes is track record of the applicant. This effect is the result of several factors operating singly or in concert. Researcher track record, largely determined by quality and number of journal publications, is considered to be the responsibility of universities but support for this capacity building has not been systematically provided in Australian universities.

Reliance on track record to determine the outcomes of all but the very best applications is very like awarding prizes for past work and is significantly different from the models of grant selection that operate in comparable international research councils.

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ANAO	Australian National Audit Office
ARC	Australian Research Council
CEO	Chief Executive Officer
CI	Chief Investigator, or researchers named on a grant application
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEET	Commonwealth Department of Employment, Education, and Training
DEETYA	Commonwealth Department of Employment, Education, Training, and Youth Affairs
DEST	Commonwealth Department of Education, Science, and Training
DP	Discovery-Projects, ARC
EAC	Expert Advisory Committee, ARC
EPSRC	Engineering and Physical Sciences Research Council
G8	Group of Eight (universities in Australia)
GAMS	Grant Application Management System, ARC
GRP	Grant Review Panel, NHMRC
LP	Linkage-Projects ARC
Minister for Education	Commonwealth Minister for Education, Training, and Youth Affairs, and other combinations of portfolios incorporating Education.
NCGP	National Competitive Grants Program, ARC
NHMRC	National Health and Medical Research Council
NSF	National Science Foundation
PG	Project Grants, NHMRC
RC	Research Committee, NHMRC

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The most important sources of information for this thesis are interviews with past and present staff and panel members associated with one or more of the research councils. They must remain anonymous but I extend my sincere thanks to all of them. The lucid, insightful analyses of selection processes by both panel members and staff provide a wealth of fascinating material.

A very important contribution to this work came from over 200 unknown applicants for funding who responded to an internet based survey. These people provided valuable data and observations about funding processes and their impact on the research community. The staff of research offices in universities, medical institutes and other research organizations disseminated the survey information and pursued their research community to respond. Thank you for participating and supporting this research.

Early in this research I was fortunate to visit several international research councils and my thanks go to the dedicated and helpful staff who provided me with information, time and resources. Firstly, in New Zealand, I was assisted by the professional staff of the Foundation of Research Science and Technology, the Marsden Fund, and the Health and Medical Research Council. Secondly, in the USA, staff of the National Science Foundation were very generous with access to resources and enabled observation of a selection meeting. Particular thanks are extended to Wayne van Citters at NSF, who opened doors. Thirdly, in the UK, staff of the Economic and Social Research Council and the Medical Research Council provided insights into the subtleties of their systems. At the

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This thesis is dedicated to the memory of my father,

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1 INTRODUCTION

Competitive research grants have a powerful effect on individual research careers, universities and on what research is conducted. This form of research funding provides the basic resources vital for the conduct of research and then attracts further funds through government block funding mechanisms and private sources. Academic careers and institutional reputations are made through success in winning grants; effectively, public money purchases academic freedom (Donovan, 2001). In Australia there are many funding sources for research, however, the bulk of funding for university-based research is obtained from prestigious nationally competitive grants, public sector funding which includes programs administered by the research councils. Grant applications, selection processes and their consequences are the focus of both criticism and support from the research community, as applicants, reviewers and panel members.

What happens inside research council selection processes is called the “black box” of peer review (Chubin and Hackett 1990). It exists in the spaces between public guidelines, applications and grant decisions. Participants working inside the box are sworn to secrecy, decisions are not subject to review and processes seem to interact with both stated and unstated rules of operation. Examining the contents of the black box will provide an evidence base for policy decisions about the organisation of research grant peer review and administration.

Researchers in Australian universities and medical research institutes rely upon competitive research grants won from the Australian Research Council and the National Health and Medical Research Council. These funding bodies operate as public service bodies; the National Health and Medical Research Council (NHMRC) as part of the Department of Health and Ageing until 2006 and since as an independent authority in the same portfolio, and the Australian Research Council (ARC) as an independent authority in the portfolio of Education, Science and Training since 2001. Both the ARC and

the NHMRC deliver research funding through application based peer review mechanisms and both claim excellence as the primary objective and outcome of their funding.

The program delivery mechanisms that the ARC and NHMRC use differ in the detail and each claims to be using the best selection model possible. Neither agency provides evidence that peer review is the best possible way of delivering government funding for research and neither can produce evidence that they use the best possible peer review model. However, peer review is systemically embedded, as research into the operation of grant selection in the US National Science Foundation (NSF) found more than a quarter of a century ago:

Peer review provides a kind of dialogue between the NSF and the scientific community concerning what science should be supported, and it has also come to symbolise for many scientists the orderly and critical debate that is necessary among qualified scientists if there are to be reliable judgements of scientific merit. (Cole and Cole, 1981, p54)

This thesis explores the relationship between selection process design, peer participation in review and peer judgements about excellence. Peer review models, processes and methods of delivery used by the ARC and the NHMRC to fund research will be examined and analysed. They will be compared with the practices used by research funding agencies in England and the United States of America. Examination of funding delivery mechanisms will include data gathered from interviews, observation, written records and surveys.

Research funding through research councils is new in the history of funding for science or invention. The current funding delivery models provide a screen for older concepts, which remain important. Funding for research purposes may be seen as a form of patronage, whether by individuals or the state, delivered as support for work promised, or more commonly until the mid-twentieth century, as prizes for accomplishments. Research council

grant funding is based on the promise of work to be performed (Turner, 1990b). This contract involves a level of trust on the part of the patron, trust that the researcher must work to maintain. Patrons, unable to measure the value of the whole research activity tend to look to its component parts for indicators of reliability and quality (Turner, 1990). Examinable components include such things as annual reporting and budget control, matters which are outside expert scientific opinion. To evaluate the scientific or research quality, governments require specialist assistance.

The current model of supporting research through government bureaucracies designed to handle state patronage emerged in the second half of the twentieth century (Rip, 1993). Participation of scientists in the allocation of funds was at first limited to consultation with senior members of the community but was varied to a form of peer review to overcome “resistance of the medical establishment” to the National Institutes of Health in the USA (Rip, 1993). Peer review, or “this higher form of nonsense” (Ziman, 1983, p3) was a creation of government organizations that required legitimate advice to allocate funding for research. Rip argues that over time the councils became the captives of the community they served and that this “conditional self-patronage” impacted on the ways that research was conducted (Rip, 1993).

The notion that decisions about spending should be made by researchers rather than politicians stems from British research policy developed early in the twentieth century and the Haldane Report in 1918. The autonomy experienced by research councils, largely free from political and administrative influences that could discourage certain kinds of research, is known as the Haldane Principle. That principle has been criticized for creating artificial divisions between university-based research and research applied to social needs (Duffy, 1986). However, the Haldane Principle remains an underpinning of research policy, not only in Britain but to a large extent in Australia, despite several forms of intervention by Education portfolio Ministers under the Howard Government from 1996 to 2007.

Peer reviewers act as mediators between the patron (the state) and the scientist. Specialists who can attest to the merits of the proposal make judgements about the quality promised and the applicant's potential to achieve those promises. Research councils were established to provide the specialist expertise that governments need to deliver and assess the value of research and to provide a distance between the government and decisions about research selected for funding.

Relations between government funders of research (patrons) and researchers can be seen as a relationship between principal and agent, as posed by Van der Meulen (1998). In this model the research councils (foundations, boards, institutes) that were created in Europe, the USA and Australia during the twentieth century are seen as intermediaries delivering research funding to agents (researchers or research institutions), and undertaking quality control. Unlike the prizes model of research patronage, research councils have delivered funds based on the promise of quality contained in proposals for research and used peer review as the primary predictive measurement device. The strength of the relationship between the peer reviewers and the council as intermediary can have an impact on the cost of the process as data about the ARC and NHMRC arrangements will demonstrate. In the case of the NHMRC, the intermediary (council) is closer to agents (researchers) than it is to the principal (government) and the organisation incurs higher administrative costs than the ARC, which has fewer researchers involved in its decision-making bodies.

Peer Review

Peer review is a core of academic life, underpinning academic promotion, publication, research funding and research quality assessment exercises. It determines success, creates ranks and allocates resources, yet it is a little understood process, often shrouded in mystery, an almost religious mystique (Goldbeck-Wood, 1999). The participants, rituals and customs,

including the base criterion of excellence vary over time and by community (Chubin, 2002). The concept of a peer as an equal is used broadly in peer review process design. Peers include experts in the field of research, generalists in a discipline, senior researchers who work in multiple disciplines and even consumers of research. A peer reviewer may be simultaneously an applicant, a reviewer, a panel member, and a performer of research. The social interactions of research create a complex web of entanglements (Chubin, 2002).

At the simplest level, peer review consists of experts advising on the worth of proposals for funding or on scholarly articles for publication. In the case of publications, peers make judgements about the work completed, from research design to presentation of findings, and this process is intended to provide a gate-keeping function for quality and reliability. Peer review of research funding has a predictive function, with peers making judgements about the work proposed, the proposers, and other matters deemed relevant selection criteria by the funding body. Leaders in research communities make judgements of quality and worth about others in their field, bestowing legitimacy and recommending funding.

Peer review has been the subject of many studies and theories about such matters as quality control, hierarchies, old boys' clubs, gender bias, the Matthew effect, institutional bias, and more (Cole, 1981, Chubin and Hackett, 1990, Kostoff, 2002, Harnad, 1982, West, 1998, Bazeley, 1998, Wood, 1997, Godlee, 1999, Lamont, 2005). However, there has been little comparative work across research councils or discussion of the variety of ways that research councils operationalise peer review. Peer review can take many forms and research councils select the process they believe will provide them with some level of quality control over the outcomes from funding they offer. The type of peer input they choose ranges from multiple external assessors moderated by peer panels to panel only assessments. The ways that those decisions are made, the roles of peers in the process, how

processes are operationalised and their impact, form the stories at the heart of this research.

The process for obtaining expert opinion and identifying merit varies between different models of grant selection. Some key variants evident in published advice from research councils include:

- Process of managing applications, from submission to outcome.
- Criteria for excellence are formally specified in some programs, but it is not clear how and whether these principles are used.
- Other models of selection for government funding give decision-making power to bureaucrats, some with advisory input from peers.
- Within funding programs moderation procedures for external assessments operate differently in different disciplines.
- Interaction and process rituals within panels may be structured by the funding body or not specified.

Participant reviewers and panel members in selection processes have very different workloads, depending on process design. Workload has an effect which may be more significant than the much discussed limits to peer review arising from chance in selection of reviewers and most forms of bias. Large workloads require panel members to adopt models of evaluation that enable speedy assessment, or as much excellence as can be detected in the compressed time available (Interview 1).

Excellence is a problematic concept. Assessment of research is not value free and basic research is particularly difficult to evaluate, with time lags from 10 to 50 years from discovery to uptake of research results. Use of peer review evaluation by research funding agencies is intended to ensure that judgements are grounded within the standards of the discipline and that best research, whether “blue sky” (basic, discovery) or applied, is supported. However, judgements of excellence, described as polymorphic by Lamont (2009), are made within frameworks set by the research council and contextualised by the reviewer; who brings his or her own views, prejudices

and personal conflicts to the task. The successful growth in success as judgements draw on track record in publication and recognition and the resources supplied by research grants enable more publications and recognition.

A meta-analysis of studies of peer review of grant applications, by Demicheli and Di Pietrantonj (2002) for the Cochrane Collaboration found “little empirical evidence on the effects of grant giving peer review”. That study recommended that research be conducted urgently to assess “the effects of grant giving peer review on importance, relevance, usefulness, soundness of methods, soundness of ethics, completeness and accuracy of funded research” (p2). While this thesis does not attempt to answer the questions raised by the Cochrane reviews, it does assess structures, models and processes used by research funding agencies and peers to reach funding recommendations. Constraints of funding, numbers of volunteer reviewers and government frameworks are managed by funding agencies in a variety of ways as they seek to produce funding outcomes that applicants and funders can live with. While excellence is the stated goal, a capacity to carry out research that is original, innovative and at the research forefront (Luukonen, 2006), proof of excellence is elusive at the promissory stage, when assessors, agencies and governments attempt to foresee the consequences of funding particular grant proposals.

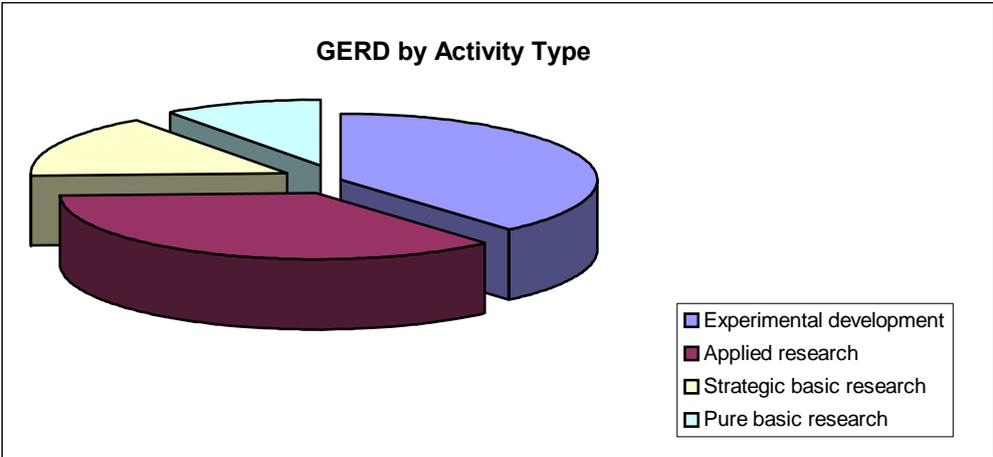
The Australian Funding Context

Research is joined with development in economic and public administration analyses and the mix includes private and public expenditure and activity across the full cycle of research from basic to applied. Politicians and bureaucrats in Australia speak of economic and social progress derived from a knowledge-based economy, depending on a vigorous national innovation system for future value creation and competitiveness. The national innovation system comprises the institutions, people and processes involved in creating, sharing and using new knowledge and all of the interactions between these elements (Allen, 2003).

The Australian innovation system consists of four broad sectors; higher education institutions, private business enterprises, government research organisations and private non-profit organisations. In 2002-2003 48.3% of gross expenditure on research and development funding was provided by the Commonwealth Government, largely to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and university sector. People working in research and development are located primarily in higher education institutions (47.6%) and government organisations (17.8%), while businesses held 31.6% of the human resources devoted to the research and development sector (Australian Bureau of Statistics, 2004). This funding distribution demonstrates a significant dependence on government funding to support the research and development workforce in Australia.

Research expenditure is classified according to notional stages of research activity from early explorations, termed basic or discovery or blue-sky research, to product development. The Australian Bureau of Statistics (ABS) classifies national research and development expenditure into four areas, experimental development, applied research, strategic basic research and pure basic research. Figure 1.1 shows the distribution of national gross expenditure across those areas in 2002-2003.

Figure 1.1: Gross Expenditure on Research and Development (GERD) in 2002-2003 by activity type.



(Australian Bureau of Statistics, 2004)

Funding for research in Australia is heavily dominated by government sources. In 2002-03, the higher education sector accounted for 78.6% (\$975m) of expenditure on pure basic research and 42.2% (\$803m) of expenditure on strategic basic research and was the main contributor to each of these activities. The business sector accounted for 35.2% (\$1,540m) of expenditure on applied research and 85.5% (\$4,040m) of expenditure on experimental development activity. (ABS, 2004). The Commonwealth Government funds research and development through its research agencies (such as the CSIRO and the Australian Institute of Marine Science), various Government department programs, the Rural Research and Development Corporations, block grants to universities, and the research funding agencies, the ARC and the NHMRC.

Another way of considering funding sources is the type of activity being supported. Matthews classified Government expenditure on R&D by mode of delivery as summarised in Table 1.1.

Table 1.1: Modes of delivery of science and innovation support.

Type of Funding	Description
Peer-reviewed competitive grants	Academic grants awarded largely on the basis of peer-review procedures. The main demarcation criteria are that selection is made largely or exclusively on the basis of excellence and that the proponent defines the problem, not the funder.
Other competitive grants and loans	All other competitive grants and loans for which there is no over-arching statement of specific objectives as regards the precise objective of the project. This category is intended to cover industry and sector-specific programs for which bids for support are selected partly on the basis of problem definitions put forward by the proponent(s).
Competitive tenders against pre-defined objectives	Funding via competitive tenders against tightly specified objectives. The main demarcation criterion is that the 'problem definition' is not made by the proponent but by the funder.
Mission-driven block grants	Funding delivered via block grants associated with defined missions and in which the recipient organisation is then responsible for internal allocations of this funding and the use of existing assets.
Formula-related block grants	Block grants for which the distribution of funding between competing recipients is determined fully or to a large part (i.e more than 50 percent) by a formula or formulae.
Tax concessions and other subsidies	Tax concessions and other subsidies that characteristically offset the risk faced by an organisation able and willing to commit its own resources to the project.

(Matthews, 2003)

The most prestigious competitive grant funding for research in Australia is provided by the ARC and the NHMRC and this falls primarily under the first two categories above, peer reviewed and other competitive grants. The NHMRC also offers competitive research funding against funder-defined research questions as part of its strategic research activities, which focus on matters of national importance, such as the consequences of a pandemic.

Funding is provided by the Commonwealth Government through annual budget cycles and major increases in allocation have historically been linked to formal reviews. Funding success is not only a factor of the quality, or excellence, of an application but also of the size of the field of applications. The total pool of Government research funds in Australia is more than one billion dollars, but funding availability has not kept up with significant

increases in demand for funding, particularly the prestigious grants by research councils. Furthermore, a focus on management accountability and academic performance measures in higher education and research bodies has increased the importance of external sources of affirmation such as peer reviewed grant funding. In this climate, researchers are compelled by pressures of competition to seek maximum allowable funding awards, placing greater demand on the funding bodies. This widening gap between demand and supply increases the difficulties in grant selection. Decreased success rates blur the line between the best and the rest so that distinguishing between them may be greater than the resolving power of human judgement (West, 1998). One experienced panel member described funding rounds with lower than 40% success rate as having too much noise at the margin, creating trouble for selection systems (Interview 5).

In this climate of highly valued grants and highly competitive funding a spotlight on processes used to select recipients is timely. Peer review as a part of process design in the NHMRC and ARC is largely unquestioned. However, there are questions raised in the literature about the impacts of peer review. There are also variations in the way peers operate inside the various funding mechanisms and agencies and issues about the organization of bigger funding structures. There is no particular evidence that any one model produces better outcomes for the funding agencies or the researcher applicants. Is funding being allocated in optimum processes, both for outcomes and administration? How are selection processes designed and controlled and can patron funders ensure that grants are not corralled by an elite? Outcomes from investigator initiated basic research typically take 10 to 50 years to appear. This makes assessment of the quality of selected applications a very long-term matter. Therefore, it is essential that funding bodies use administrative processes and review mechanisms that are robust, effective and conducive to supporting the best research.

Relationships between grant selection processes and how peer panel members reach decisions about excellence are explored here. Perspectives of,

and interactions between, major participants in funding councils are considered. Data were collected from applicants, peer panel members and assessors, and research council administrative units in Australia, the UK and USA. These data provide information on the nature of the administrative structures used in four research councils and the policies that govern how applications are considered. Panel members inside council selection processes illuminate the workings of these processes, shedding light on the black box metaphor used by many applicants to describe application review. Applicant experiences add further understandings about research funding processes and university policies, particularly in relation to capacity building.

Thesis Structure

A review of literature on peer review, research funding and research council processes follows in Chapter 2. Key themes and unresolved issues are explored. This chapter will draw connections between this project and the work that has been done before, highlighting points of connection and difference.

Chapter 3 provides an explanation of the methods used, why they were chosen and the strengths and limitations of those methods. Details will be provided about how the methods were implemented and the issues that arose during data gathering. The data gathered for the study have been grouped into three parts for presentation and analysis.

Data discussion and analysis has been organized into three parts, reflecting the major entities and participants in the research funding enterprise; the research councils, participant peers as panel members and reviewers, and applicants. Each section presents and analyses data collected from the entities and participants.

Part One, *The Framework – Funding Bureaucracies and their Processes* includes Chapters 4 and 5. This Part draws on data gathered from the

research councils and explains how they are structured and how they operationalise their grant selection processes. Information here is from the public domain but close examination sheds new light on the subject. In Chapter 4 the structures of the Australian Research Council and the National Health and Medical Research Council are considered; how they are governed and organised and under what constraints they operate. Relationships between these Government bodies and the research communities they serve are examined; how decisions are made, the degree of control or influence exercised by researchers as committee members. Funding program offerings and the systems that support grant allocation are analysed, including panel and committee structures and staffing arrangements.

The choices made within these bureaucracies are demonstrated through comparative analysis of grant processes. Models of grant selection processes are developed in Chapter 5 to demonstrate how subtle differences in process design involve significant variation in sources of influence. Data are drawn from the Councils' own publications and other government documents. The Australian Research Council and the National Health and Medical Research Council are the focus of this part, but references are also made to the National Science Foundation and the Engineering and Physical Sciences Research Council.

Part Two, *What the Insiders Did*, examines operations inside the black box of grant selection from the perspectives of the selection panel members, senior staff of the research councils, and external peer reviewers in Chapter 6. Drawing on interview and survey data, this chapter covers the ways that panel members interpret instructions and apply council rules and the informal and panel specific ways that make the system function. Strengths and weaknesses of grant review systems will be revealed by these insiders.

Part Three, *What it Looked Like*, (Chapter 7), considers grant review processes from the points of view of applicants for funding to the ARC and

the NHMRC. Applicants who responded to a survey provide a snapshot of their participation in all aspects of grant peer review systems over four years. These data provide evidence about applicant successes and failures, their understanding of processes, their views about what does and does not work effectively and the impacts of processes.

Chapter 8 draws together the themes that emerged from discussion of data sets and considers what new knowledge about the subject has emerged. It reflects on the original research questions and discusses the extent to which these questions have been answered. Suggestions for future research are made.

2 LITERATURE REVIEW

This chapter presents discussion of literature on research funding bodies, peer review and judgements about research excellence and how this work connects with the three main themes of this thesis:

1. the organization of grant funding mechanisms in research councils;
2. grant peer review issues and impacts; and
3. how peer panels determine excellence in grant selection.

Section one of this chapter examines the organization of research funding through research councils. It includes analyses of council relationships with funding sources and recipients of funding and methods of grant allocation (Rip, 1985, Turner, 1990c, Roy, 1985, Van der Meulen, 1998, Viner et al., 2006, Chubin and Hackett, 1990, Martin, 2000, Gulbrandsen, 2005, Laudel, 2006). This section is an overview of key themes in structures supporting research, matters that form the framework for considering grant selection processes developed within the Australian Research Council and the National Health and Medical Research Council.

Section two covers debates about grant funding arising from empirical research (limited in number) and critiques of selection processes (frequent and across all disciplines). Many of these publications focus on the most visible and debated aspect of grant systems, peer review. Analyses of peer review have largely focused on questions of fairness and accountability including, whether assessment of quality and agreement among peer reviewers may be impeded by matters such as biases for or against particular groups, attitudes to risk and innovation, reviewer selection and chance (Spier, 2002, Chubin, 2002c, Harnad, 1982, Wenneras and Wold, 1997, Claveria et al., 2000, Glantz, 1994, Cole et al., 1981, Abrams, 1991, Bornmann and Daniel, 2005 a, Langfeldt, 2004, Miller, 2006, Kassirer, 1994). External peer reviewers are the most common subjects for examination because of the perceived influence of their role in providing written assessments of applications.

Peer reviewers as panel members are discussed in fewer studies, which are the subject of the third section of this literature review. In particular, this section considers discussion of what happens inside the black box (Chubin and Hackett, 1990) of grant selection panels and committees, including peers who assess and rank applications using various inputs, not always external reviewer reports. Literature that addresses panel behaviour is discussed (Bornmann and Daniel, 2004, Langfeldt, 2004, Obrecht, 2007, Bazeley, 1998, Wood, 1997). Also in this section reference is made to work which analyses the cognitive content of peer evaluation in the social sciences and humanities and broaches the subject of meanings that underpin notions of excellence and originality (Lamont and Mallard, 2005, Lamont, 2006 b, Guetzkow et al., 2004). This literature on the work of selection panels is a significantly smaller field than the material on peer review generally. It provides a basis for an examination of the ways that panel members determine excellence and how they operate within the selection systems of research councils.

Section 1 – Organising Research Funding

Patronage and Agents

Governments, business, and individual benefactors fund research, the percentage share of load varying across countries and sectors. In the 18th century patronage was dominated by prizes for results, such as the prize awarded for developing the means to determine longitude at sea (Hanson, 1997). During the 19th century the scientific organizations such as the British Association for the Advancement of Science and the Paris Academy of Sciences began to exercise control over the award of funding and other sources of funding though government organizations became more common. Hanson claims that this shift was most likely because the non-local and non-autocratic governments tended to prefer grant funding over prize funding. The prize model of patronage was largely supplanted by the mid-20th century with payment for effort in the form of short-term grant funding.

Hanson described the now dominant form of science patronage, competitive grant funding, as a combination of an award for an interesting topic and a small fund to work on it. He goes on to state that one of the results of these changes is that patronage now relies more on the quality and veracity of people who manage the process (Hanson, 1997).

Research funding is provided by patrons (private or government) who seek to procure benefits such as profits, long-term investment, social advances, or economic growth. Patronage from the public purse is currently organised through intermediary agencies, which are required to test the reliability and potential of those who seek funding and the results of that funding. These agents, including research councils, have evolved systems for measuring likely success, research activity and research outcomes, not only to fulfil their charter, but also to maintain the trust of the patrons and ensure continued and increasing funding. Peer review is a key component of the system, providing some level of expert advice on allocation of funding. The patron, not normally an expert in the research area, cannot fully understand the purposes of the funds nor fully assess the use of funds; there is an underlying fact of uncheckability in the relationship (Turner, 1990). This problem has been managed in a number of ways, particularly by the creation of intermediary dyadic relations between researchers and the staff of research councils, and between research administrators and politicians. Thus, judgements about quality and value are delegated to persons deemed to be experts who will act in the best interests of the patron. To maintain the trust underpinning this relationship the research community has to sustain the belief of the patron (in the public arena this is both politicians and the general public) that researchers use the discretion and the resources provided to the best advantage of the state (Turner, 1990)

Research councils were widely established in the second half of the twentieth century to act as the intermediary body handling state patronage of science. Rip (1993) argues that the advancement of science, rather than the whim of the patron became the driver for support, with the patron retaining the right

to determine what that advancement may be. Peer review was not an automatic inclusion in the early research council processes, but was added by bureaucrats, “to overcome the resistance of the medical establishment to the NIH” (Reingold cited by Rip, 1993, p4). Roy emphasizes that adding peer review into the selection processes in US agencies was not a conscious decision and did not arise from any theoretical framework (Roy, 1985).

Gradually, scientists “captured the research council system” with peer review of applications, membership of committees and boards, developing a form of “conditional self-patronage” (Rip, 1993, p 4-5). This ownership of the research councils changed the way that science reward systems operated, as research council grants developed a higher cachet than other forms of funding, “worth three times other dollars” (Rip, 1993 p10). Peer review of proposals has become a “right of scientists” (Rip, 1993, p5), a thing that cannot be taken away or criticized without invoking wrath from scientists.

It has become part of the reward system of science, and it is legitimated by the ideology that peer review is the best way to conduct evaluation processes. ... in the case of peer review of research proposals to NSF and NIH, scientists have been able to capture the ‘system’ to some extent ... So peers are in the business of dividing the spoils. (Rip, 1985, p84)

Rip argues that peer review of research council funding is embedded into a credibility cycle for individual researchers that moves through; knowledge, recognition, funding, resources, data, publication and further recognition (1993).

The relationship between funding sources (or patron states) and researchers is described by Van der Meulen (2003) as fitting a model of principal-intermediary-agent, where the research councils (foundations, boards, institutes) that were created during the twentieth century are intermediaries delivering research funding to agents (researchers or research institutions), and undertaking quality control on behalf of the principal. Research councils have focused on the promise of quality contained in proposals for research

and used peer review as the primary predictive measurement device. He suggested that the strength of relationship between the council and either the funding source or the fundees will determine the cost of the process. Where the intermediary (council) is closer to agents (researchers) than it is to the principal (government), the organisation is likely to incur higher administrative costs (Van der Meulen, 2003).

A recurring theme is the relationship between the members of the researcher community as applicants and beneficiaries, and as assessors representing the patron state. Their roles as expert advisors in the structures that support research grant funding provide credibility to the funding bodies and legitimize the research councils' claims of supporting excellence. Gulbrandson, writing on tensions between research councils and research communities, posited that:

...it is in the interests of the reviewers to maintain the quality and relevance of the research they select, because publicity regarding the opposite could endanger future funding (2005, p205).

In some research councils, the research community not only advises on principles but also determines the structures of funding processes, controlling administrative decisions. Many of the researchers who work in grant selection processes have significant histories of grant success, in some cases unbroken success. Rip stated that when research councils identify more closely with the role of bureaucracy and become more pro-active that this should not be seen as pressure on science, for this assumes a right to unfettered continuing state patronage of science. This attitude also assumes that scientists have a right to determine processes of dividing "the spoils" and that there are no "other relevant actors in the science scene" (Rip, 1993, p4). This relationship proximity between actors in the research reward system is discussed in Chapter 4 in terms of the advisory and governing bodies of the ARC and NHMRC.

The Matthew Effect

Funding bodies claim that the allocation of funding or prizes for research is directly related to quality work, outcomes or ideas, however, quality is an elusive concept. Merton (1968) identified the 'Matthew Effect' operating in science reward systems. The term originates from an interpretation of the following quote from the Christian Bible: "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath." (Matthew XXV:29, KJV). The effect Merton defines is a disproportionate attribution of credit, recognition and prizes for work, favouring eminent scientists over comparatively unknown researchers. Researchers thus rewarded may also benefit from a ratchet effect in their careers, after reaching eminence, maintaining that level. Merton goes on to state that a reward system that has a "fixed number of places at the summit of recognition" (1968, p57) is bound to produce anomalous results. He draws on the practice of the French Academy, which admits only 40 members, to describe the point below cut-off as the 41st chair, held by the talented who were not granted membership. These people may be more talented than others elected to the Academy when there were fewer very accomplished candidates but they remain outside. Allocation of research council senior fellowships, such as the ARC professorial fellowship, bears some resemblance to this scenario, with many highly qualified applicants and a small, finite number of awards. However, even the most senior fellowships are offered for a limited duration and some previously unsuccessful applicants are eventually awarded the fellowship. According to Goldstone (1979) the Matthew Effect is not limited to science, but can also be observed in a variety of fields where rewards are offered.

Grant peer review decisions draw upon a range of criteria including the history and accomplishments of applicants, to assess the potential for success of a grant proposal, a practice that provides significant opportunities for the Matthew effect to operate. Such processes of cumulative advantage are a characteristic of science and have been represented as beneficial for science (Chubin and Hackett 1990). A cumulative advantage model is one of

three explanations of resource allocation posited by (Mitroff and Chubbin, 1979), the others being a merit model and a political model which features an elite researcher hegemony controlling distribution.

The relationship between membership of the controlling group of peers and personal success in winning funding has been explored by Viner, Powell and Green (2004 b), who examined ten years of Engineering and Physical Sciences Research Council (EPSRC) applicant and College membership data. They found a significant relationship between a long-term successful reputation and membership of the decision-making process but posit that the cause could be either merit or politics. They also described evidence of cumulative advantage in the form of connections between home institution, previous history, involvement in decision-making processes and the chances of gaining funding. Viner et al hold that this effect may not be unfair if it increases focus on the most effective and productive scientists. Indeed, research councils encourage the development of critical mass to build research centres, by funding existing strengths (2004 b). Cuca (1990) found that track record, in the form of the investigator's previous grant success as well as investigator qualifications and experience were the best predictors of approval. Her work also demonstrated that an application score was best predicted by the mean score of previous applications by the investigator. This process of building on success is operationalised into selection criteria as *track record* and its use by selection panels is covered in Chapter 6.

Chubin and Hackett (1990) argue that criticisms of allocative mechanisms and peer review which confuse efficiency of allocation and equity of distribution are not sound. They hold that funding processes cannot be evaluated solely by administrative efficiency and that efficiency should not be commingled with debates about administrative justice. Martin (Martin, 2000) examined the systems that allocate research funding and defined problems in terms of the method of allocation employed by a funding scheme. He classified allocative methods in five categories; administrative decision, peer review, performance based funding, equal distribution and

community based allocation. In this analysis, peer review systems were considered to be negatively affected by bias, waste, discouragement and orientation of research to the interests of others. However, the most significant decisions about research funding, such as government research priorities, infrastructure provision and budget allocations, are set by administrative decision not by peers (Langfeldt, 2006, Martin, 2000). Both Martin and Langfeldt argue that the purpose of the funding provision should determine the methods used in allocation, as innovation and problem solving may not be well supported by some peer review processes. Chapter 4 will uncover differences in selection designs and consider the reasons for those differences.

Selection Process Design

According to Langfeldt the impact of process design is not well understood and differences in peer review procedures may have substantial implications for the outcome of review (2006), particularly when central policy aims include supporting highly innovative or interdisciplinary research. Some theorists and research agencies have examined alternative models of grant allocation. Chubin and Hackett (1990) suggested various models including an allocative mechanism based on career stage and track record. This idea was explored by Viner, Green and Powell (2006), who tested whether segmentation of fund-seeking academics could improve the efficiency and effectiveness of resource allocation. They examined the characteristics of more than 9,347 applicants and grantees of the Engineering and Physical Sciences Research Council in England over a six-year period. The profiles of 2,000 persons, the most active and most successful applicants were then closely considered. Two features of note emerged, firstly the active group:

...accounted for less than a quarter of the total population submitting to EPSRC, were responsible for over half of the proposals submitted and grants awarded over the study period (2006, p172).

Secondly, the group which comprised 1,264 academics (14% of all applicants) with a grant success rate of at least 40% were much more likely to be “members of the group that makes funding recommendations through

peer review” and to have “track record in carrying out research” (p172). The study concluded that:

...heterogeneity exists within the proposal-submitting population, suggesting that a meaningful measurable segmentation is possible. (Viner et al., 2006, p176)

The process of segmentation within the EPSRC has been incorporated into a program, Portfolio Partnerships, providing up to 20% of EPSRC funds to identified highly successful groups. Not only does the process provide security of funding to the high performing individuals but also reduces the demands on the peer review grant programs (Viner et al., 2006). This work demonstrates a viable addition to the suite of allocative mechanisms used by research councils. The EPSRC is similar in size to the Australian Research Council, in terms of annual applications and funding, however, the ARC allocates its larger and longer term grants through its Centres of Excellence program, a complex multi-stage peer-reviewed competitive selection process. Specific ARC funding processes will be examined in Chapter 4.

A satirical commentary on grant funding structures (Osmond, 1982) supports the notion of reducing peer review hurdles. Many of the issues he identifies are current more than 25 years after his publication, in particular, the time spent as writer and reviewer and the repetition of peer review hurdles that researchers must pass. Osmond favours relying on track record and describes the granting process as based on over-review:

Over-review is as unproductive as under-review. It multiplies work and expense, setting one jury upon the next, ... to the point where the final agency jury passes judgement, not only on the researcher but also on the competence of all preceding juries (1982, p97).

Others have raised the question of what constitutes effective review. Notably, Viner and Birch provide insights into the stages of research funding processes, determined as part of a peer-review benchmarking undertaken by UK research councils (2004 a). Using a common process framework, the councils undertook self assessment, peer assessment by expert groups, consideration of the outcomes and development of responses and programs

of change. Benchmarking produced significant positive effects, identifying strengths and weaknesses in the different processes run by the research councils and enabling better practices to develop (Viner and Birch, 2004 a). This collaboration and comparison across multiple agencies provides object lessons for research councils seeking to assess the efficiency of their funding processes. The Australian research councils have not experienced such comparative benchmarking of their processes, however, questions of administrative efficiency and distribution equity are core issues for the research councils and they approach distribution in different ways.

An ARC commissioned study into the peer review process reported that the operationalisation of peer review within research funding agencies is the source of contention, rather than the use of peer review in selection, and that:

...whilst peer review procedures are expected to be efficient, accountable, transparent and equitable, these objectives are not necessarily compatible (Wood, 1997, pxiii).

In particular, transparency and equity provide challenges for grant funding systems that assert selection by excellence and which use peer reviewers. Excellence is a notion that precludes equity by definition, it is defined anew by every reviewer and panel, and one-way blind review does not facilitate full transparency. At the time of the Wood report the research councils published little on the subject of panel membership and selection, as she noted:

the credibility of peer review procedures is also substantially dependent on the calibre of review panel members ... evaluation of panel performance is a largely unexplored issue (1997, pxvi).

Significant changes have been made to ARC processes since the Wood report. Chapters 4 and 5 will discuss how the ARC and NHMRC define, operationalise and manage their funding programs.

Section 2 – Grant Peer Review Issues and Impacts

Peer review is a generic phrase that covers a range of different activities undertaken in publishing academic articles and selecting research proposals for funding. It includes refereeing, quality control, peer evaluation, peer advice and merit review (Chubin and Hackett, 1990). Peers are considered to be experts in the research field, research leaders who have the ability to distinguish between proposals and proposers, based on merit. They are asked to provide their expert opinion on the proposed research or publication. These opinions are often made in the context of defined goals or selection criteria established by the funding body and may include such matters as quality of the research team, quality of the proposed research or national need and potential benefit. A central tenet of the organization and operation of scientific communities, peer review is used for:

allocating resources, ensuring traditions and standards of good research, and for promoting competition and an achievement-orientated attitude in the research community (Langfeldt, 2006, p33).

Peer review is usually a one way blind process, with reviewers acting anonymously as part of a confidential process with limited appeal possibilities. Indeed, grant peer review judgements are exempt from the process of administrative review under the administrative law arrangements in Australia that cover government decisions; a framework that not only provides protection for the academic judgements made by peer reviewers, but also extends the mystique of the black box. Details of each decision cannot be examined, only insiders know how judgements were made (West, 1998). Operations of peer review within research funding agencies “have traditionally been surrounded by secrecy, there has frequently been strong resistance to systematic external investigations” (Wood, 1997, p17). This tendency to secrecy is endorsed by Kostoff, who notes that many critics who publish on peer review have not undertaken any peer reviews (2002). To add to this mystery and complexity, the very nature of peer review processes and decisions are subject to change over time, even the base criterion of

excellence varies by discipline and over time (Chubin, 2002c, Langfeldt, 2006, Lamont, 2006 b).

This research attempts to shed some light on those internal decisions, the contexts in which they were made, the issues and constraints of peer review processes that applied in the two peak Australian funding councils in the early years of the 21st century. In this section of the literature review debates about peer review theory and practices arising from research studies and experience-based opinions are examined.

Peer review is a powerful force in the scientific community, exercising symbolic power that protects and elevates ordinary activity to a position where it is above reproach (Chubin, 1994). An internal study by the National Institutes of Health of its grant allocation processes was examined and found to use emotive language of persuasion and conviction rather than analytical language, inference and proof (Chubin and Hackett, 1990). They concluded that this assessment did not provide robust evidence about the processes. Judson refers to peer review as seeming to be indispensable and rational but notes that it is a recent social construct, not a law of nature, or of epistemology (Judson, 1994). This notion of function and change is supported by Rip who argues that peer review mechanisms “serve... an interorganisational function and do not, by themselves provide quality control (1985, p85).

Problems with peer review

Rustum Roy (1985) has identified features that he believes work against the use of peer review systems for funding research, including; difficulty predicting good research, the large amount of time spent by researchers preparing proposals, that innovative research cannot be supported, dishonesty is encouraged in a climate of low success rates, program manager bias in reviewer selection, and system rigidity. Chubin and Hackett argue that where a grant system has high competition for funding, significant differences at the margin are found in non-meritocratic criteria

(such as chance in reviewer selection), reviewer tolerance for new ideas is reduced and opportunities for conflict of interest are increased. They posit that peer review suffers when decisions require degrees of discernment that exceed the resolving power of the evaluation process (Chubin and Hackett, 1990).

Peer review as a grant selection tool attempts to judge the quality of future research, a process described as a “higher form of nonsense” (Ziman, 1983). Indeed, a study of Wellcome Trust recipients in the United Kingdom suggests that changes to the original proposal were often made because of the time lag between drafting the application and funding it, often new scientific findings or technical difficulties had emerged in the interim period (Moxham and Anderson, 1992). Another view is that scientists describe work in progress or completed, an approach described by Wood as grantsmanship which may be linked to low success rates for funding (1997).

Innovation and peer review

Peer review may narrow the possibility of very innovative research being funded. Drawing on the work of Kuhn and others, Gillett states that peer review “must favour incremental research which defends the existing body of understanding of a subject – the current paradigm” (Gillett and Harrow, 1993). Funding councils use established successful researchers to form peer review panels and committees and these people have an interest in maintenance of existing models and are likely to be hostile to really innovative proposals (Gillett and Harrow, 1993). An experimental study by Mahoney involved submitting a research paper to 75 referees from the Journal of Applied Behavior Analysis. Some referees were supplied with results which confirmed the dominant ideas in that field (paper A) while others received the same paper with different, opposing, results (paper B). Paper B was rejected by more referees than paper A, on the grounds that it was poor on methodology and relevance, factors that were the same for both papers (Mahoney, 1977).

Innovation tends to be risky and peer reviewers tend to be risk averse, preferring the framework of a discipline (Rip, 1993). Rip discusses the application of risk averse strategies and their relationship to discretionary power, noting that the patrons of science can be arbitrary in their support of novel approaches and protection of mavericks. Support for novelty and risk can also occur in research funding agencies such as the National Science Foundation, where the structure and culture of the organization enables senior staff officers to exercise discretionary power. Where a senior officer or an organizational culture is more timid the bureaucracy reinforces the conservative tendencies in peer review (Rip, 1993). This capacity for exercising risk-taking strategies by senior staff in the NSF is explored in Chapter 6.

Interdisciplinary Research

Porter and Rossini (Porter and Rossini, 1985) tested the fate of 38 interdisciplinary proposals submitted to selection panels in the National Science Foundation. Differences between disciplines were found, however, they concluded that generally panels favour proposals that fall inside their discipline area. In particular:

Novel interdisciplinary research is likely to fall on the fringe of panel expertise and hence to face a poorer expected rating than more mainstream, disciplinary research ... (Porter and Rossini, 1985, p37).

Interdisciplinary approaches to research have increased as problem-solving approaches are adopted. Research teams may cross five or six disciplines to gather evidence from all perspectives on complex or intractable problems. Such proposals are difficult to assess using external review as assessors struggle with methods and knowledge outside their areas of expertise.

Chance

In the late 1970s the US committee on Science and Public Policy (COSPOP) of the National Academy of Sciences commissioned a review of the operation of peer review in the National Science Foundation by Cole, Cole and Simon, with a view to assess whether the procedures it used for assessing grant applications were equitable and robust. An experiment was conducted using

a set of proposals for funding that had already been assessed, with half selected for funding. The proposals were assigned to new assessors and evaluated. Significant differences were found between the first and second review groups, such that:

between 25 and 30 percent of NSF funding decisions could be reversed were the ratings made by another equally qualified group of reviewers. (Cole and Cole, 1981, p43)

The study concluded that funding involved a significant element of chance:

we may conclude that the fate of a particular grant application is roughly half determined by the characteristics of the proposal and about half by apparently random elements which might be characterized as “the luck of the reviewer draw” (Cole, Cole, Simon 1981, p885).

Cole et al attributed the sources of reviewer disagreement to intersubjectivity, identical opinions expressed differently, or to real and legitimate differences about what constitutes good science (Cole, Cole, Simon 1981).

Cole, Cole and Simon’s controversial findings resulted in little reaction from the government, which had focused attention away from the complexities of grant selection and towards the outcomes of funded research (Kruytbosch, 1989). As Wood (1997) suggests, there may also have been an element of government desire to work with what is possible, rather than take on the intractable conflicts of grant selection. The role of chance in grant funding has remained a focus of discussion about peer review and the structures that research councils introduce to ameliorate the impact of chance effects and manage conflicts of interest.

Bias

Peer review is a system of selection that is based on social interaction, where roles of applicant, reviewer and researcher converge to create unavoidable conflict of interest (Chubin, 2002). The potential for bias in peer review can be broadly grouped into; characteristics of the applicant and the proposal,

and relationships between the reviewer and the applicant. Potential sources of bias identified by Lee (2000) from experimental studies on peer review are summarized in Table 2.1.

Table 2.1: Potential Sources of Bias in Peer Review

Applicant characteristics	Proposal characteristics	Reviewer/Applicant Relationship
the Matthew effect prestige of employing institution applicant’s academic recognition location of institution prestige of PhD awarding department gender age minority group reputation prior success in grant funding length of time funding has been provided	approach untried research is interdisciplinary research is mainstream research in a new area project type	old boy network personal relationship academic relationship employment relationship discipline match between reviewers and applicant

(Lee et al., 2000, p102)

Not all of the characteristics identified by Lee are negative aspects of bias, but rather are impact factors in decision-making. Some, prior success, recognition and prestige, combine to form a specific selection criterion, track record of the applicant. Others, conservatism towards innovative and interdisciplinary research, have been identified as factors of the selection process design and funds availability. However, all the items in this list are recognised in the literature as having varying degrees of effect on the judgements of peer reviewers.

Selection of peer reviewers is difficult in small research communities, either small discipline groups or small countries, where all of the leading players are known to each other and are in competition for the same funds. In worst cases patronage networks form and dominate funding decisions (Wood,

1997). Gillett cites work done by Irving and Dudley on the backgrounds of members of the British Medical Research Council's key expert committees, which found a bias towards southern medical schools, described as a "self-perpetuating oligarchy". (Gillett and Harrow, 1993, p1674) Interviews of England's Medical Research Council staff conducted by Gillett revealed "widespread reservations" about the operation of peer review simultaneously with an overall commitment to the process. Gillett notes that:

those interviewed had prospered under current arrangements so they may have no vested interest in change, though this consideration makes their candour about the system's shortcomings (...) more telling. (Gillett and Harrow, 1993, p1674)

However, Judson counters that those most qualified to judge the merit of a grant proposal are precisely the closest competitors (Judson, 1994).

Gender bias

Questions about gender bias in grant selection have been considered in a number of studies (Brouns, 2000, Cole, 1992, Wenneras and Wold, 1997) and conflicting accounts emerge. Cole did not find evidence of gender bias in external reviewers. However, Wenneras and Wold found that, "peer reviewers cannot judge scientific merit independent of gender" (Wenneras and Wold, 1997). They examined the records of panel decisions about fellowship applicants to the Swedish Medical Research Council and tested panel member scores of scientific merit against a set of six indicators for each applicant. Competence scores were found to be influenced by two factors in addition to scientific competence; gender and affiliation with a committee member. In fact, female applicants "had to be 2.5 times more productive than the average male applicant" (p342). The MRC policy included procedures to prevent committee members from taking part in selection of applicants with whom they had an association but:

the neutral committee members compensated by raising their scores when judging applicants affiliated with one of their peers (Wenneras and Wold, 1997, p342).

Panel bias based on gender was also detected in a study of Dutch funding agencies by Brouns (2000), who found that female applicants were treated differently from male applicants. In spite of being marginally better qualified than their male counterparts, and the existence of variation across discipline clusters, females were not as likely to be rated as excellent.

Committee peer review for the selection of fellowships in the Boehringer Ingelheim Fonds, a German foundation, was examined (Bornmann and Daniel, 2005 a) who used statistical methods to assess selection reliability and potential bias. While the study reported finding evidence of reliability of reviewer selection and agreement between reviewers, it also found problems with fairness. The selection of fellows was intended to be judged solely on scientific merit, but evidence of bias was reported for three applicant characteristics, gender, discipline and institution. Reviewers preferred applicants associated with an institute of the prestigious Max Planck Society (46%) over other institutions (10%). Success rates for women (7%) were less than half those of men (16%) and applicants working in the field of chemistry were half as likely to succeed as applicants from other disciplines.

Decisions made by reviewers and panels for the Engineering and Physical Sciences Research Council have also demonstrated subtle forms of bias. Viner, Powell and Green (2004 b) detected a different pattern of recognition and continuity of reward for women. Women who experience high levels of initial success did not continue into the “long-term success group” in the same ratio as men. Viner et al suggest as explanation:

Women ... may suffer an ‘inverse Matthew Effect’ where their initial success leads to demands on their time as high profile members of an under-represented group which makes it harder to sustain previous levels of research activity (2004 b, p453).

Concluding that peer review “mostly operates as it should”, they go on to warn against the probable operation of indirect bias in gender and ethnicity, arising from a “relative lack of advantage enjoyed by others” and recommend explicit analysis of access to resources as a means of addressing bias (p454).

This notion is operationalised in the ARC as ‘track record relative to opportunity’ and is one of the matters to be considered in grant selection. Panel member insights on the conduct of grant selection are considered in Chapter 6.

Satisfaction with peer review

Writing about the National Science Foundation, Kruytbosch (Kruiybosch, 1989) referred to peer review as “both a social process (a set of practices) and a social ideology (a set of ideals)”, a distinction which aids in understanding many of the attitudes held by the research community. He goes on to cite the outcomes of a 1988 survey of applicants to the NSF, in particular the reasons for dissatisfaction with the review process, the most frequent being:

1. Reviewers or panelists not expert in the field, poorly chosen, poorly qualified (18%)
2. Reviews perfunctory, cursory, non-substantive (17%)
3. Reviews were conflicting (12%)
4. Cronyism, politics, old boys network (12%)
5. Decision unclear or inconsistent with reviews (10%) (Kruiybosch, 1989)

Levels of satisfaction were matched with the frequency of grant success and participation in selection processes and the results were found to be similar to an NSF survey conducted in 1975. Chapter 7 of this thesis will discuss the views of applicants and use a modified version of the Kruiybosch matrix to examine relationships between frequency of application, award and satisfaction.

Burdens of Peer Review

Peer review as a grant selection process requires considerable commitment and participation by the research community. Proposal writing commences a cycle of burdens across the sector. As Chubin and Hackett note, “proposals beget reviews, panel meetings, and administrative actions within the funding agency” (1990, p27). Applicant researchers devote a significant amount of time to preparing proposals.

A month's labour per grant does not begin to define the professional burden of grant getting. The entire year is dominated by thoughts of preparation and of the tragic consequences of refusal ... we gradually evolve into money-grubbing operators. ... Our life is measured by the size of the grant and by the interval between applications ... Not every good scientist is psychologically equipped to live under the guillotine. (Osmond, 1982, p101)

The system requires that many researchers also provide their time to read and write assessments about the work of other researchers. Some researchers serve as panel or committee members who rank a field of applicants. The load on reviewers is significant and rejection of invitations to assess is an increasing problem for research councils, as is 'reviewer fatigue' which Wood asserts includes failure to be up to date (Wood, 1997). Reviewing has become a chore which affects the capacity of a researcher to keep abreast of developments in their own field (Judson, 1994).

Review load varies significantly across grant funding organizations and over time. In 2003 the National Science Foundation in the USA obtained reviews from 54,000 reviewers (Porter, 2005). Panel members working in US funding agencies reported to Porter that they received between 20 and 100 proposals for a meeting, were assigned as first or second reviewer on six to eight proposals and spent up to 60 hours preparing for a meeting. West (West, 1998) refers to reviewers, working on a grant program run by a US Government Department, who have a load of up to 15 applications, each of 25 to 100 or more pages in length. Obrecht (2007) suggests that average reviews (by panel members) take two hours per application and warns of inconsistency in assessment when members are not able to read all of them prior to meeting. Panel members in a study by Langfeldt described problems achieving thorough review as, there was no time to go into great depth. This limitation in time and resources was the reason for:

vague assessments and absence of explicit negative criticism as the thoroughness of the review was too limited allow well-founded negative statements on the research under review (2004, p59).

Time and resource limitations also worked against the “kind of positive group effects that might have enhanced the quality of the reviews” (Langfeldt, 2004, p60).

In her study of the influence of order effect on decision-making by members of peer panels, West (West, 1998) found a statistically significant difference between initial mean scores for proposals read by individual members first and proposals read in second and subsequent positions. However, reasons for changes to scores following group discussion were not collected. West refers to the volume of material being considered as having an impact on reviewer judgement, with heavy loads potentially causing information overload, making it hard for the reviewer to discern important variables. Citing research on the psychology of decision-making, West also discusses factors that lead individuals to decide between two or more alternatives to assess overall worth with the weighing of attributes. Group decision-making that includes interaction expands the decision basis and provides scope for greater accuracy and consistency. It can also introduce group polarization effects and may be affected by dominance of one individual member with greater authority or status (West, 1998).

Reviewer load in the Australian context has greater variations between research councils and funding programs. Significant changes in selection process design were made by both the ARC and NHMRC between 2002 and 2006, in part to deal with reviewer fatigue. These processes and differences will be discussed in chapters 4 and 5.

Cost of Peer Review

Administrative costs of peer reviewed grant selection processes vary considerably, according to the models of evaluation and selection that are employed. Not included in annual accounts of the cost of peer review is the cost of contributions by the peers, who are employed outside the research councils, but give significant time to the process of reviewing and selecting proposals. Judson describes the increased load of review on the research

sector over the later part of the twentieth century, as the change from exponential growth in science to a steady state. The burden on peers has grown so that, what was an interesting duty has become a chore (Judson, 1994). Gillett and Harrow, considering the process of review operating in England's Medical Research Council (MRC), refer to the side-tracking of the, "most able, experienced and highly paid researchers, who are called on to give their (and their employer's) time to allow the system to operate". They go on to quote an MRC unit director, "I suspect that if they costed the process on a realistic basis they would have to discontinue it tomorrow" (Gillett and Harrow, 1993, p1673).

Panels and committees providing peer review for funding councils are constituted as ad hoc, single event, panels or as term appointments of one to three years. Membership turnover causes a loss of corporate memory and difficulty in maintaining common standards and interpretations from one round or year to the next. Other impacts on operational efficiency and responsiveness arise from the degree that a research council relies on external expert opinion. Gillett and Harrow refer to an addiction to peer review in the MRC, where expert central managers are never called on for their opinion, "which is always imported from outside experts." (Gillett and Harrow, 1993, p1673) These and other aspects of administrative decisions about process models are discussed further in Chapters 4 and 7.

Section 3 – Peer Panels and Excellence

Grant funding processes rely heavily on the work done by expert panels formed for the purpose. These peer reviewers are contracted to the funding bodies in a variety of ways, depending on the funding agency and the funding program; from multi-year appointments on panels that undertake several tasks and meetings to ad-hoc selection to serve at one panel meeting. Panel processes are prescribed by the funding body and are framed within a much larger process of managing applications, gathering external reviews and garnering approval. In practice, panel members engage in complex

negotiations and observe unwritten rules of interaction to manage the decision making tasks.

Comparing the behaviour of assessors as external reviewers and then convening as panel members, Obrecht found “no improvement to fairness and effectiveness over and above that attainable from the pre-meeting evaluation” (by the same assessors) (2007, p79). The panels in Obrecht’s study for the Canadian Institutes for Health Research (CIHR) considered a similar number of applications to panels constituted by the National Health and Medical Research Council (approximately 10 applications per panel member, discussed further in Chapter 4). Within the CIHR panels the focus of discussion was inconsistent, with differences in perceptions of criteria and their relative importance and good candidates were often identified because a panel member had made a strong case by “going in to bat for a candidate” (p84). Obrecht reports that committees tried to work to increase fairness but that was counterbalanced by inconsistency within and between panels and “evidence suggesting that ratings were being used to manipulate the decision outcome” (p85). The study recommended employing structured review by panel members to score applications but not to meet, thus saving both time and meeting costs. More reliable and fairer outcomes were predicted for structured review with clearly defined and benchmarked criteria for selection. As the authors conclude:

If two systems are equal in terms of fairness to applicants and effectiveness in achieving program objectives, it makes sense to use the one that requires the least amount of reviewer time, staff time and physical resources. (Obrecht, 2007, p89)

While this advice seems obvious, it is not necessarily applied. Chapter 4 includes comparison of structures and costs of the two Australian research councils, the ARC and the NHMRC.

Transparency

Reasons for panel member decisions about grant applications are not transparent to applicants. There is limited evidence about whether panels

apply selection criteria and how they weigh particular criteria when evaluating applications. Bornmann and Daniel (2005 b) analysed all applications to the Boehringer Ingelheim Fonds in Germany for fellowships between 1985 and 2000, where the success rate averaged only 11.3%. They examined records of panel scoring and decisions against the three selection criteria; applicant achievements (track record), originality of the project proposed and quality of the laboratory (host institution). Successful applications had all three factors evaluated positively. Additionally, there is evidence in Bornmann and Daniel's data that suggests the panels applied an order of importance to the selection criteria that is; laboratory quality, track record, project. Applicants who were not associated with the best or neutrally ranked laboratories were not funded. Interaction of weighed selection criteria and success rate has a significant impact on other grant funding process and will be discussed further in Chapter 6.

Panel Constraints

Langfeldt has conducted important studies with grant selection panels in the Research Council of Norway, exploring processes constraining panels and panel decision-making processes to understand the influences at work in panels (Langfeldt, 2001, Langfeldt, 2001 a, Langfeldt, 2004, Langfeldt, 2006). Reporting on the behaviour of ten panels that assessed over 600 applications, Langfeldt concluded that "panels do as they like, whereas mail reviewers do as they are told" (p835) and that panels varied in their approach, but all were characterized by tacitness in criteria and standards of judgements (Langfeldt, 2001 a). Panel members had problems explaining how they apply criteria for judging scientific quality (2004). Panels which operated with informal rules allowed pragmatism and social sensitivity in assessments without explicitly formulation.

Another major finding of Langfeldt's work was that organizational constraints influence the outcome of review, in particular, tight budgets (low success rates), fine rating scales, averaged scores and majority decisions produce outcomes that favour established research groups and avoid risk.

Conversely, ample budgets, rough rating scales, heterogeneous panels and “open decision-making processes” provide scope for pluralism and innovative projects (2001, p837). Her conclusions, that reviewers are central actors in defining good research and that a central premise of peer review, the idea of a universalistic criterion of merit is a limited possibility, challenge the assumptions of much grant funding organisation (Langfeldt, 2001 a). This thesis includes consideration of the structures and constraints affecting selection panels and the decision-making processes that panel members use to arrive at recommendations.

Epistemological Differences

Research funding bodies emphasise their selection of excellent research. One Chairman of the Australian Research Council referred to excellence as entirely intrinsic to the research activity and suggested that the ‘classic’ peer review system can effectively judge such matters by considering researcher quality, potential impact of the research, methodology, and resources (Brennan, 1994). However, Langfeldt (2006) has shown that definitions of excellence vary across disciplines and time.

Originality is a factor in peer panel decisions that varies with discipline. A study by Guetzkow, Lamont and Mallard (2004) found that peer reviewers in the social sciences and humanities employ definitions that vary from those understood to be used in the natural sciences, with the latter defining originality as new findings or theories, the social science and humanities reviewers were broader in definition:

As using a new approach, theory, method, or data; studying a new topic; doing research in an understudied area; or producing new findings (Guetzkow et al., 2004, p190).

Their work also found a “moral dimension” to judgements about originality of scholarly work. They posit that reviewers look for attributes of “scholastic virtue” which includes, seriousness, hard-work, enthusiasm, carefulness, curiosity, undertaking politically important research and considering

“subaltern groups”. These attributes contribute to judgements about an applicants’ capacity to “produce worthwhile work” (Guetzkow et al., 2004).

Lamont (Lamont, 2006 b) reports differences between discipline based panels in the humanities and social sciences in approaches to defining quality. She concluded that panels employed “cognitive contextualization, the adaptation of epistemological styles to a specific field or discipline in order to reach decisions that they consider fair” (p1). Panel processes included a number of strategies to develop shared understandings and agreed outcomes, including, ‘horse trading’, observing deliberative democracy principles and managing disciplinary prejudice. She provides insights about a range of epistemological styles used by panel members, sheds light on aspects of the cognitive dimension of evaluation and reveals that most panelists respect differences of opinion among evaluators. This latter point, concerning “emotional inclusiveness” combined with “cognitive contextualization, explains why culture wars do not dominate funding panels in the social sciences and the humanities” (Lamont and Mallard, 2005, Lamont, 2006 b).

Summary

This discussion has covered existing literature on research funding bodies, peer review and judgements about research excellence as it relates to the organization of grant funding by research councils, peer reviewer behaviour and impact and the ways that peers in selection panels make decisions about grant funding. Both empirical studies and participant critiques of selection processes have been considered. Questions of fairness and accountability dominate the literature, with some more recent contributions about impacts of process design on selection outcomes and panel member understandings and behaviour. Notions of originality and excellence are found to bear multiple meanings that vary with time, place and discipline.

However, the impact of selection process design is not well understood, despite being flagged as contentious in a 1997 study of the ARC (Wood).

More recently it has been identified by Langfeldt (2006) as substantial. The impact of process design on peer behaviour and Australian research councils is not known.

The next chapter is about the methodology employed in this study of the operation of grant peer review in the Australian Research Council and the National Health and Medical Research Council.

3 METHODOLOGY

Research funding arrangements in Australia and internationally came under closer scrutiny in the latter part of the 20th century as government expenditure controls tightened and evaluation frameworks required evidence of value for money. In Australia, the National Health and Medical Research Council was reviewed and recommendations were made for reorganized program offerings and a doubling of funding. The Australian Research Council was given a separate identity and the program staff from the Department of Education Science and Training (DEST) before its funding was doubled. Throughout this period various claims were made about the efficacy of peer review and grant selection processes. One senior committee Chairman in the NHMRC claimed that the NHMRC had the “Rolls Royce model of peer review” in its Project Grant selection process design. At the time there was no empirical evidence to support this claim, or indeed any claim, about the NHMRC review process. This thesis aims to provide an examination of the impact of selection process design upon grant decisions, notions of excellence and selection panel behaviour.

This chapter outlines the processes used to gather and analyse data and provides justification for the methodology. This research is a comparative case study, using two major research councils as the cases in Australia and selected data from two comparable international organizations. The research councils are bounded entities created under legislation to achieve specific goals within a defined community. They develop their own approaches to the operationalisation of grant selection processes and idiosyncratic approaches to peer review. Therefore, each council is treated as a separate case in this research, which seeks to understand the similarities and differences between them.

The Research Councils

The principal focus for this study is the peak funding body for competitive research conducted in Australian universities, the Australian Research

Council. The National Health and Medical Research Council is the other Australian council, as the funding body providing support for research leading to improvements in human health, particularly, clinical medicine and dental research. International organizations included as comparative cases are the National Science Foundation USA (NSF) and the Engineering and Physical Sciences Research Council England (EPSRC).

Data gathered for several other councils have not been included in this analysis due to volume of material and time constraints. Discussions with program staff and examination of documents from these organizations did, however, provide a broad and significant background. Those studied but not discussed were; in England, the Economic and Social Research Council, the Medical Research Council and in New Zealand, the Health Research Council, the Foundation for Research Science and Technology and the Royal Society of New Zealand.

The international cases that are included, the NSF and the EPSRC, were selected to provide points of comparison with the Australian research councils and to allow for theory building. They were clearly identifiable as peak bodies in leading western nations with strong research links to Australia. Thus the possibility of extraneous variation was removed and boundaries were created for generalisations of findings (Eisenhardt, 1989).

Research Questions

This study is exploratory in nature and thus a qualitative design was used to describe observed phenomena and explore relationships between different phenomena (Leedy, 1997). No attempt has been made to manipulate conditions or control variables, rather the situation has been studied without alteration. This work aims to explore the relationship between selection process design, peer participation in review and peer judgements about excellence. The ideas that underpin this research concern the impact of selection process design and are based on observations that this

researcher made over a decade of close association with the Australian research councils. In particular:

- Australian grant selection systems incorporate time and workload pressures, or administrative arrangements that control collegial processes, limiting the capacity of peer review to contribute to decision-making.
- Research councils allocate competitive research funding using a variety of selection processes and peer review models and they attempt to manage the shortcomings inherent in peer review through operationalisation of decision-making processes.
- Grant application selection processes influence peer review panel member decisions about which applications are the most competitive.
- Australian grant selection systems in the ARC and the NHMRC tend to privilege track record, relative to the systems used by the NSF and EPSRC.
- There is no evidence of quality differences between decisions made by peer panels using complex selection models and peer panels using streamlined selection models.

In order to generate a research design that would provide data sufficient to test these ideas the following research questions were developed.

1. What is peer review and how is it operationalised in selected research funding councils in Australia, the USA and England?
2. How does the ARC selection process compare with that of the NHMRC, and selected international research councils, in terms of peer processes, peer involvement in policy and the costs of peer review?
3. How do peer panels rank applications and how do they define excellence?
4. What are the experiences of applicants for funding from the ARC or the NHMRC?
5. Does the way that peer review is operationalised affect the way that excellence is defined?

Identification of two discrete entities as the core of the study led to the adoption of a case study framework for the collection and analysis of data.

Case Study Approach

Underpinning this research is rigorous coding and thematic examination of qualitative data. The research design incorporates a rich range of available sources, including survey data, interviews, observations, document analysis and personal experience. The primary purpose of this research design is concept formation, elaboration and refinement and the greater part of the effort in this study is directed towards building the cases and sharpening concepts appropriate within the cases (Ragin et al., 2004).

Case study research enables analysis of context and phenomenon in an unbounded situation and the capacity to include varied sources of evidence on the same topic. Criticisms have focussed on research design faults, reliability and generalisability of the research (Yin, 1994). Case study research theorists have developed strategies for dealing with the criticisms and protocols to ensure robust processes and data. The essential characteristic of case studies is that they work for a holistic understanding of cultural systems in action with the focus on systems rather than individuals (Tellis, 1997). Stake defines a case as a bounded system (1994). Case study methods are apt as each of the research councils in this research operates as a bounded cultural system and each needs to be considered within the parameters of its system.

Yin (1994) expands on case studies, defining them firstly in terms of their scope: a case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident. Secondly, in terms of their technical characteristics, a case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points as one result relies on multiple sources of evidence with data needing to converge in a triangulating fashion. This study

draws upon multiple sources of evidence to explain the operations of peer review and grant selection; with administrative structures considered from intent to consequence, from policy makers to panel behaviour and applicant observations.

A case based approach has advantages when questions of how and why are the core of the research, where the researcher does not have control over events, and where contemporary events are under study [Yin 1994]. The research questions in this investigation focus on events, processes and effects in the context of research funding allocation, without any process intervention. Case studies are useful when a holistic, in-depth investigation is needed (Tellis, 1997). They are multi-perspectival analyses. This means that the researcher considers not just the voice and perspective of the actors, but also of the relevant groups of actors and the interaction between them. (Tellis, 1997) Another important feature of case studies is their capacity to examine contemporary events, when behaviours cannot be manipulated.

Case study research may consist of either multiple cases or single cases. Single case studies are ideal for revelatory cases where an observer may have access to a phenomenon that was previously inaccessible. Multiple case studies follow a replication logic, not to be confused with a sampling logic, as each case is a study entire, with conclusions drawn from the facts in each case (Tellis, 1997). Stake (1994) notes that a researcher may not know in advance whether the individual cases, in a collective case study, manifest features in common or if they are different. They are chosen “because it is believed that understanding them will lead to better understanding, perhaps better theorizing, about a still larger collection of cases” (Stake, 1994, p237). In this study, the researcher did know in advance that the two Australian cases manifested different features, as a result of her employment in the Councils. Both Councils were included because they are the major sources of competitive research funding in Australia.

Case studies have been criticised as inherently lacking in rigour, leading to inclusion of equivocal evidence influencing the direction of the findings (Yin, 1994). Yin challenges this view, noting that bias can also enter other forms of research design and that researchers have an obligation to report all evidence fairly (Yin, 1994). The issue of generalisation is also raised as a problem with case study research. Criticism hinges on a view that the outcomes of a case study should be generalisable to a larger group of cases. Yin argues that this view is inappropriate and that case studies are like experiments, generalisable to theoretical propositions and not to populations or universes of cases. The investigator aims to expand and generalise theories and not to enumerate theories (1994).

According to Yin (1994) research design must also take account of four key tests of quality; construct validity, internal validity, external validity and reliability. Construct validity in case study research is concerned with the development of sufficiently operational measures and control of subjective judgements in the data collection. Internal validity is primarily concerned with dealing with spurious effects and is particularly relevant in drawing inferences within case study research. External validity is concerned with the generalisability of the research beyond the case study to some broader theory. Reliability testing is concerned with the possibility that another researcher using the same procedures, conducting the same case will be able to produce identical results. Tactics for dealing with each test in the development and conduct of case study research to ensure valid, reliable and replicable research outcomes have been developed by Yin and are summarised in Table 3.1. This research design employed the tactics shown in the table.

Table 3.1: Case study tactics for four design tests applied to this study

Tests	Case study tactic	When used	This study
Construct validity	Use multiple sources of evidence Establish key chain of evidence Have key informants review draft case study report	Data collection Data collection Composition	Sources include - Interviews, Documents, Observations and Survey. Each data item collected is stored with unique identifier, in electronic, audio and paper copies. E-copies of transcripts and questionnaire extracts are linked to source data. Discussed preliminary findings with key informants during data analysis phase.
Internal validity	Do pattern matching Do explanation building Do time series analysis	Data analysis Data analysis Data analysis	Data from survey and interviews coded thematically using NVivo Themes examined for relationships and causal links Not used
External validity	Use replication logic in multiple case studies	Research design	Two cases used as principal units of study and two others considered as comparators.
Reliability	Use case study protocol Develop case study data base	Data collection Data collection	Data collection followed strict protocols. Data sets are securely stored on university server.

(Yin, 1994, p33)

Triangulation procedures are commonly used in the case study method, where the triangulation of evidence from multiple sources provides a means of confirming the validity of the process. The data should converge on the same set of findings (Yin 1994, Tellis 1997). Rigorous and comprehensive research studies develop theoretical concepts, create a rich picture and verify assertions by combining methods and perspectives. Triangulation provides the means to identify different perspectives of phenomena while recognising that observations and interpretations are not perfectly replicable. Qualitative research, acknowledging that objective reality will not be captured, employs triangulation as an alternative to validation (Denzin, 1994b, Stake, 1994, Denzin and Lincoln, 1994). There are six sources of evidence available to case study researchers: documents, archival records,

interviews, direct observation, participant observation and physical artefacts. This research design incorporates three of those sources of evidence, documents, interviews, and direct observation and adds a survey of applicants.

Whatever the data source used, there are, according to Yin [1994], three principles to be followed in its collection to ease problems of construct validity and reliability, and all three principles have been adhered to in this research design. First, multiple sources of evidence should be used to enable triangulation. Second, a case study database created as a separate collection and third, a chain of evidence maintained to ensure reliability and transparency.

This research design uses data triangulation to broaden understanding. Sub-types of data sources defined by Fielding (1993) include time, space and person, and data has been collected from different actors and institutions at different points in time and different locations to ensure data triangulation. The multiple case research design used in this study ensures that multiple perspectives were investigated and examined, leading to a richer understanding of issues (Denzin, 1994). These perspectives included:

- views of applicants for funding under the peer reviewed funding programs of the ARC and the NHMRC,
- experiences of panel members and former council staff,
- observations of selection meetings in the EPSRC and NSF,
- prior personal experience of managing grant selection processes and observing grant selection in the ARC and NHMRC, and
- documents by and about the research councils.

This approach provided extensive and varied data on the phenomena under consideration.

Data in this study were analysed using a grounded theory approach in order to produce an explanation of the social phenomena under consideration. Explanation and description form part of a grounded theory, which will

provide some level of predictability under particular conditions (Corbin, 1990). This approach was incorporated because the evidence sources and content provided original material and new insights on the processes under study. Both survey respondents and interviewees ranged widely in their comments and a structured approach to coding and classifying these comments facilitated analysis. Grounded approaches draw on the same types of evidential material as case study methodology. Data collections include interviews, observations, documents and other media that provides information about the phenomenon. Coding procedures are similar for this and other methods of quantitative data analysis.

The data collection process for this research incorporated key principles of the grounded theory approach to enable clarification and mapping of concepts as they emerged. Data were analysed at time of collection when possible and this process formed a basis for fine adjustments to subsequent data collection (Strauss and Corbin, 1994). Each data set, for example each interview, was coded according to concepts and key questions and codes were expanded and then grouped at higher levels as the data set increased in size.

Data Collection

Choices about the data to collect were based on extensive knowledge of the ARC and the NHMRC operations. The researcher worked for over nine years in those research councils, as both a program manager and a policy analyst. It was essential to separate that which was privileged information, obtained while an employee of the Commonwealth Government of Australia from that which was in the public domain. It was also important to cull information, as much that is collected is subsequently determined to be of little consequence Stake (1994). Data types and sources were selected to ensure adequate triangulation of data and to reflect a range of perspectives, building on the observations and personal experiences of the researcher.

A survey of researchers who applied to either the ARC or the NHMRC at any time between 2000 and 2004 was conducted over four months from November 2004 to April 2005. It gathered details about the roles of peers in the selection process, the personal experiences of successful and unsuccessful applicants, external reviewers and panel members. These data were collected to provide information about successful and unsuccessful applications, applicant attitudes and differences between the ARC and NHMRC processes as well as information from applicants who had served as external assessors and panel members on the ways they undertook their work.

Interviews with 23 informed participants in the grant process, some of whom had served in more than one role, provided insight into the confidential work conducted inside panels. The interviewees included; 14 who served as ARC panel members, three were NHMRC panel members and six were employed in one or more council. The interviews sought to collect detailed explanations of decision-making processes and interactions between panel members and council staff.

International fieldwork comprised visits to research councils in New Zealand, the USA and England where senior staff were interviewed and some selection panel meetings observed. Detailed notes were made during or immediately after every interview and panel meeting. These interviews and observations were conducted to provide information about other cases and points of comparison with the Australian data.

Publications were gathered and scrutinised for information about the research councils' structures, policy, history and processes. This information provided baseline understandings about how each organization was governed, sources of authority, the operation modes and models of selection. It also provided a clear view of what the research councils see themselves as doing and of what they are prepared to reveal about selection processes.

For each data type and source choices were made about which person, place or event to observe and to use. These choices were based on practical matters including availability, access and variety with a clear frame of reference to attributes of interest (Stake, 1994). For example, the National Science Foundation in the USA offers grant support using a range of mechanisms similar to those in operation in the ARC and the NHMRC. The NSF staff were enthusiastic and the researcher had access to senior Program Managers and to observe selection meetings. In England, the staff of the EPSRC were responsive to requests for interviews and provided access to internal policy documents, discussion papers and facilitated observation of a grant selection panel meeting.

Survey of applicants

This section describes the research design of the survey, the data items identified for collection, the construction of an internet based instrument, determination of the potential field, how the field was approached to participate, and the protocol for obtaining and managing responses.

The objectives of the survey were to collect data about applicant experiences of competitive research funding processes including processes within administering institutions, and the experiences of peers as external reviewers and panel members. Surveying applicants for funding meant that the peer reviewers and panel members were also collected in the field, as neither the ARC nor the NHMRC excludes its reviewers from applying contemporaneously with assessing.

In order to minimise respondent confusion about a variety of experiences the survey structure required each respondent to focus on their experiences with one agency. There are a significant number of researchers in enabling biological and social sciences who apply to both the ARC and NHMRC and 25 survey respondents were from this grouping. Respondents were able to indicate what funding they had sought and been awarded and what roles they had played in both organizations. Internal checks were created within

the instrument to ensure that responses could be related to a particular council. Questions were also posed about most recent experiences, which for most respondents had been in the 2004 round of applications, concluded only a month before the survey commenced.

The Participant Field

One funding program in each of the ARC and the NHMRC is regarded as a 'flagship' for the organization. In the ARC it is Discovery Projects. In the NHMRC it is Project Grants. These funding programs provide the bulk of investigator initiated basic science¹ and most of the peer review activity for the councils. The survey was designed to collect data about researcher experiences of applying for funding under these programs. Researchers who were first named, called Chief Investigator (CI) for these purposes, on a funding application for Discovery Projects or Project Grants in 2003 were the targeted respondents.

The potential field of respondents is estimated at approximately 4,350, taking into account those CIs who lead two or more applications. In 2003 there were 3,260 applications to the ARC for Discovery Projects (DP). ARC funding rules stipulated that no investigator could hold more than two Discovery grants concurrently. Data is not available from the ARC to establish the number of CIs who were leading two applications, but a staff member estimated the number as approximately 15% of applications². On this basis, the total number of persons who were lead CIs on ARC DP applications in 2003 was in the order of 3,000. The NHMRC funding policy for that year limited to six the number of Project Grants (PG) that a researcher could hold concurrently. Data is not available from the NHMRC to establish the number of CIs who were leading two or more applications, but

¹ Basic science and *blue sky* science are terms used to describe research projects which are not initiated for instrumental reasons, but often for reason of curiosity. The ARC maintains that there is a strong quantifiable connection between such basic science and economic and social benefit following a time lag of 10 years or more. One such example is the discovery of penicillin, not utilised fully until 15-20 years later when mass production became possible.

² Personal communication with an ARC officer.

a staff member of the NHMRC estimated the number of individual CIs in that round as approximately 1,350.³

In order to obtain an overview for each participant's experiences of the period following major changes in both research councils' processes the survey included questions about the period 2000-2004. This provided both a snapshot of the range of applicant and reviewer experiences, and an emphasis on the most recent experiences of a selection round.

It was important to include both successful and unsuccessful applicants in the survey to ensure that the views represented the researchers in the field. Prior experience in program management at the ARC and the NHMRC informed this researcher that applicants who are consistently unsuccessful may develop negative views about the selection process. Applicants who are frequently successful and who participate as external reviewers are more likely to have positive views about the selection process. This observation is supported by research on applicant satisfaction conducted at the NSF (Kruytbosch, 1989). Surveys are also prone to the effect of selection bias, in that those who respond are more likely to be successful (Viner et al., 2004 b).

The Survey Instrument

The survey instrument was developed and piloted in three stages with reflective amendments made following each stage. Data items were specified prior to development of the draft survey instrument and each question constructed carefully to minimize ambiguity and contextual confusion. Pilot interviews were conducted with seven informants from the target population to obtain indicative responses, feedback on question design, and suggestions to improve the usability of the survey and the quality of responses. The survey instrument is at Appendix 1.

³ Personal communication with an NHMRC officer.

A range of survey delivery methods was considered and an internet based survey was selected. A paper survey was rejected as it could not be sent directly to participants (see section below on contacting participants) and the cost of printing and postage was high. An electronic survey was the optimal mode, to maximize responses, enable direct data transfer into a purpose build database and provide an anonymous, secure platform. A team of University of Canberra information technology students in their final undergraduate year undertook the project as an assessment task. The student programmers were given a clear set of parameters for a web-based survey to be sited on a university web server and data management protocols that met ethical considerations and individual privacy. The student project team met with the researcher each week until the final survey instrument was tested and installed effectively on the university server.

Access to the survey required a login ID and password to limit possible access by persons outside the target field. The survey site contained inbuilt navigation so that respondents who indicated early in the form that they had acted as external referees or panel members were offered additional questions framed specifically for those roles (sections 5 and 6). Other navigation features included questions for respondents who had not been successful at least once over the period 2000-2004 (section 2). Once the respondent submitted the survey the system was programmed to automatically download data across the university firewall, stripped of its originating electronic address. The data items were stored with unique identifiers in a relational database. This database was checked and backed up daily during the four months that the survey remained open.

Contacting the Participants

Research councils publish identifying details of successful applicants for funding, but not of unsuccessful applicants, who are protected by the Privacy Act 1988. Neither the ARC nor the NHMRC was willing to email or post survey information to the appropriate applicants, citing concern over political perceptions in one case and fears about possible negative findings

about the organisation in the other case. Another approach was required. Managers of Research Offices in universities and some medical research institutes were contacted to seek their assistance. They were either visited or telephoned and emailed and asked if they would assist by identifying the appropriate researchers and then inviting their participation in the survey. The Managers were supportive and many research offices subsequently spent considerable effort encouraging staff to respond to the survey.

All university and health research institutes were emailed on 30 November 2004 advising that the survey was open and the web address live. They were provided with details of the survey and the research project, suggested text of a message to be sent to the identified field of researchers and the access details (at Appendix 2). The field was all first named Investigators on applications made in 2003 for an ARC Discovery Project or NHMRC Project Grant. Confidentiality of participants was assured, with no identifying information attached to surveys. An undertaking was given to only publish data which could not be used to identify individual respondents. For example, citing the following information about a respondent could lead to their identification; institution, field of research, and panel member in a given year.

Some universities and research institutes contacted the field of researchers within 24 hours, others did not make contact for two months. Not all universities limited the email distribution to the 2003 applicants. In several cases the text of the email and the description of eligible respondents was attached to a general information bulletin distributed by the Research Office to all active researchers in the university. This information included the password and login code used to access the survey. This was the case at two of the largest research institutions. However, this invitation did not compromise the data set because in one case there were no responses and the other only one response (which did match the criteria). In contrast, another large institution sent the email directly to the target group and there were 40 responses to the request, approximately 30% of the possible field.

Clearly, the bulletin style of email was an ineffective communication tool for this purpose. The institutions were advised of the outcome of their communication strategies.

As the respondents were anonymous volunteers, the researcher held concerns about the distribution of respondents across identified strata in the sample. Survey responses were monitored daily to examine the response rate for a variety of factors including; primary funding body (ARC or NHMRC), institution, successful and unsuccessful applicants, gender, field of research, and peer roles. Research offices in institutions with low, or no, responses were contacted and asked to remind their potential participants. Emails were sent and followed up with telephone calls encouraging their involvement. The survey closed on 28 March 2005.

Respondent profile

Respondents covered the full range of the field in terms of location, gender, discipline area, and application success. There were 202 respondents to the survey, 71% citing ARC as the research council they normally seek funding from and 29% citing the NHMRC. These numbers include 27 respondents who applied to both organizations over the period 2000-2004. The total number of respondents is fewer than the desired number for the potential population, which is 375, even taking into account ambiguity about the size of that field (Leedy, 1997). However, the range and distribution of respondents was better than expected and other data sources were employed to limit the potential impact of bias from a small sample.

Respondents indicated on the survey their participation in peer review over the period 2000-2004, including years in which they submitted applications, served as external assessors or as panel members. The tally of those responses indicates that the survey respondents have extensive experience of application for competitive funding, with 808 applications, and assessment, amassing 239 person-years of external assessment or panel roles.

Table 3.2: Respondent roles in peer review processes 2000-2004

	Number of Persons	Total Number of Years
ARC applicant	168	464
NHMRC applicant	69	215
Other NCG ⁴ applicant	56	129
ARC external assessor	67	206
NHMRC external assessor	4	8
ARC panel member	5	7
NHMRC panel member	13	22

Respondents were located in 32 administering institutions, including 29 universities, one medical research institute, one hospital and one branch of CSIRO. Of the university respondents, 57% were from the top tier of institutions (respondents from 6 of the 'Go8')⁵, 30% were from the middle grouping and 9% from the third tier. In 2003 the ARC awarded 65% of grants and 69% of DP funding to the top 8 institutions and the NHMRC 60% of PG funding to the same group. The middle tier of universities received 28.4% of ARC DP funds. The bottom tier of institutions received 2.7% of funding from the ARC and none from the NHMRC, which supports another grouping at the lower level, small hospitals and research organizations. The respondent distribution is a reasonable approximation of this institutional distribution of funds for both the ARC and NHMRC.

Respondents came from all the discipline areas funded by the ARC and the NHMRC. Distribution of ARC respondents across discipline areas is broadly similar to the distribution of grants in 2003, as shown in Table 3.3.

⁴ National Competitive Grants are defined by the Commonwealth Department of Education (in its various forms). They must be advertised nationally, use peer review processes to select recipients and offer grants above a specified amount. These grants leverage more supporting institutional and infrastructure funding from the Department for the host research institution. ARC and NHMRC research grants fit into the NCG cluster.

⁵ Australian universities fall loosely into clusters. The Go8 are the largest and richest research and teaching institutions and receive the majority of research and institutional funding from the Commonwealth. The next grouping consists of the remaining capital city universities, older regional universities, former institutes of technology and some of the new generation universities. The third and least resourced grouping is remaining new generation universities.

Table 3.3: Percentage of ARC Respondents by Discipline group, compared with grant distribution in 2003

ARC Discipline Group	%	%	%
	Grants	Funds	Respondents
Biological Sciences and Biotechnology	17.6	19.6	17.1
Engineering and Environmental Sciences	14.4	15.8	11.3
Humanities and the Creative Arts	17.7	12.6	22.0
Maths, Information Technology and Communications Sciences	14.6	14.5	11.3
Physics, Chemistry and Geoscience	17.1	24.2	23.4
Social Behavioural and Economic Sciences	18.5	13.4	14.9

The gender distribution of respondents was 61% male and 39% female. This is a larger proportion of female respondents than the proportion of female applicants to the ARC (23% of all Chief Investigators in 2003 were female). No figures are available for the gender of applicants for NHMRC Project Grants in 2003.

Table 3.4: Number of respondents by gender and success

	All	Male	Female	Successful	Unsuccessful
ARC	141	89	52	82	59
NHMRC	56	32	24	37	19
Missing value	5				
Total	202	121	76	119	78

More of the respondents were successful than unsuccessful in their applications for funding at least once between 2000 and 2004. ARC respondents included 58% who had been funded at least once and 42% not

funded in the same period. NHMRC respondents included 66% successful and 34% unsuccessful. This proportion of successful applicants is much higher than any single round of funding but the responses covered five years of applications and the survey provides evidence that many applicants were unsuccessful on several occasions before winning a grant and others had both unsuccessful and successful applications over the five years.

Respondents also included 70 academics who acted as external assessors for one or more of the councils and 18 who had served on one or more selection panels or committees between 2000 and 2004.

Interviews and Observations

Fielding (1993) defines two key approaches to good interviews. First, employ open-ended questions to encourage spontaneity in response and second, use techniques to encourage considered, analytical responses rather than glib answers. There are three types of interview; structured, unstructured and semi-structured (Fontana and Frey, 1994). Structured interviews leave little capacity to respond to emerging issues or to tease out underlying views. Unstructured interviews seek to understand rather than explain (Fontana and Frey, 1994) with flexible approaches to discussing a series of topics. Given that this study was seeking to understand phenomena in context, and that several themes were to be discussed during interviews, the use of structured and unstructured interview techniques was ruled out. The semi-structured interview model was used.

Semi-structured interviews enable understanding of complex social relationships and gathering an explanation of these from interviewees. The researcher employs a flexible, adaptive instrument and is able to address new topics that emerge in the interview. The interviewer is able to ask key closed-form questions in the same manner but also re-order questions and probe for clarifying information (Leedy, 1997). Probing for more detailed responses is a core of the semi-structured interview, encouraging interviewees to be as comprehensive as possible (Fielding, 1993).

Interviews - Australia

Interviews were conducted to generate qualitative data about process from the point of view of the peers on panels and staff of the research councils. Key informants were identified following preliminary analysis of the survey data that pointed to concepts that required further discussion. Interviews were conducted with 18 of the 19 key informants who were invited to be interviewed. One former panel member was outside Australia and unavailable, all others accepted. Most interviewees were former panel members of the ARC and the NHMRC, covering a wide range of disciplines and holding over 70 years of Australian panel experience between them, in addition to their external reviewer work in Australia and internationally. Three interviewees had served on panels for both councils. Former administrative staff of the Australian research councils, with more than 35 years of grant administration experience, were interviewed. Interviews with several senior staff from Australian university research offices and four staff of the EPSRC and the NSF are also included.

Interviews were conducted between May 2005 and March 2006. Twenty interviews were conducted in person and three by telephone. All but four of the interviews were tape recorded to ensure accurate transcription and to maximise interviewer focus on the interviewee's responses. Four interviews were shorter and conducted in noisy settings where a tape recorder was not helpful. Interviews varied in length, depending upon how much the interviewee had to say about their involvement in peer review processes and the time available to them. Over 17 hours of interview tapes were recorded and transcribed.

Interviews – USA and UK

While the Australian cases are the focus of this study, the work that they do is similar to that of research councils and other funding organizations throughout the world. Peer review features in some form or another in all of these organizations. This researcher does not know of any research council that does not use some form of peer review in its grant selection processes,

whether by including components of external review or panel review, or by appointing persons with discipline expertise to administrative staff. Gathering knowledge about some of those processes was part of the research strategy, providing wider reference points and examples of alternative practices.

Gaining access to the National Science Foundation, in Washington DC, was not easy. There are hundreds of requests made to the NSF each year and staff are not always able to provide time to assist. After several attempts the researcher contacted a senior Program Manager with whom she had corresponded on funding for a research project some years previously. This approach proved to be very effective and access was expedited by that Manager. During one week in September 2004, semi-structured interviews were conducted with senior staff, Program Managers and Deputies, in several discipline areas. Notes were taken during and following these interviews. The focus of these interviews was the detail of the peer review processes and other mechanisms used in their area to select grants for funding. Additionally, the researcher was invited to observe a panel consider applications for grant funding, an extremely interesting and rich experience. Notes were taken during the day of observation. Only a small sample of NSF program structures was examined due to the size and complexity of the organization.

Three of the UK research councils were visited in September 2004 and semi-structured interviews conducted with senior policy and program staff about selection processes. The councils visited were the Engineering and Physical Sciences Research Council (EPSRC), the Economic and Social Research Council (ESRC) and the Medical Research Council (MRC). In all three cases, senior program and policy staff provided information about the work of their council and discussed issues about selection with considerable frankness. Notes were taken during and following each of these meetings. At the EPSRC the researcher was allowed to observe a full day of deliberation by a selection

panel. Staff of the EPSRC also provided detailed internal policy papers. Only the EPSRC data is included in this thesis.

ARC and NHMRC Published Materials

Publications by the ARC and the NHMRC were drawn upon extensively. Annual Reports, Strategic Plans, funding program information, commissioned research and other publicly available materials were analysed and formed points of reference for discussions and confirmation of matters of fact. These materials are the basis for models of selection processes and a workload analysis of panel members developed in Chapters 4 and 5 of this thesis.

Data Analysis

The materials collected for this research were gathered and organised using several computer-based tools. The survey was collected using an internet-based form; the data stripped of its identifying electronic address and automatically transferred into an Access database prior to collection by the researcher. The text of responses to open-ended questions was transferred into NVivo together with key demographic data for each respondent. The bulk of survey responses were transferred into SPSS for manipulation and cross-tabulation. Interviews were transcribed into NVivo and coded in the same manner as survey data. Documents by and about the research councils were classified using the same higher-level concepts as text data in NVivo. Not all themes collected in this research data were pursued in the final version of this thesis.

Data collected through open-ended questions in the survey and through interviews were managed and analysed using NVivo, a software package designed to assist researchers, particularly those using grounded approaches. The interviews were transcribed in full, entered into the NVivo database and coded using thematic coding. Concepts developed in the first coding were explored and organized as further data were entered into the

database and patterns emerged. Data trees and sets enabled clarification of concepts and modelling of relationships between data.

Survey data were collected electronically, which expedited conversion of the data into a statistics management tool, Statistical Package for the Social Sciences (SPSS) for analysis. The original data structure produced by the student project team did not meet the stipulated requirements of portability into SPSS and the transfer process required moving the data between an Access database and Excel to produce a clean, error free data set for entry into SPSS. Following that process the final data were checked against the original dataset, a comma separated value (CSV) file string stored on a server in the university.

Variables were coded in SPSS, with all text responses converted to numeric codes where possible. The questions that offered multiple responses in matrix arrangements were collated into new variables to enable and simplify cross-tabulation. One example of this collation is Question 5, about the number of applications made to the ARC and their success over the period 2000 to 2004. A new variable called ARC success was created to identify those respondents who had successful applications during the period.

Data collected and analysed using the methods described in this chapter have been grouped into the following chapters. Chapter 4 consists of an overview and analysis of research funding arrangements, including the structures and roles of the ARC, NHMRC, EPSRC and NSF and the ways that those organisations operationalise their grant selection processes. It is based largely on documents and publications by the research councils. Chapter 5 builds on Chapter 4 by providing an analysis of grant funding peer review processes operating in the studied councils expressed through models of the different grant program processes. Chapter 6 draws on interview and survey data to reveal what happens inside selection processes and panels from the perspective of peer reviewers working as panel members and external

assessors. Chapter 7 is based on survey data and covers applicant experiences of competitive grant funding processes.

PART ONE - THE FRAMEWORK

4 FUNDING COUNCILS AND THEIR PROCESSES

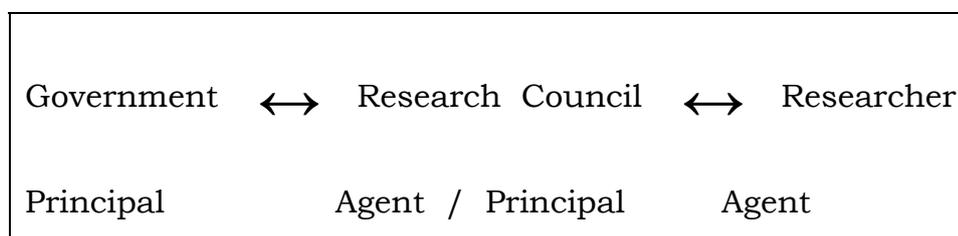
This chapter contains analysis of baseline information about the bodies that use grant peer review selection processes. The purpose and structures of the two Australian research councils and an American and a British case are considered. All four research councils manage the allocation of government funding to support research activity. Administrative arrangements and costs of supporting peer review panels and committees for the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC) are compared. These arrangements are contrasted with the structure, organization and functions of the National Science Foundation (USA) and the Engineering and Physical Sciences Research Council (UK).

Council structures, administration, processes and running costs vary, with the number of peers appointed to serve on panels and committees a significant variable. In the relationship between councils, peer reviewers and funded researchers, trust plays an important role. Systems of grant allocation all depend on the advice of peers, mostly given freely, and considered by senior researchers to be an important part of their community obligations. Rip describes this commitment further, as a perceived right of scientists who may also assume that “the procedures and processes to divide the spoils are a matter for the scientists alone” (Rip, 1993, p4). Data on the structures of the National Health and Medical Research Council in Australia discussed in this chapter provide some examples of a council that does not have clear boundaries and is dominated by the research community, which crowds the organisation with panels advising on policy and administrative matters. Chapter 6 discusses further this engagement of researchers with research councils, including commitment to peer review and the experiences and attitudes of panel members and assessors.

Relationship between government, council and researcher

The dynamics of the relationships between governments and research councils may be analysed using principal-agent theory where the government is the principal, contracting agents to undertake research (Van der Meulen, 2003a). Braun (1993) notes difficulties facing research councils taking into account the third party in the relationship; the researcher community. Van der Meulen suggests that the relationships can be seen as a chain of principal-agent relationships taking the form shown in figure 4.2.

Figure 4.2 Principal-Agent Chain

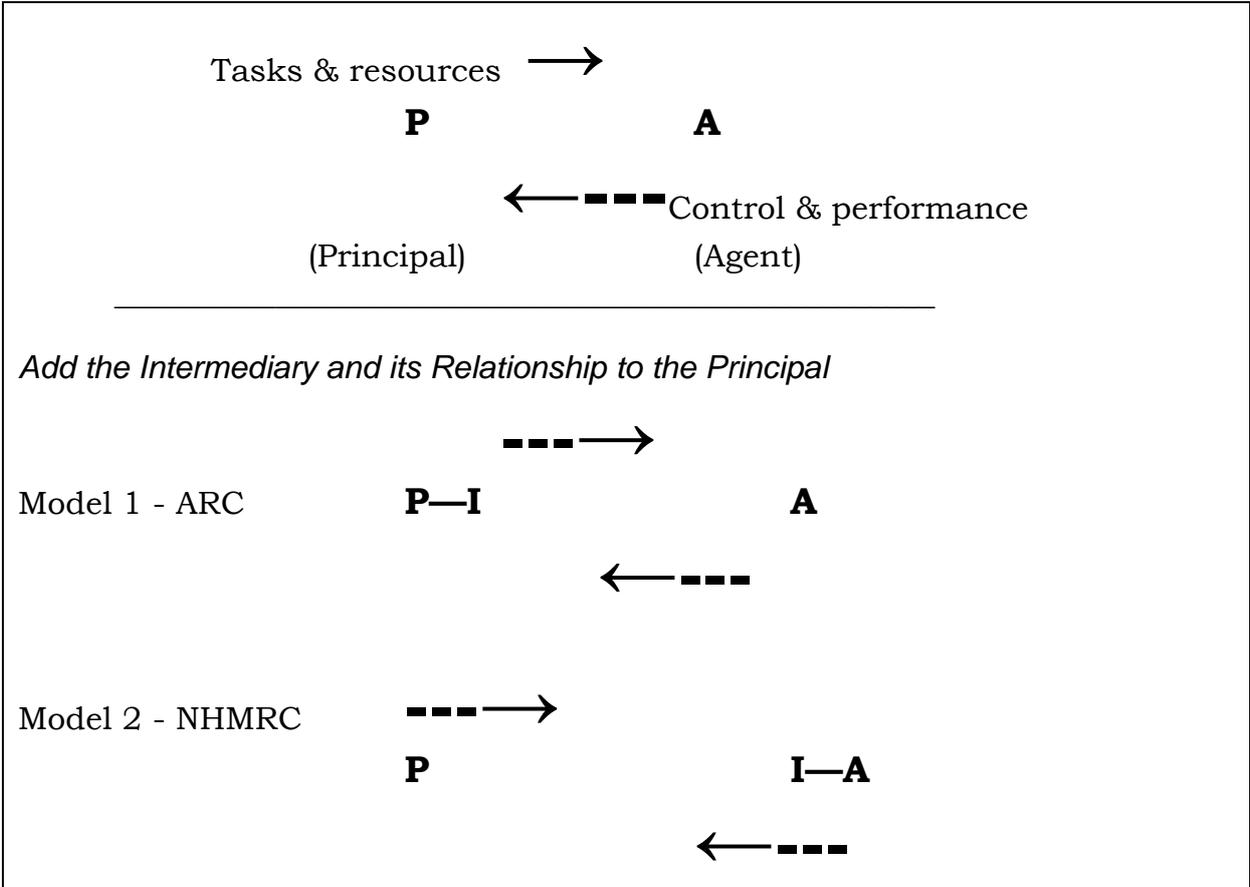


(Van der Meulen 2003, p325)

Alternatively, the role of the research council can also be identified as that of an intermediary body, which works for the needs and interest of another party. It represents the needs and interests of the principal (government) to the agent (researcher) and reports the performance of the agent to the principal. The interest of the research council in this case is defined “in terms of the interests of the other two actors” (Van der Meulen, 2003b), p324). The authority of the intermediary in this principal-agent relationship is determined by the degree of control the intermediary has over funding allocation, policy and performance and the co-operation of researchers in performance monitoring. Van der Meulen (2003) suggests four possible relationship configurations between principal, intermediary and agent. One of these models demonstrates the position of the ARC, in that the government controls policy (through legislation and directions) and resources (through annual budget processes) and strictly defines the operations of the council. Peer review has a role but under government policy, where the Intermediary is closely linked to the Principal (model 1 in Figure 4.3).

In the case of the NHMRC the role of the peers is strengthened by legislation which requires that the peers (Research Committee and its appointed sub-committees and panels) advise on expenditure, on quality and scope of research, and monitor the outcomes of funded research. This requirement places the NHMRC closer to the agent, where those who benefit from funding having a powerful influence over its use and evaluation (model 2 in Figure 4.3).

Figure 4.3: Relationships between principal, intermediary and agent



(Van der Meulen, 2003c)

This intermediary role alters significantly when third parties are joined to the model. Industry partners, users groups or other agencies enter the configuration as agents, or principals or alternative funding sources and can alter the position of the intermediary significantly (Van der Meulen, 2003d). The ARC has entered partnerships and tripartite funding agreements with several external partners in principal roles, including CSIRO and several

government departments. It has also joined industry organisations into research collaborations on Linkage-Projects. In this latter case the partners are both principals, providing capital and resources to the research and agents, working as part of research teams.

The NHMRC has funding agreements with international agencies, also as principals, including the Wellcome Trust in the United Kingdom, the Health Research Council in New Zealand and the Canadian Institutes of Health Research as well as not-for-profit enterprises including the Juvenile Diabetes Research Foundation. NHMRC Development Grants connect industry partners in a similar way to the ARC Linkage-Projects but at an early stage of research, forming a link between basic research and commercialised outcomes.

Research councils, as intermediaries, stand between the Australian Government and the research community, responsible to the government and responsive to the research community. Legislated government control of research councils varies from the size of annual appropriation to determining the policies, funding programs and grants to be awarded. In Australia, the Commonwealth Parliament has created significantly different enabling legislation for the ARC and NHMRC, but in both cases the Minister of the day holds authority to approve grant funding. The differences in legislative frameworks contribute to larger differences in operating style and relationships with research communities.

Purpose and Structure of the NHMRC

The NHMRC enabling legislation provides the framework and scope for the Council and its Committees. The *NHMRC Act (1992)* establishes, at section three, the following objectives of the NHMRC:

- to raise the standard of individual and public health throughout Australia
- to foster the development of consistent health standards between the various states and territories

- to foster medical research and training and public health research and training throughout Australia
- to foster consideration of ethical issues relating to health.

The Minister of Health and Ageing holds powers under the legislation and is answerable to the Parliament for all activities conducted under its auspices. *The Act* requires the Research Committee of the Council to advise (Council and the Minister) on research expenditure, to monitor the use of research funding and advise the Council on matters relating to medical research and public health, including “quality and scope of such research” (s35, 1992). This broad responsibility underpins the extensive influence of the external peers in this organisation, ranging from deciding what types of funding programs should be offered, to allocating resources between funding programs and advising on the contents of administrative policies governing funding arrangements. The elected and appointed members of the research arm of the organisation exercise both legislated authority and de facto authority over administrative practices.

The NHMRC structure focuses on the committees created to provide advice to the Council on each of the key roles of the organisation, research, ethics, advice and regulation. Research Committee creates a sub-set of structures of committees and panels to provide peer review and policy advice. The number of panels and committees varies from year to year, with ad hoc advisory groups formed to discuss policy issues or to respond to discussion papers. In 2004 the NHMRC created 69 panels or sub-committees to provide advice on investigator initiated research, strategic research and policy, and a total of 701 places on these committees were filled by members of the research community and government bodies (NHMRC, 2005 b). The organisation is dominated by the research community that it funds.

Changes to the NHMRC occurred in 2006, when it became an independent statutory agency in July, following passage of legislation. The agency retained its roles in relation to advice on research and health matters but major changes were evident in relation to its governance structure. Decisions

for funding remain with the Minister, based on the advice of the NHMRC. How different the agency operations will be from the previous model is not entirely clear, particularly as changes to the legislation were minimal.

The NHMRC also initiated changes to its peer review processes in 2006 with a view to streamlining its administrative load, lessen demand on peer reviewers and to lower costs. The number of funding programs was reduced by grouping schemes under four or five broad clusters with similar application and assessment processes. In 2006 the selection of Project Grants used a new process of assessment without external assessors. The NHMRC believed that assessor fatigue was posing a risk to the organization as 50% of assessors approached in 2005 had declined to assess (slightly higher than the rejection rate for the ARC). Instead of three external assessments and two 'spokespersons' within a panel there were more panel members designated to each application and more panels formed for the purpose. Panel Chairs read applicant provided Notices of Intent to apply and then advised on panel composition to ensure depth in discipline coverage. Approximately 700 persons were appointed to panels for the Project Grants process, a 350% increase over 2005. The NHMRC has stated that this decision was intended to simplify and shorten the time taken from application to funding announcement and reduce the burdens on external assessors. However, the increase in numbers of panel members created additional burden on that research community estimated at 15,000 persons across Australia by the (Australian Society for Medical Research, 2006) by bringing the assessors inside the organisation.

This move had consequences for the funding applicants. With all assessments done by panel appointees, the NHMRC was not bound to provide assessments to applicants for their response prior to a decision on recommendations, something it is required to do when external assessments are obtained, to comply with Australian government legislation designed to

ensure procedural fairness and transparency in decision making.⁶ This process, known as either rejoinder (ARC) or response (NHMRC), adds to the length of the assessment timetable but also provides most⁷ applicants with meaningful, detailed comments on their applications, and an opportunity to add relevant information for the selection committee or panel to consider. The new model was less transparent and more of the ‘black box’ hated by applicants. Subsequently the NHMRC has changed its process bringing external assessors and rejoinders back.

Purpose and Structure of the ARC

The *Australian Research Council Act 2001* created a statutory body governed by a Board, with a Chief Executive Officer reporting to the Minister for Education Science and Training. This structure changed in 2006, as part of a realignment of the governance of Commonwealth Government agencies, to an advisory council, with the CEO reporting directly to the Minister. Under the original Act, the Board provided advice to the Minister and carried responsibility for monitoring the performance of the organisation. Following the 2006 legislative changes the Minister retained a key decision-making role, now based on the advice of the CEO. Ministerial decisions include determining the funding distribution between funding types (Linkage and Discovery), approving or rejecting Funding Rules for all funding schemes, approving or rejecting research projects selected by peer review and recommended by the CEO, and must be consulted prior to any ARC initiated inquiry. The external peers involved with ARC advice and governance still have significantly less influence than those in the NHMRC structure.

The ARC sees its role as a broker between the research community and government, in policy and in delivery of research outcomes. It also defines the brokerage of partnerships between researchers and the users of research

⁶ Both the ARC and the NHMRC had legal advice that external assessments cannot be used unless the applicant is given a reasonable opportunity to respond to the assessment and that response taken into consideration in selection decisions.

⁷ A small percentage of assessment reports are not detailed and a few are not helpful to either applicant or panel.

at national and international levels as a key function. It draws upon advice from members of Expert Advisory Committees (EACs), and staff (including discipline based Executive Directors) to develop policy initiatives and funding programs designed to sustain and expand research capacity and deliver to government directives. Six EACs were formed in 2001, replacing a larger, more complex committee and panel structure that operated before the separation of ARC administration from the Department of Employment, Education, Training and Youth Affairs. There are 72 EAC members covering all the disciplines supported by the ARC (all except clinical medicine and dental research, which are covered by the NHMRC).

Each EAC during the period under study (2000-2004) included one or two 'end users' of research, appointed from private and public sector organisations. This addition to the peer review process was a political imposition intended to modify perceived negatives inherent in peer review selection. The users were added to represent the broader community and act as a grounding mechanism for the academic panel members. In some cases the external members brought valuable expertise to panels, but frequently these 'industry' members did not carry the same heavy assessment load that the academic members take on, were not well matched to the task, and served shorter terms on panels (Interview 1).

The EAC members work on competitive selection of applications for funding, while permanent staff of the organisation, including six Executive Directors, appointed from the research community for terms of two or three years, manage the administration of funding schemes. Decisions about what funding is offered, and under which mechanisms, are taken by staff in the administrative body with the express permission of the Minister for Education.

Panels and Colleges

In 2003 public criticism of ARC grant selection processes, in the Australian newspaper and directly to the Minister for Education, Science and Training,

included suggestions that interdisciplinary research suffered due to rigid panel assignment of applications, where only part of the work could be assessed. The ARC responded by renaming its panels a 'College of Experts' and listing the entire body as one group in its publications. This terminology reflected that used by the Engineering and Physical Sciences Research Council (EPSRC) in the UK to describe a body of several thousand researchers elected by their colleagues to provide external assessments and to sit on selection panels. In practice, no substantial changes were made to the ARC selection process, with panels meeting as previously in the discipline clusters (Interview 1). However, the renaming strategy was successful and criticism was quieted.

The Minister and the Peers

The Minister for Education has rejected ARC funding recommendations on several occasions, either because the projects were considered to be politically sensitive or too esoteric by a Minister in a populist, conservative government. These rejections were based on the information provided to the Minister by the ARC, initially a summary listing of projects with institution and applicant names, project title and amount recommended. Media reports and Senate Estimates Committee hearings in the Australian Parliament reveal Ministerial intervention in the following cases:

- Minister Vanstone declined to approve a recommendation from the ARC in 1997 to fund a project;
- Minister Nelson declined three projects in 2004 and seven projects in 2005.

All rejections since 2001 were projects within the Humanities and Creative Arts portfolio of the ARC (Senate, 2005).

Each year the ARC provides approximately 1800 recommendations to the Minister but this handful of rejections caused significant disquiet in the research sector in Australia. The confidence of the peers was shaken. If a Minister may reject the result of a complex peer reviewed assessment process and not provide reasons, then what would become of research?

Stuart MacIntyre, a former ARC panelist, writing in *The Age* discussed the move by Minister Nelson to satisfy populist commentators. The Minister had added three people to an ARC process oversight committee, the Quality Committee, to monitor recommendations for social acceptability:

P. P. McGuinness, the omniscient editor of *Quadrant*, found that his role would be limited to invigilating the titles and summary descriptions of the projects awarded funding.

"Quite frankly," he complained to *The Australian* in September of this year, "it's purely window dressing." He could tell from the titles that many of these projects were "rubbish", and he demanded authority to inspect them and reject them. Nelson hurriedly assured McGuinness that he would have full access. (Macintyre, 2005)

In fact, the Quality Committee has an interesting role in the ARC process, providing a high level overview and expert analysis of the quality of projects at the margins across all the panels, noting any differences between disciplines and recommending some projects at the margins. The addition of three commentators to the panel made for a very awkward meeting:

McGuinness wanted about 20 applications removed from the list on the basis of their titles and summary text. We would not agree to that – it goes against the entire *raison d'être* of peer review. He took his hit list direct to the Minister too (Interview 5).

The Minister went on to remove seven recommended projects from the list of approved projects, but it is not known if those seven were on Mr McGuinness's list. As for the applicants, they would have received feedback from the ARC that indicated they were unsuccessful, but not why.

The disquiet continued after Minister Nelson moved out of the portfolio, to the extent that the new Minister, Julie Bishop, announced soon after taking the office, that she did not intend to reject the ARC recommendations:

She has ... signalled she will not pursue the same controversial practice as her predecessor Brendan Nelson, who vetoed research grants in the past two years.

"I know Dr Nelson exercised ministerial discretion on a very few occasions," Ms Bishop told the HES yesterday.

"My view is that if the peer review process has the independence and integrity to ensure that it's robust, then I would see no need for me to second-guess that process." (Illing, 2006)

ARC and NHMRC Administrative Differences

From a distance the ARC and NHMRC are parallel organisations, providing the intermediary role in distribution of research patronage to research bodies in different discipline clusters. Closer examination reveals significant differences in their decision-making processes, relationships with research communities, degree of autonomy from government and the extent of influence exerted by the funded community.

Expert advice on the selection of applications for funding, on policy and process is provided to both organisations by members of their research communities who serve on advisory committees and panels. The ARC Board can establish committees for particular purposes only with the consent of the Minister for Education. The NHMRC Research Committee may establish committees, advisory groups and panels, and effect concomitant expenditure commitments for meeting support, without reference to the Minister or even the NHMRC Chief Executive Officer (CEO), even though control over the administrative budget rests with the CEO. This means that the CEO may constrain the number of committees and panels only by limiting funding for administrative support. The table below demonstrates the effect of this confluence of unclear authority.

Table 4.2: Panel Members and Funding, ARC and NHMRC 2004

	<i>Number of Committee and Panel Positions</i>	<i>Amount of funding allocated and monitored \$m</i>
ARC	96	413.8 (Fin Yr 2003-2004)
NHMRC	701	333.8 (2004)

Data are derived from Annual Reports of the ARC and NHMRC 2004.

Workloads for Panels and Staff

With so many people sharing the load of advising the NHMRC the panel members are assigned a much smaller number of applications to assess and less responsibility for the process than members of ARC committees. At the end of the assessment process, NHMRC Grant Review Panels (GRP) consider the Project-Grants applications over a week-long selection meeting. Up to 2005 each panel considered approximately 100 applications, each of which had three external assessments and an applicant response. Each member carried primary responsibility, as 'spokesperson', for 10 applications, secondary responsibility for another 10, and shared panel responsibility for the remainder. The members read applications, selected assessors, read applicant responses and made comparative judgements. GRPs do not have a program budget to meet, but discuss and score applications as a group⁸ and provide very brief written feedback for all the applications assigned to them. These unpaid volunteers think their workload is heavy (Chapter 6 includes discussion of the views of panel members).

At the ARC the EACs consider, in a similar week-long selection meeting, Discovery-Project (DP) and Linkage-Project (LP) applications, including attached Fellowship applications, assigned to their discipline cluster. In 2004 each committee considered between 500 and 800 DPs and between 50 and 150 LPs in that week. Each member carried primary responsibility for 40-80 DPs and secondary responsibility for a similar number. With the LPs added the load varied from 100-200 applications for each member. (In 2006 the number of applications had increased by 20% but EAC and staff numbers were the same.) By the meeting the members had read applications, selected international assessors (Int Readers), provided preliminary scores for each of their primary and secondary applications, read assessments from the Int Readers and the two Australian-based

⁸ The process of scoring is discussed later in this chapter, including the use of secret ballots in GRP meetings.

Readers (Aus Readers, who were assigned by the Executive Directors), read applicant responses, and made comparative judgements within sub-disciplines. During the meetings they discussed and revised budgets and made sub-discipline ranked lists by combining all assessment scores, ranks and commentary, made comparative judgements of quality across the discipline cluster to arrive at a ranked list for each grant and fellowship type within the allocated budget and priority lists. They think their workload is heavy. It is indeed heavy, with five to eight times the number of applications that are allocated to each NHMRC panel member and with the added complexity of selecting across several disciplines.

Table 4.3: ARC program and operating budget, 2001–02 to 2005–06

	2001-02	2002-03	2003-04	2004-05	2005-06
NCGP budget (\$m)	265.8	298.3	394.4	481.4	556.5
Operating budget (\$m)	9.7	11.2	12.6	12.8	14.3
Operating as % of NCGP budget	3.6	3.1	3.1	2.7	2.7
Total Staff (at 30 June 2006)	56	60	60	71	67

Source: (ARC, 2006), p5)

Workload size is considerably different for ARC and NHMRC panel and committee members. The smaller ARC structure places heavy burdens on its panel members, who hold full-time jobs in research, teaching and administration of universities or industry organisations in addition to this load. Many members report that they would not repeat the experience, although they believed they gained personally, learning and making a contribution to research (Interviews 1, 8, 10). NHMRC panel members, with a much smaller load, more frequently return for second or third terms on selection panels and committees. Experiences of panel and committee members are discussed further in Chapter 6

Panel Appointments and Roles

While the differences between the organisations are marked, in terms of the number of positions on committees and panels, the method of appointment

is also notably different. The panel structure in the NHMRC is a cascading series of appointments starting with the Chair of the Research Committee (RC). Members of the Research Committee, who have been appointed by the Minister on the basis of recommendations supported by the Chair of that Committee, are appointed to chair policy or funding program committees that report to RC. They influence the appointment, by RC, of members of their committees and then they select chairs of another layer of panels, who repeat the selection process. Some panel members and applicants regard this process as consisting of “grace and favour” appointments (Interviews 10, 1, 19), whereby the most influential people develop a coterie appointed in their wake. Some survey respondents claim that the system is flawed, a matter further discussed in Chapter 7.

The NHMRC Research Committee determines the number of granting programs and the division of funding between them. It instructs the administrative arm of the organization to create new programs to deliver research and equipment funding to targets that it determines. Research Committee determines the selection process and the contents of the written program documents, which serve as the rules for funding. It supervises the selection process, adjusts panel recommendations to move funding cut-off points across the various programs. Research Committee then recommends funding recipients, to the Council and the Minister for Health and Ageing.

In contrast, the ARC panel members may make suggestions for minor alterations to funding rules and other program documents but have no further influence. Program documents are created by the administrative arm, taking into account comments from the sector and the panels. They are cleared by legal advisors and then sent to the Minister for Education for approved. Changes to the program offerings are negotiated between the CEO and the Minister for Education. The CEO must obtain annual Ministerial approval for new program offerings and the funding split between Linkage and Discovery programs.

While this ARC process provides a clear link between the principal and the actions of the intermediary it constrains the capacity of the organisation to respond to areas of need. The NHMRC is able to respond quickly to identified areas of need and produce mechanisms for funding urgent need. On occasion such funding has lead to significant grants to members of NHMRC committees. This is not a surprising outcome, given the number of world-leading researchers on committees, but it is an outcome that opens the organisation to criticism based on perceptions of bias. The changes to the enabling legislation of both organisations in 2006 have not altered these differences.

NHMRC funding is provided under the authority of the enabling legislation and particular conditions for each program are detailed in *Guidelines and Advice to Applicants* published each funding round. ARC funding is provided under enabling legislation and the particular conditions for each program are detailed in *Funding Rules and Instructions to Applicants*, which are approved by the Minister for Education and published each funding round. The flagship programs, NHMRC Project Grants and ARC Discovery Projects, are offered once in each calendar year and the selection process managed over a six to eight month cycle using considerable staff and volunteer resources. Table 4.4 provides a summary of key program activity for flagship programs of the ARC and NHMRC in 2004.

Table 4.4: Grants, Funding and Committees, ARC and NHMRC 2004

	No. of applications	No. of new grants	Amount spent on all new & continuing grants	No. of funding types	No. of c'tees & panels	No. of places on ctees
ARC	3260 (Discovery Projects)	875 (Discovery Projects)	\$413.8 m (Fin Yr 2003-2004)	10	10 ⁽¹⁾	96
NHMRC	1892 (Project Grants)	416 (Project Grants)	\$333.8m (2004)	25 ⁽²⁾	69 ⁽³⁾	701 ⁽⁴⁾

(1) Six EACs form the basis for other ad hoc panels. Three such panels operate at least once per annum and draw specialist additional members from outside the EACs.

(2) There are also many fellowship and scholarship sub-categories not counted separately.

(3) Includes all panels and committees under the Research Committee in 2004.

(4) All places under and including Research Committee; its sub-committees, working committees, panels, advisory groups, steering committees and working groups in 2004.

(ARC, 2004b, NHMRC, 2004b, NHMRC, 2004a, NHMRC, 2005a, ARC, 2003 - 2004)

Cost of Panels and Committees

The costs of supporting an appointed advisory workforce are large for both the ARC and the NHMRC. The ARC EAC members are provided with a small annual stipend in lieu of daily meeting fees. This amount is determined by the Remuneration Tribunal, as is the amount paid to experts recruited for particular tasks such as the Federation Fellowship selection panel. NHMRC members are also paid fees determined by the Remuneration Tribunal, but only the Chair of Research Committee is provided with an annual fee. Additionally, the Chair of RC is provided with a salary equivalent for administrative support and an amount for research purposes, in lieu of estimated earnings foregone while working on the business of Research Committee. Prior to 2006 this transaction was conducted under contract with the Department of Health and Ageing and not reported in NHMRC expenditure. Costs of the committee and panel membership fees, based on 2004 numbers, are estimated in the following table. This costing does not include airfares (often at business class rates) meeting room hire, travel allowance (per diems) or ground transport.

Table 4.5: Estimated cost of committee and panel member fees 2004

	Cost type	Fees & costs per person \$⁽¹⁾	No. of places	No. of meeting days	Cost PA \$	Total Cost PA \$	No. Meeting Days PA
ARC	EAC chairs per annum	20,800	6	10	124800		
	EAC Members per annum	14,670	66	10	968220		
	Ad hoc members (3 panels) per day	292	24	2	14,016		
	<i>Totals ARC</i>					1,107,036	66
NHMRC	RC members per day	292	20	22	128,480		
	RC Chair per annum	50,550	1	annual	50550		
	RC Chair staff & support costs ⁽²⁾	300,000	1	annual	300,000		
	RC Executive per day	292	10	12	35,040		
	Sitting fees panel & sub-c'tee Chairs per day	292	69 ⁽³⁾	5 ⁽⁴⁾	100,740		
	Sitting fees panel & sub-c'tee members per day	219	611 ⁽⁵⁾	5	669,045		
	<i>Totals NHMRC</i>					1,283,885	379

(1) Fees are those determined by the Remuneration Tribunal. While fees were increased mid-way though 2004 Determination 2003/03 has been applied to the entire year Actual costs are not publicly available and have been estimated conservatively here.

(2) The exact amount is not in the public domain. The contract includes payment in recognition of costs, including a full-time personal assistant, compensation for research and other income foregone.

(3) This figure includes all Chairs, Co-Chairs, and Convenors listed in the Annual Report 2004, other than RC Chair.

(4) The number of days that a panel or working committee meet in a year has been estimated at an average of 5 for the NHMRC.

(5) This is the number of positions, some people serve on two or more committees, working groups or panels.

The figures in Table 4.5 have been derived from ARC and NHMRC Annual Reports, NHMRC Members’ Handbook and the Remuneration Tribunal Determination 2003/03.

The increase in number of panel members in 2006 to 700 in the NHMRC raised administrative costs by up to \$1.5m for sitting fees and travel for five days of panel meetings. In 2007 the number of panel and committee members is estimated to have exceeded 1000.

The cost of external advice on grant applications is not limited to the membership fees, travel and accommodation of members and meetings. Administrative costs for staff time in servicing meetings are significant. Table 4.6 summarises the costs of servicing meetings, costs that are additional to the cost of administering funding applications and grants.

Table 4.6: Cost of staff support for meetings of panels and committees ⁽⁵⁾

	No Committee and Panel Meetings pa	No staff days supporting meetings ⁽³⁾	Cost ⁽⁴⁾ \$
ARC	16 ⁽¹⁾	112	185,024
NHMRC	160 ⁽²⁾	420	693,840

⁽¹⁾ Each EAC meets twice per annum and other panels usually meet once.
⁽²⁾ Numbers of meetings are not published for all NHMRC committees and panels. This figure assumes that all panels and committees under RC meet twice a year. Some meet more frequently.
⁽³⁾ Staff days are calculated at a total of 7 days per meeting distributed across 3 staff levels, including preparation and post meeting administrative work. SES level officer time is not included here.
⁽⁴⁾ Cost calculation is based on salaries for APS5, EL1 and EL2 (pro-rata reduced time commitment with increased seniority).
⁽⁵⁾ This table considers administrative work associated with meetings but does not include administrative time spent processing grant applications.

The figures in Table 4.6 have been derived from ARC and NHMRC Annual Reports.

Staff Structures

Administrative staff who work on grant selection programs and support meetings of panels and committees differ significantly in profile and number between the ARC and the NHMRC. The ARC structure in 2004 included six Executive Director positions, at Senior Executive Service, Level One. These positions are filled by discipline experts, appointed from the active researcher community, to head discipline clusters. Although their roles include developmental work, building research networks in addition to leading the administration of funding programs, they are included here as program administrators. In 2004 each discipline cluster had three to five staff and programs were managed either within a cluster (Infrastructure, International, Federation Fellowships, Centres of Excellence and Indigenous Researcher Development) or distributed across all clusters (Discovery Projects and Linkage Projects). In all there were 29 staff managing research funding for most of 2004, including the Executive Directors.

During the same year, the NHMRC Centre for Research Management was headed by one senior administrator, a Branch Head at Senior Executive Service Level One, and included four Sections that managed research funding programs and supported committees and panels. There were some 45 staff managing research funding in 2004, including the Branch Head. The much smaller (64% of the staff), but more senior, ARC research funding administration spent approximately 82% of NHMRC expenditure on staff salaries.

Key structures and processes of the NHMRC and the ARC are summarized and compared in table 4.7.

Table 4.7: Key Features of ARC and NHMRC Structures and Processes 2005

Feature	ARC	NHMRC
Legislation	ARC Act 2001	NHMRC Act 1992
Governance	Statutory authority with a Board and CEO reporting to the Minister for Education, Science and Training. Staff of the Australian Public Service	Not independent, part of the Department of Health and Ageing. A Council, CEO and staff of the Australian Public Service
Advisory Committees	6 Expert Advisory Committees, in discipline clusters, conduct peer review of applications.	Legislated 4 Principal Committees. Other committees and panels may be created.
Appointment process for committees and panels	Vacancies are advertised nationally and applications sought. Applicants are nominated by their employing institution. A panel is formed by ARC to assess nominations against vacancies in terms of selection criteria: excellence in research, and a sound understanding of the importance of the utility of research broad discipline expertise professional and academic standing organisational skills relevant experience in industry or public-sector organizations experience in dealing with coordination of research activity.	Members of Research Committee are appointed by the Minister from a list of recommendations provided by the CEO on the advice of the Chair of RC (who has already been appointed to the Council). Many of the members of Research Committee then chair sub-committees which have membership appointed by RC on the advice of the Chair of that sub-committee and the advice of the Chair of RC. Committees then recommend to RC persons for appointment as members of selection panels. Until 2005 there was no advertised selection process.

Feature	ARC	NHMRC
Other committees and panels	In 2002 there were 10 panels with 83 positions supporting research programs. 2005 there were 11 panels with 103 positions, including an EAC Selection Panel and a Quality and Scrutiny Committee. Members of the 6 EACs served with other appointees on panels formed for programs - Linkage Infrastructure, Centres of Excellence or Federation Fellowships during their appointment. Grant applications passed through one panel before Council.	In 2002 there were 40 panels and committees under Research Committee. In 2005, there were 76 panels and committees with 777 positions. Grant application decisions passed through either three or four layers of committees and panels before Council.
Funding allocation to grant schemes	Minister authorises each year the split between Discovery and Linkage budgets. The ARC Board determines budgets for the programs (10-11 types). ARC Executive determines funds available for Panel allocation using a formula that takes past allocations, application numbers and requested funding into account. Panels are advised of allocations at the commencement of the selection meeting.	Research Committee allocates funding to more than 30 programs. It also creates new programs to meet needs it identifies. RC makes final decisions on allocation amounts for each program after recommendations from selection panels are presented to it.
Funding Rules or Guidelines	Developed by employees of the ARC, in accordance with administrative law requirements and approved by the Minister, on recommendation of the Board and CEO. All programs have selection criteria that allocate weightings. For Discovery Projects track record is weighted at 40%.	Developed by sub-committees with staff assistance and approved by the Research Committee, on the recommendation of a sub-committee or panel. Three selection criteria added during this period for Project Grants with equal weightings, two criteria (66%) are track record based.

Feature	ARC	NHMRC
Employment of discipline expertise	The CEO has academic standing. Six Executive Directors are employed full-time to provide expert advice to the sector and the administration in six broad discipline areas.	The CEO has academic standing. Some members of staff are recruited for particular expertise (such as ethics or regulation) other than administration.
Payment for service by members of committees and panels	The six EAC Chairs are paid \$22,700 pa and the other 66 EAC Members are paid \$16,000 pa (Remuneration Tribunal determination).	The members of Research Committee (no more than 20 persons) are paid \$55,000 pa each (Remuneration Tribunal, 2003). The Chairs of Principal Committees, including RC, negotiate support packages from the NHMRC and the Dept of Health and Ageing. Packages may include: part personal salary, part or full salary for personal assistant, grant in lieu of competitive funding for each year of service, extensive travel costs and other matters. Committee and panel members may receive daily fees for meetings.
Panel review of applications	Yes, based on Reader assessments and external assessor reviews and their own expertise, the EACs recommend applications for funding and the amount for each application to a budget provided by the Executive Director at the start of the meeting.	Yes, panels consider expert assessor reviews and then score each application based on the score assigned by the member who is the application spokesperson.

Feature	ARC	NHMRC
External assessment	Each application is assigned to two Australian-based Readers who consider between 15 and 25 applications, rank them and provide assessment text and scores. Additionally one or more international experts in the field of the application is assigned to provide assessment text and score. In 2001, there were 593 members of the Australian reader base for Discovery-Projects and 351 members for Linkage-Projects. They provided 6,070 assessments and 900 assessments respectively. Many of these readers were involved in the assessment of applications for both programs.	Panel members obtain agreement from three experts in the field of the application to provide assessment text and score.
Applicant rejoinder process	Applicants receive all assessor text and may provide a rejoinder of up to 2 pages of text within a defined period.	Applicants receive all review text and may provide a text response within a defined period.
Process post selection panel	Recommendations are provided to the Board and then the Minister.	Ranked lists are considered by a sub-committee of Research Committee which determines the merged list from all panels. RC decides how many applications from the recommended list to fund by setting the amount available, after they examine the recommendations. RC recommendations go to the Council and then the Minister.

Feature	ARC	NHMRC
Approval of research projects and fellowships	Minister for Education	Minister for Health and Ageing
Review research final reports	Executive Directors	Panel members
Reporting process for agency	Ministerial and Parliamentary responsibility - Annual Report, Senate Estimates for budget.	Ministerial and Parliamentary responsibility - Annual Report, Senate Estimates for budget.

Other Research Councils

The National Science Foundation USA

The National Science Foundation (NSF) in the USA is one of the largest and most significant research funding agencies funding basic science with peer review models of assessment. Created in 1950 by Congress, to “promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defence”, it has grown to an organisation with an annual budget of \$5.5 billion (in 2004). It processed 43,817 applications for funding in 2004 and supported 10,400 of those applications. In 2004 the NSF provided funding for 20% of all federally funded basic research undertaken at colleges in the USA. (NSF, 2004a) Unlike the position in Australia, grants provided by the NSF come complete with funding for the indirect costs of research, an amount determined federally by the Office of Naval Research. Competitive merit review processes account for about 90% of NSF allocations.

The NSF states that their processes are “recognized throughout the government as the gold standard for responsible use of public funds” (NSF, 2004a). Research councils select metaphors that equate their work with high value, in this case gold. The ARC chooses excellence as its motto. The NHMRC provides the “Rolls Royce of peer review” according to a former Chairman of its Research Committee (Anderson, 2002). It is interesting that the NSF gold standard of usage includes several different models of peer review in the selection of grants.

NSF staff are a mix of permanent staff, contractors and researchers who are seconded for terms of up to three years. These staff, drawn from colleges and research institutions, enable the organisation to engage closely with the research community, and significantly expand the capacity of the organisation. Their salaries are derived from a different funding pool from that of the permanent staff and thus provide a buffer against staff contractions or growth in workload. For example, in 2004 there were eleven astronomers employed within the NSF, augmenting permanent staff, in administrative roles managing a budget of approximately \$200m per annum (NSF, 2004b).

NSF grant selection employs several models of peer review and the choice of model is determined by the discipline Program Manager, a full-time administrator who was originally a researcher in the discipline. This is a senior role with responsibility for development, monitoring and grant allocation. In 2004, approximately 47% of all NSF funding decisions were made on the recommendations of expert panels of peers without external peer assessments. At the NSF the written external assessments are called ‘mail review’. The NSF had determined by 2004, at its most senior level of policy formulation, that this was the model the NSF would move towards and that all disciplines would eventually operate in this fashion. Several factors underpinned this decision. First, that increasing numbers of competitive grant funding applications had placed too much stress on the pool of reviewers, and second, that the cost of managing mail review had become

unsustainable (Van Citters, 2004). The process of change is variable across the organisation. In 2004 the majority of panels working in astronomy did not use mail review but all the panels in sociology used six expert mail reviews in addition to panel generalists (White, 2004).

The NSF is reviewed annually, for administration, grant selection processes and research impact. Large panels of external reviewers consider actions and outcomes against the strategic plan of the organization and publish their findings. This transparency, combined with the presence inside the administration of hundreds of active researchers on temporary transfer, opens the organization to the research community. The way that the NSF serves that community and the broader national interest is monitored. Capacity building across institutions is one target and the following comment from a review in 2006 illustrates a real concern about the spread of funding:

As the need for a well developed workforce increases, greater efforts must be made to ensure true inclusion of all people and institutions. Partnerships with minority-serving institutions must be infrastructure and science partnerships, not solely external student research opportunities. Student training must be the right balance between rigor and exposure. Funding must have the appearance of a true meritocracy, where the ideas are more important than the institution in which one resides (Rodgers, 2006, p39).

Further comment about how the NSF supports capacity building occurs in Chapter 6.

The Engineering and Physical Sciences Research Council UK

One of seven research councils funded by the UK government, the EPSRC is a non-departmental public body, which is governed by a council. The primary role of the EPSRC is to “invest in the generation of new knowledge in engineering and physical sciences and in the training of people skilled in research” (EPSRC, 2002a). The EPSRC has two standing panels providing advice from academic and commercial perspectives and frequently seeks

external opinions on “policies, scientific strategies and administrative processes” (EPSRC, 2004).

Funding programs administered by the EPSRC are assessed by peers and managed by program staff who have research training. Assessors and Panel members are drawn from a Peer Review College. Members of the College are elected by their academic peers for a term of three years and approximately 20,000 researchers participate in the process. An academic requires four nominations for automatic membership and an industrialist three nominations. In 2004 the College had 4400 members. Those elected to the College commit to provide assessments on applications for grants (approximately 12 per annum) or fellowships and to assess reports on completed projects. Approximately 142 College members also serve on Responsive Mode Panels ranking grant applications during their three year term (EPSRC, 2002c).

The Peer Review College provides a very strong base for EPSRC operations. It guarantees a field of assessors who have the confidence of some of their peers and overcomes a critical problem that faces the NHMRC and the ARC, the rejection of requests to assess. In 2005 the ARC and the NHMRC cited rejection rates of 40-50%. EPSRC data on responses by referees in 2003 reveals that rejections or non-responses were significantly lower with a rejection rate of 25% among College referees and a return rate for all review requests of 69%. Responses also indicate a higher refusal rate by proposer nominated referees, which is perhaps a comment on the success of the College system (EPSRC, 2004b).

The process of gaining College membership through election ensures that researchers view College membership as both desirable and democratic. As a further incentive to participation in peer review the EPSRC piloted an incentive scheme in 2004, whereby points were awarded to university departments for referee reports submitted by faculty staff and these points were translated into cash annually. The EPSRC provides support and

training to its College to ensure that members provide quality assessments and robust panel recommendations. When appointed, members of the College are trained in a series of events across the country, their experiences are monitored by survey throughout their term and they actively participate in a process of continuous review of the administration of funding programs.

Like the NSF, the ARC and the NHMRC, the EPSRC separates the process of ranking applications for funding from the formal approval process with administrative staff managing the latter. Unlike the aforementioned agencies, the EPSRC Panel members are instructed to not re-referee the proposals, but to “make a judgement on those comments/issues and concerns raised by the referees” (EPSRC, 2002b). Administrative staff, including Program Managers, cannot alter the rank order lists produced by Panels for any reason.

EPSRC uses a system of panel review that is distinct from those of most perhaps all other UK Research Councils and foreign funding agencies. EPSRC’s panels are asked to rank proposals entirely on the comments and ratings from postal reviewers and responses to these comments by the PI (applicant). Panellists are enjoined from including their personal analyses of the original proposal (“re-refereeing”) (EPSRC, 2002b).

Panels at the EPSRC are appointed from the College and each panel is selected to ensure expert coverage of the applications it will consider. Panel members are carefully selected from the College to meet selection criteria for:

- scientific expertise - a breadth of research experience rather than specific scientific expertise matched to every proposal under consideration;
- conflict of interest control - In particular it is desirable that panel members are not investigators (particularly principal investigators) on proposals that are under consideration at the meeting and to minimise the impact of organisational conflicts of interest;

- peer review experience - an experienced and respected panel chair, together with a balance of established and new peer reviewers;
- demographic factors - to ensure that there is a desirable gender, age, experience, user, industry, and regional coverage. (Claydon-Smith and Webber, 2003)

In terms of application numbers and successful projects the EPSRC resembles the ARC.

In 2003/04 it received 4248 research proposals of which it funded 1345, valued at £333.3 million. This investment funded 3522 researchers in 113 organisations. In the same period, 7036 postgraduate students and 234 fellowships were supported (Murphy, 2004).

Like the ARC, the EPSRC keeps operational costs low in relation to its program budget, consistently less than 4% of its overall funding. This figure is comparable to the other UK Research Councils, but lower than the Wellcome Trust and the NSF (Murphy, 2004). However, the EPSRC has a significantly larger budget and is able to support approximately 300 staff, more than three times the staff of the ARC.

One significant cost component of peer review selection processes is the provision of panel meeting support. The ARC and NHMRC use commercial providers of meeting rooms, usually large hotels which strip guest suites and create temporary meeting rooms. For each Australian council multiple panels meet simultaneously and appropriate venues are expensive and getting harder to find. The response mode of selection used by the EPSRC requires only one panel to meet at any time. In 2003 a purpose built facility, costing £150,000, was created in Polaris House, Swindon, where six of the UK research councils have offices. This suite is used to run around 200 review panel meetings each year. (Murphy, 2004)

During 2004 this researcher observed a selection meeting conducted by the EPSRC in their peer review room and noted the ease with which the meeting

progressed within a purpose built environment. The suite consists of two rooms, the first designed for meal breaks and furnished with chairs, tables and benches designed to facilitate casual dining, social interaction and internet access. The meeting room, shown in Figure 4.4, is soundproof, spacious, well lit and furnished for maximum comfort of all participants. Each place around tables arranged in a horseshoe shape has power and data points and a clear view of data projection screens used by EPSRC staff during the meeting. The chairs for all users are top of the range office furniture, fully ergonomic, light weight and of an open weave breathable fabric. Even the colours and shapes used in the room have been selected to maximise concentration and productivity for participants. The facility saves operation costs and enhances meeting progress.

Processes and policies at the EPSRC are closely monitored and documented by several senior people who work full time to ensure the process delivers the best possible research outcomes for the government investment. All sections of the grant funding and selection processes are documented, all processes are transparent, participant experiences are monitored and processes reviewed. The EPSRC level of attention to the impact of policy and process far exceeds that of other research councils reviewed for this study. It provides in the public domain rich data for comparison.

Figure 4.4: EPSRC Peer Review Meeting Room, Polaris House, Swindon



Summary

This chapter outlined legislative and administrative arrangements for state patronage of research through peak body funding councils in Australia, the USA and England. These councils, as intermediaries between the patron state and the researchers, are able to make choices about the processes and administrative arrangements they use to allocate research funding.

The different policy frameworks of the ARC and the NHMRC were examined and compared and significant differences were identified in the Councils' approach to grant selection and the roles of peer reviewers. The NHMRC handled a smaller budget than the ARC and fewer applications for funding in 2004. The NHMRC processes changed from 2004 to 2007, increasing the number of peers as panel members to 1201 whereas the ARC panel membership remained under 100, with external peer assessments provided to support panels. These differences in policy were shown to have major cost

impacts, as the NHMRC panel and committee costs grew to be 2.5 times those of the ARC.

Other examples of processes and structures were drawn from the National Science Foundation in the USA and the Engineering and Physical Sciences Research Council in the United Kingdom. The NSF is a very large organization which includes semi-autonomous discipline directorates. Peer review selection processes vary across the directorates with two major models in use in 2005. The EPSRC administrative arrangements for peer review processes were found to be based on detailed analysis of their impacts. The result is that the EPSRC has developed low cost selection models.

Structures and policies of the councils have created meanings about what peer review is and how it is conducted. Chapter 5 uncovers the detail of process differences and models of grant selection process designs that incorporate peer review.

5 MODELLING GRANT SELECTION

This chapter is about the ways that peer review is used to determine excellence in the ARC, the NHMRC, the NSF and EPSRC. It builds on what was learned about structures and frameworks in Chapter 4 and develops models of the major grant review processes practiced in the Australian Research Council and the National Health and Medical Research Council. Differences between research councils and differences between funding programs within the councils are explored and modelled to establish the ways that peer review is operationalised and how ARC selection processes compare with those of the NHMRC.

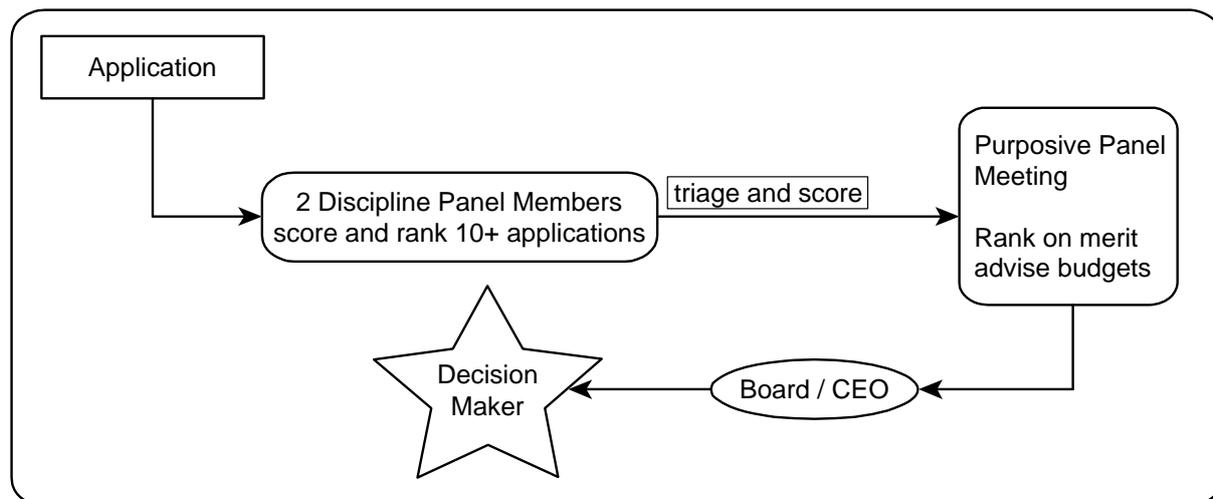
Models of Grant Peer Review

Peer review is a complex set of arrangements, defined and operationalised in a variety of different ways across and within research funding organisations. There is no evidence of one best model or one best fit for grant selection processes. Peer review is common to all the research funding bodies discussed, whether by external (mail) reviewers, by panel only, or by a combination of external review and panel. Staff of the funding bodies interact with panel members and external reviewers and in some cases add a layer of assessment following panel review. Recommendations about selection emerge from the work of panels and staff.

There are many possible models for peer review grant selection, eight common models used by research councils are charted in the following section. Each model is linked to one or more funding programs in the period considered by this thesis, 2000 to 2004. While the research councils change the models attached to funding programs from time to time the models here demonstrate most possible process designs.

The first model is a simple panel-only model, shown in Figure 5.1.

Figure 5.1: Peer Review Model 1 – Purposive Panel only



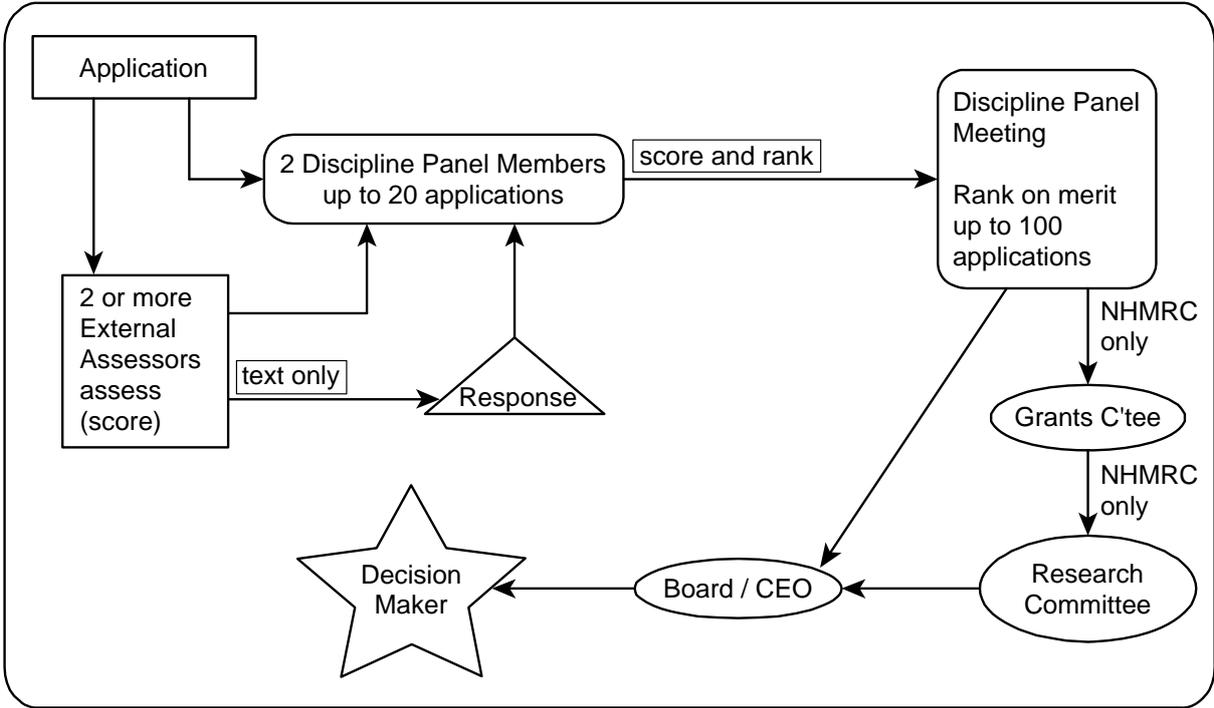
Model 1 is used by the ARC for its infrastructure program (Linkage Infrastructure Equipment and Facilities, LIEF), and is adapted by the NHMRC for its Project Grants (see an expanded version of this for NHMRC processes at Model 4). The NSF uses this model for almost half of NSF selection processes, with the Board review role replaced by Program Manager review. The NSF are moving to increase the use of this model to ease peer review burdens, to cut costs and expedite processes (Interview 2005 NSF).

This very simple model of peer review used in grant selection involves the funding agency forming a selection panel for the purpose of assessing and selecting proposals for funding. Funding agency staff assign applications to panel members who assess a portion, or all, of the field. Some panels are formed around a sub-discipline so all members have knowledge of the work proposed in almost all applications. Other panels are formed across many disciplines, for example ARC LIEF, so the focus is kept on national need. Often the agency provides the entire package of applications to all panel members so they can familiarize themselves with the full field. Panel members assess applications in advance of the meeting and may provide a triage ranking, where members assign applications into one of three categories (fund, perhaps fund, do not fund). Members discuss all applications at the selection meeting, creating a list of fundable projects in rank order and in some cases recommend a project budget for each recommended application.

Although the panels have the subject matter expertise in this, and many following selection models, they rarely make a decision. Decision making power is assigned by the enabling legislation or rules of the funding agency. In the case of the ARC and the NHMRC decisions rest with the portfolio Minister who usually accepts recommendations from the council’s CEO or board, but who may reject specific recommendations. Further discussion of decision-making powers and rejection of recommendations occurred in chapter 4.

The next model, in Figure 5.2, demonstrates the process with the addition of external assessors to the panel process, which under the Australian Administrative Law framework triggers a requirement to offer applicants an opportunity to respond to the external assessments.

Figure 5.2: Peer Review Model 2 – Assessors, Response and Panel



Model 2 was used by the ARC until 2002 for Discovery-Projects and Linkage-Projects and by the NHMRC for Project Grants until 2006. The NHMRC process added two layers of committees above Grant Review Panels (GRPs). A similar model is used by the EPSRC, where in place of the Board a senior

staff member reviews panel recommendations (outlined in Figure 5.3). Just over half of NSF selection processes use this model with the addition of the Program Manager review in place of the Board (Interview 2005 NSF).

This model has been a dominant model for many funding agencies and programs. The funding agency forms a panel for the purpose of assessing and selecting proposals for funding. Funding agency staff assign applications to panel members. Assessors are assigned by either agency staff or panel members. In the case of the EPSRC, the assessors and the panel members are drawn from a college of experts nominated by their peers for the purpose. Panels are formed to provide coverage for the applications in the field and to ensure a mix of experienced and new panel members.

External assessors are assigned by either the panel member or the staff of the agency. Assessments are provided to applicants with the identifying details of the assessor removed. This process enables applicants to respond to criticisms or inaccuracies in the assessment, in accordance with administrative law requirements. The response or rejoinder features in all Australian research council models where external assessors are used.

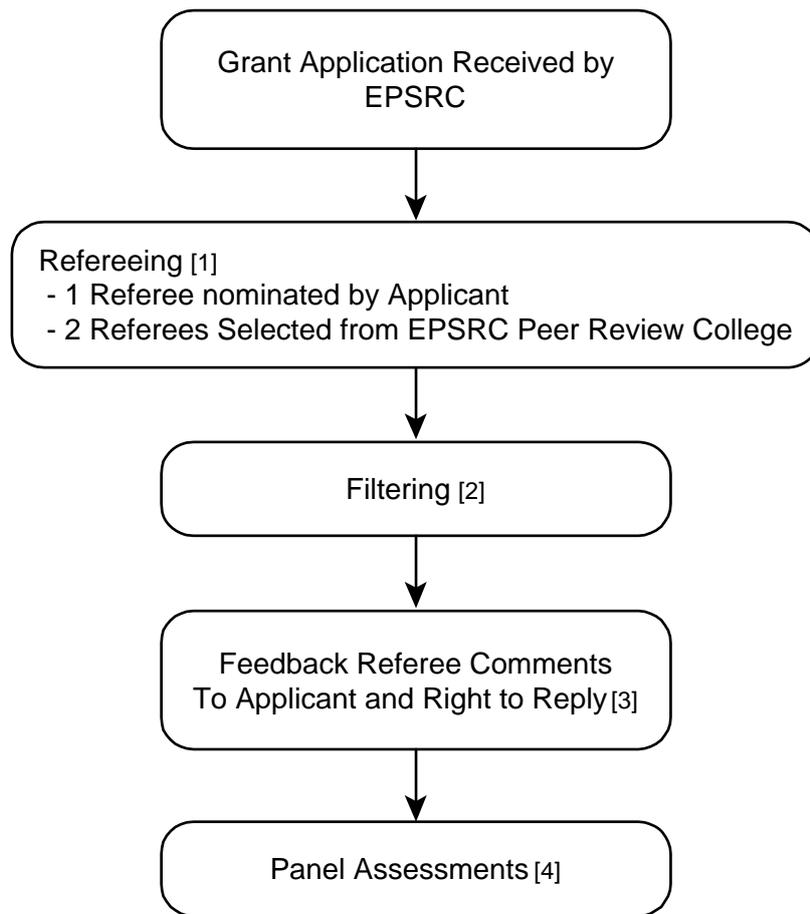
Panel members also assess applications in advance of the meeting and score applications relative to other applications read. Members discuss applications at the selection meeting, often in pairs of first and second assigned EACs (ARC), being those closest to the application sub-discipline without a conflict of interest. They rank applications in these sub-disciplines and then work with the rest of the panel to create a list of fundable projects in rank order and in some cases (ARC) recommend a project budget for each recommended application.

The NHMRC panel process prior to 2006 involved the members of the GRPs discussing 100 applications over the course of a week. This process is very different from the ARC process, with all discussion occurring within the assembled group of members. The two “spokepersons” assigned to the

application provide a verbal summary and indicate what their score will be for the application (out of 7). All members then score the application by secret ballot. Scores were constrained to not deviate by more than one point above or below the score of the spokespersons unless an explanation was offered in advance. This scoring process meant that the spokespersons largely determined the outcome score. Staff calculate the final score by averaging all votes cast. However, this complex process did not end the selection. Two committees reviewed the recommendations. The first committee integrated the 20 GRP lists into one ranked list. The second adjusted the budget available for the round, thereby moving the cut-off line up or down, in full view of the recommended projects (which were listed by number and title).

EPSRC selection during the same period was similar to Model 2 in that there are external assessors, an applicant response and a discipline panel meeting. There are several key points of difference; the Peer Review College, filtering by staff and the role of panel members. Membership of the Peer Review College is desirable evidence of support from peers and carries workload recognition so requests to assess have a higher success rate. A majority of poor assessments, as judged by a staff member, can remove an application from further consideration (filtering). Panels members are not permitted to assess the proposals themselves, but instead judge application assessments and responses and create a ranked list based on shared meanings. Figure 5.3 shows this process.

Figure 5.3: Peer Review in the EPSRC – Assessors, Response and Panel



[1] There are about 4,400 members of the EPSRC Peer Review College. Each person is nominated for four years. The aim is to have at least 3 referee reports. Sometimes more than 3 referees will be contacted to achieve this. The response rate to requests for referee reports is about 70%.

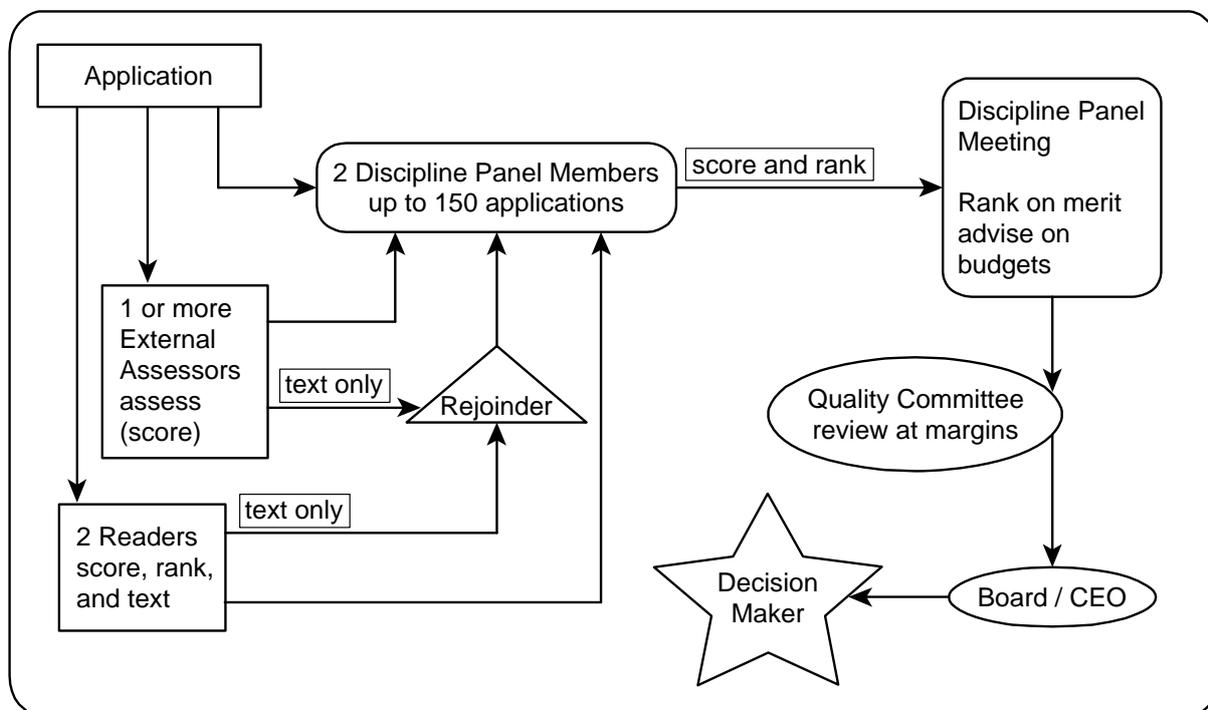
[2] If 2 out of 3 referee reports are negative the application may be sifted.

[3] Anonymised referee comments are sent back to the applicant. The applicant is allowed a week to respond.

[4] Panels typically review 40-50 grant applications. Each grant application is nominated two speakers on the panel. The means members have to speak to about 10 applications in detail – although they are encouraged to familiarise themselves with all the applications. Panel members are not asked to referee the proposals themselves. They are asked to use the referee reports, applicant responses and other panel information to rank the applications, ensuring this done on a consistent basis for all applications. Effectively, they are moderating and prioritising. (Murphy, 2004)

Another type of external assessor, a Reader, is added into the mix shown in Figure 5.4.

Figure 5.4: Peer Review Model 3 – Assessors, Readers, Response and Panel



Model 3 is the ARC model for Discovery-Projects, the ARC flagship program, in use since 2002. This is a complex model of peer review employing three categories of reviewers. The ARC receives over 4000 DP applications annually in one round. Six ARC panels, called Expert Advisory Committees (EAC), consider the applications. The six cluster mixes are; PCG - physics, chemistry and geosciences, BSB – biological sciences and biotechnology, MIC – maths, information and communication sciences, SBE - social, behavioural and economic sciences, EE – Engineering and Environmental Science, and HCA - humanities and the creative arts. Each EAC of 11-14 members has the entire field of DP applications to consider in one round a year, between 500 and 750 applications. The assigned load of applications to each EAC member is in the order of 150, half as first reader and half as second reader. First readers assign external assessors (Int Readers). EAC members assess and score all of their (150) assigned applications in advance of the EAC meeting and their scores are added to those provided by the Oz Readers to create an indicative ranking of applications.

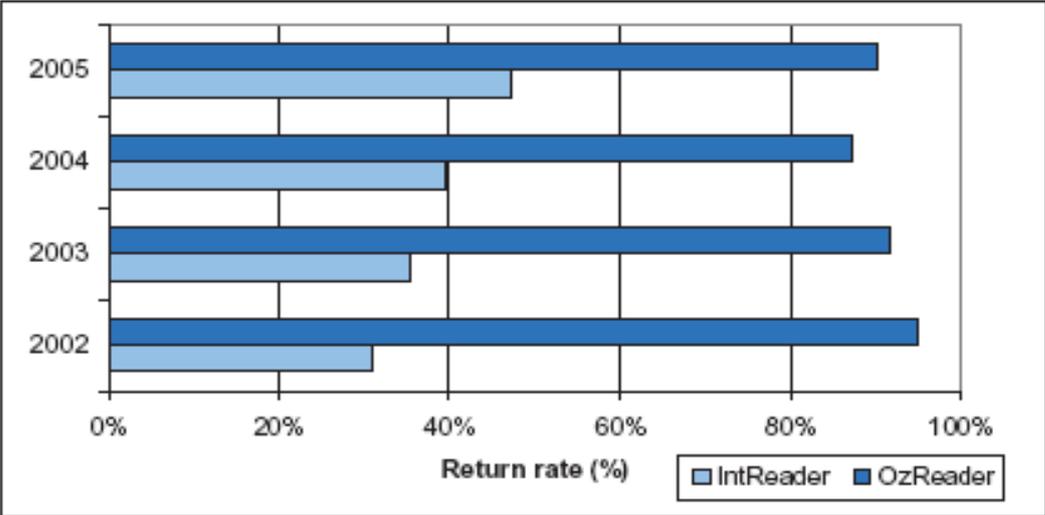
The ARC introduced Australian-based Readers (Oz Readers), into the selection process following a trial conducted over several years across two discipline panels in the social sciences. That trial concluded that assessors who read a bundle of applications produced assessments reports that discriminated between applications on quality, thus providing panels with better information for their decisions. It also recommended that assessors read 30 applications for the most reliable outcomes and a minimum of 20 applications. This latter recommendation has not been implemented, in part due to reluctance of Readers to carry such a load (Interview 1, 2005).

Oz Readers bring expert readership to a bundle of applications, enabling relative ranking within a broad sub-discipline cluster, in addition to individual scores and the textual comments that go to the applicant. Ranking a bundle of applications is qualitatively different from assessing one or two applications and the Oz Readers produce assessments that are more useful to a panel attempting to rank hundreds of high quality applications. Most Oz Readers are recipients of ARC funding and are under contract to accept assessment tasks if asked to serve. They are offered a nominal amount of \$30 per application assessed. This process ensured that external assessments are available, when approximately 50% of external assessors decline the request to assess (Auditor-General, 2006).

In addition to the Oz Readers, are the external assessors, called International (Int) Readers by the ARC. The ARC seeks to obtain three assessments from persons who are international experts in the field of the application. ARC staff send invitations to assess to five or more potential assessors, identified by the relevant EAC member. The rate of return varies but one Int Reader assessment is considered to be baseline. However, the ARC does not promise to obtain any assessments. Yet, it is these assessments that applicants regard as most valuable and relevant, and the ones that they think define peer review (Survey responses). However, the peer panel members find these isolated reviews less helpful than the ranked

Oz Reader assessments (Interviews). Int Readers are not paid for their assessments. The relative response rates of Int and Oz Readers over the period 2002-2005 is shown in figure 5.5

Figure 5.5: Response Rates for Int Readers and Oz Readers 2002-2005



(Auditor-General, 2006)

Under Australian administrative law arrangements a funding body that seeks external opinions in support of a decision about funding is required to provide the applicant with a right of reply to assessor comments. This reply called a rejoinder in the ARC. The ARC provided assessor reports do not identify the assessors, scores or ranks and are vetted by ARC staff. This vetting picks up a handful of assessments that contain potentially libelous comments, which are removed from assessments prior to dissemination to applicants and panel members. Applicants have approximately ten days to provide a response of up to two pages, addressing significant criticism, errors or providing new evidence in support of their application. This rejoinder is provided to the panel members who consider it as part of their deliberation.

EAC members discuss applications at a five day selection meeting, creating a list of fundable projects in rank order, with a revised project budget for each recommended application. Budgets are almost invariably cut, with the top 5% usually receiving close to their request and others reduced to enable

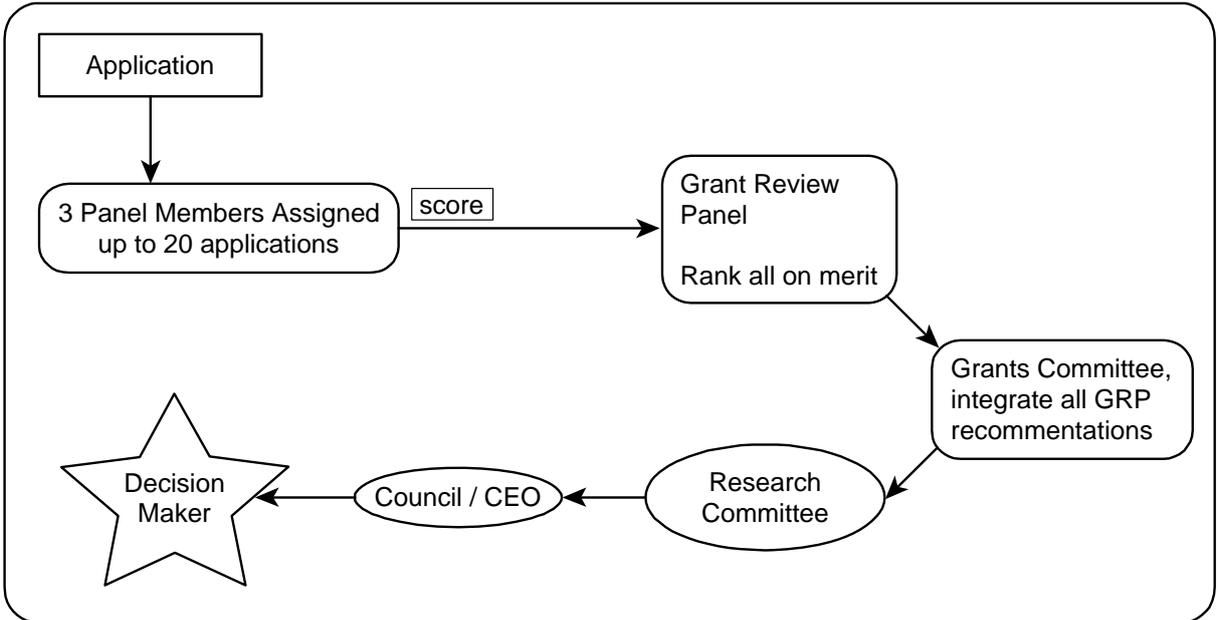
more projects to be supported. Panel members aim to allocate sufficient funds to enable the core idea, to get the work done (Interviews 2005). Cuts to budgets vary, but commonly are in the order of 30%. For example, an audit report includes figures of funding percentage by grant year and in 2001, 60% of funded applications for ARC DP received less than 70% of the amount requested (Auditor-General, 2006). Reasons for budget cuts are not provided to funded applicants, who receive a “one-line budget” (only fellowship salaries and stipends are quarantined). This process of cutting without feedback was criticized by the Auditor-General as lacking transparency (Auditor-General, 2006).

The model implies that every application is treated in an identical fashion to others in the process but there are variations with in the EAC process. During the period of this study (2000-2004) the discipline clusters employed a variety of approaches to managing funding distribution across the disciplines in their cluster. Some EACs divide the available funding so that each discipline received an amount for allocating based on a formula that considered past success, numbers of applications and field quality. Others conduct a quality review to assess the international and national standing of the disciplines in the cluster and generate an integrated ranked list for the entire group. For example, the science grouping of physics, chemistry and geosciences first assessed applications within disciplines and then integrated all applications, assessing relative international merit of applicants within their discipline at set points (eg 1st, 5th, 10th, 15th place) on the ranked lists of the three disciplines (Interview 8 and 14, 2005). The Humanities and Creative Arts cluster incorporated a larger mix of disciplines, with at least; history, law, architecture, literature, art, philosophy, archeology, theology, film studies, languages, Asian studies, Aboriginal studies, anthropology, and linguistics. This panel separated the funding allocation so that each of the disciplines had an amount to allocate. With so many disciplines in the panel, only 12 panel members (varying from time to time in number) and many applications of similar quality at the margin, this approach meant that on

most occasions one panel member had significant decision-making power over the fate of applications in their discipline (Interview 1, 2005).

To reduce the number of steps in the process and confine the assessment to panel appointees some agencies use many panels and no external assessors, as illustrated in Figure 5.6.

Figure 5.6: Peer Review Model 4 – Many Panels



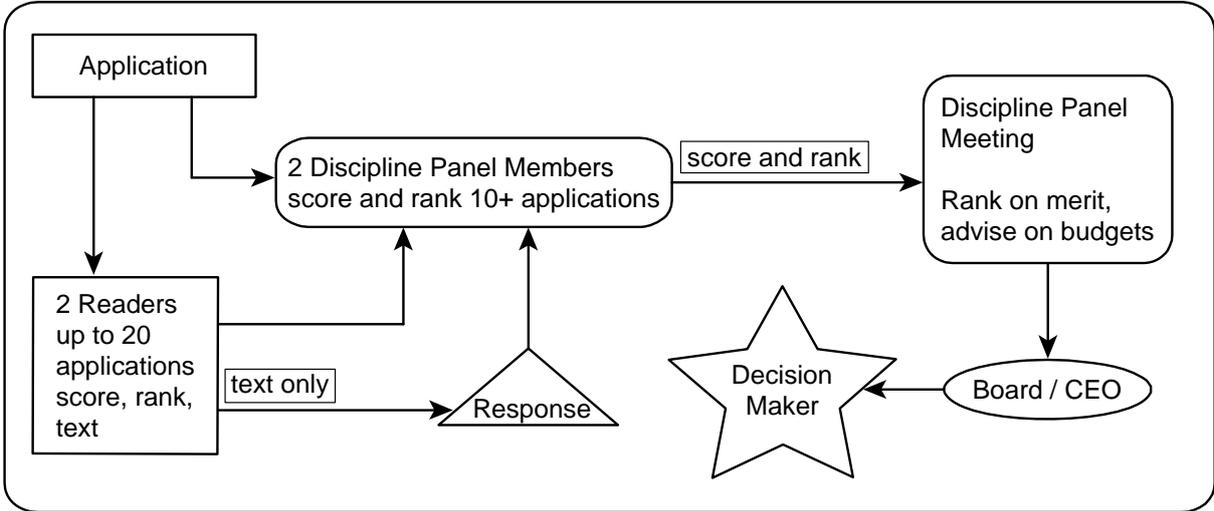
Model 4 was used by the NHMRC for its Project Grants (based on the simpler Model 1) in 2006. The panel only model superceded Model 2, which included external assessors and a response from applicants. The NHMRC announced that this would be a faster selection process. They also hoped that it would overcome the problems of assessor “burnout” evident in an increased rate of decline by potential assessors.

In practice, many of the people who would have been external assessors were included on panels and the total number of researchers involved in the NHMRC processes increased. In order to satisfy its committees and applicants that the process would competently deal with sub-discipline differences the NHMRC added an Expression of Interest stage so that they could form Grant Review Panels (GRPs) specifically for the field of applications. This created a new process stage and larger workloads in the

administering institutions (most of which are universities or medical research institutes). It also meant that the NHMRC GRP member numbers grew by 300-400% and the selection meeting became a bigger, more expensive logistical exercise involving relocation to a bigger city. By 2008 the NHMRC had returned to a model involving external assessors and applicant responses, like model 2.

Varying the nature of external assessor roles to include only Readers to provide expert reports to peer panels, the ARC has developed the model shown in Figure 5.7.

Figure 5.7: Peer Review Model 5 – Readers, Response and Panels



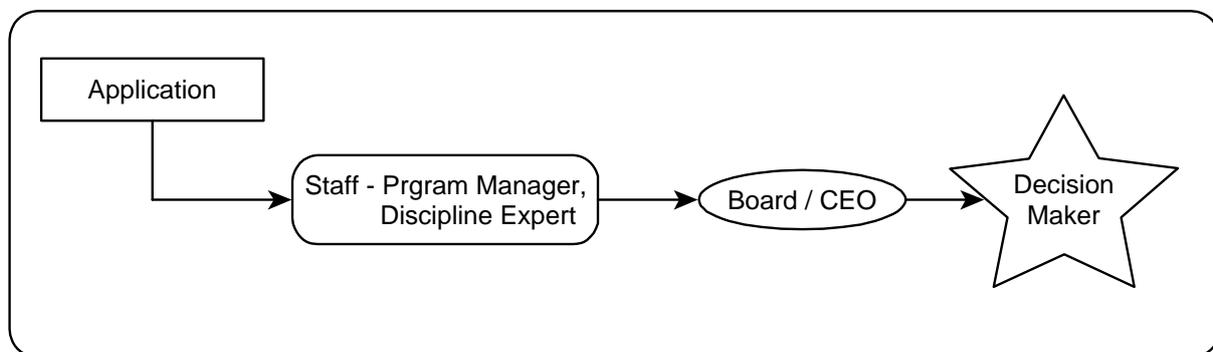
Model 5 is the ARC model for Linkage-Projects, the ARC program that encourages industry and other collaborating organizations to co-fund and participate in problem-solving research. This is a basic model of external peer review employing two categories of reviewers, Oz Readers and panel members. Unlike model 3, used for DP, there are no Int Readers sought and this variation expedites the selection process. Thus, LP applications are resolved in a shorter period than DP, a faster response designed to take into account the needs of industry partners.

The ARC receives approximately 1000 L-P applications annually over two rounds and applications are considered by the same panels that undertake DP review. The EAC members discuss all applications at the selection

meeting, creating an integrated list of fundable projects in rank order and recommending a project budget for each recommended application. ARC selection criteria for LP shape a different model of panel decision-making, with an emphasis on problem-solving, partnerships and partner contributions to add to judgements about the nature of the research and researcher track record.

Some funding programs do not seek review outside that which can be provided by senior staff of the agency. Figure 5.8 demonstrates this approach.

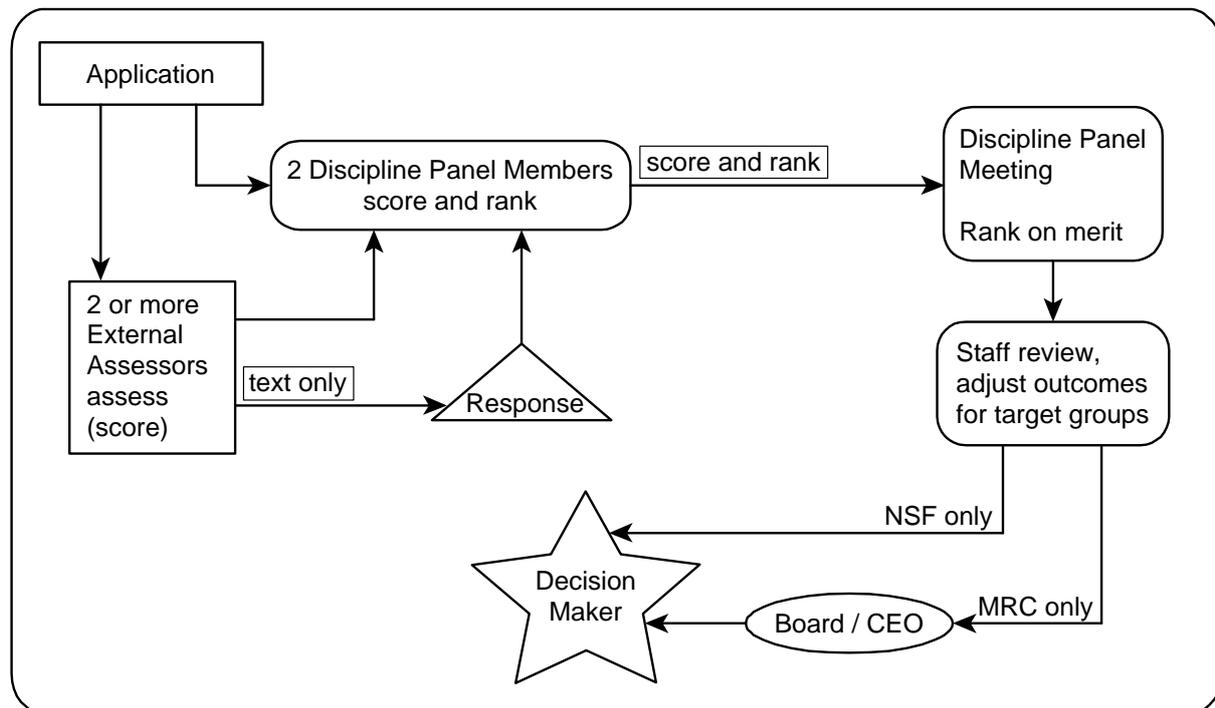
Figure 5.8: Peer Review Model 6 – Agency Staff



Model 6 is used for small awards by the NSF and the ARC for its Linkage-International Awards and scholarship only Linkage-Project APAs. The discipline experts employed as Executive Directors in the ARC or as Program Managers in the NSF make decisions either singly or as a small group. This approach is adopted where the agencies believe there is already sufficient peer reviewed information to serve as a basis for decision. For example, ARC International Awards applications are limited to recipients of Discovery-Projects. The process has the advantage of simplicity and speed but becomes difficult to manage when success rates are low.

Some funding agencies add a layer of control by assigning a review function to its senior staff as described in Figure 5.9.

Figure 5.9: Peer Review Model 7 – Assessors, Response, Panels and Moderation



Model 7 is used by the National Science Foundation (NSF) with or without external assessors, and by the New Zealand Medical Research Council (MRC). This is a version of the dominant model for many funding agencies and resembles models 3, 4 and 5 in that it uses peers in panels or panels plus external assessors. However, it has an additional step, a control layer of review by the Program Directors or senior agency staff.

This control overlay enables agencies to meet government directives and affirmative action targets. In the NSF the Program Director reviews the recommendations from a panel meeting and considers how the funding distribution meets the requirements of legislation (Experimental Program to Stimulate Competitive Research, EPSCoR) designed to build capacity in states and universities that historically have had a small share of research funding (Office of Legislative Policy and Analysis, 2005). Recommendations by the peers may be reordered, within the fundable group, to maximize capacity building opportunities. The New Zealand MRC process review takes into account government targets for the Maori people.

Summary

This chapter has described and analysed the uses of seven different models of grant selection that operated in the Australian Research Council, the National Health and Medical Research Council and several other research councils in the period 2000-2004. Peer reviewers are used in all except Model 6, where the staff of the agency may or may not be peers of the applicants. Peer roles include external assessors of a few applications, readers of many applications, panel and committee members. The models do show how workloads of these roles are significantly different (discussed in Chapter 4) or how the experiences and influence of peers differs significantly according to role type. The models do not expose how decisions are made, the influence of the various peer roles nor the differences between disciplines in their approaches to judgements about quality, yet these are crucial elements in the decision process. Chapter 6 examines the story of the peer reviewers inside the “black box” of panel and assessment processes to reveal how excellence is determined under various process conditions.

PART TWO – WHAT THE INSIDERS DID

6 PEERS INSIDE THE BLACK BOX

Discussion to this point has focused on the big pictures, the context of research council funding and the ways that peer review processes have been operationalised for grant selection. This chapter drills down inside the process, into what some applicants call the “black box”, to examine the process from the perspective of peer reviewers as selection panel members and external assessors. It includes discussion of the ways that these peers review and rank applications for research funding. In particular, this discussion seeks to understand how peers define excellence and whether the ways that grant peer review is operationalised affects the ways that excellence is defined.

Data from 23 semi-structured interviews with panel members and council staff are augmented by responses from 18 panel members and 70 external assessors collected in the survey of applicants. These responses form the basis of a discussion and reflection on how comparative selection decisions are made and the ways that external reviewers see the process of determining excellence. This data opens to scrutiny the “invisible hand of scientific opinion”, the judgements scientists make within research council processes (Rip, 1993, p3).

Profile of Panel, Staff and External Assessors

Interviews were sought with former panel members and former staff, of one or more of the councils, who were identified as key informants. All had served for three or more years in one or both councils and had actively engaged in discussions about program and process design. Most interviewees were former panel members of the ARC and the NHMRC, covering a wide range of disciplines and having over 70 years of panel experience between them, in addition to their external reviewer work. Four

interviewees had served on panels for both councils. Several former administrative staff of the ARC and NHMRC, with a total of 36 years of grant administration experience, were interviewed. Another 18 panel members responded to the survey. The combined field held equal numbers of people with ARC and NHMRC panel and administration experience. This chapter includes analysis of textual data provided by 70 external assessors who answered the survey; 42 ARC assessors, 2 NHMRC assessors and 13 who assessed for both councils.

About Panels

Chapter 4 provided an analysis of the structures used in grant funding processes, including an overview of the work of selection panels, in particular the load differences between NHMRC Grant Review Panels and ARC Expert Advisory Committees. In summary, noting that there are differences between councils and funding programs, the panel members are asked to assign external assessors, read applications and related documents (assessments, rejoinders, rules), score or rank applications, discuss them at a panel meeting and make recommendations about which applications to fund and at what level.

Panel Appointment and Selection

Panels formed for ARC and NHMRC selection processes commonly have 10 or 12 members who are appointed for up to three years. The procedures for panel selection differ between the councils. In the period 2002-2006 the ARC called for nominations for panel vacancies, seeking institutional authorization for nominees, in recognition of the significant workload that membership entailed. Panel membership turned over at approximately 35% per annum so that each year there was a mix of experienced and new members. Selection was carried out by a small group of senior staff and EAC Chairpersons. Selection was based on published criteria and apart from the research standing and experience of the applicants, recognized factors such as the discipline coverage required in each panel, geographic distribution

and occasionally gender. However, continuity is an issue for some panel members:

I'm not entirely satisfied by the way they choose the panels, not sure it works all that well ... in the absence of continuity systematisation is crucial, things can swing wildly. Consistency of culture. (Interview 5)

During the same period the NHMRC panels were formed on recommendation of members of the Research Committee, a committee appointed from recommendations made by its Chairperson and the CEO of the NHMRC. Considerations about membership also included research standing and discipline coverage but there were no published selection criteria and the process was not open to scrutiny. Within the research community this lack of transparency can be seen as a flaw:

Some of the people in power in the NHMRC have a vested interest in filling the committee jobs because that is the source of their funding and power. I don't think I'd be the only person who'd describe the system as a Mafia operation and you wouldn't have to think very hard to know which city it is based in. The level of arrogance is quite breathtaking. (Interview 10)

Decisions and Records

Panels are considered under Australian administrative law to be inside the research councils, holding similar responsibilities to those of the staff. Their deliberations are classified as expert opinion and are not subject to review, whereas processes are. This latter potential for review has resulted in the councils establishing complex systems for recording panel outcomes.

ARC selection panels discuss and debate the relative merit of applications. The panel secretariat creates records of the final ranking of the applicant field with recommended budgets for each grant. While notes may be made during a meeting they are kept within the organisation. Applicant feedback up to 2006 usually took the form of advice to unsuccessful applicants about the final rank of their application in one of several bands below the funding

line. However, following a performance audit the ARC agreed to provide information to funded applicants about the nature of budget reductions so they could adjust their projects appropriately (The Auditor General, 2006). NHMRC panels provide scores for each application on a scale of one to seven and the primary panel 'spokesperson' writes individual feedback for each of the applications, before a higher-level committee determines a final cut-off point.

Conflict of Interest Management

Panel decisions are subject to scrutiny of the processes used, including procedures to manage conflict of interest. Both the NHMRC and the ARC publish the procedures they follow during selection processes and work to prevent conflict of interest from occurring. In both councils, conflict management commences with application assignments. Panel members do not usually receive applications that include people identified as having a close connection to them through kinship, marriage, collaboration or supervision, nor those that include staff from their institution. Where an application with potential conflict of interest is assigned, the panel member has a duty to return it to the council declaring a conflict. Within selection meetings a panel member with a conflict of interest is usually asked to leave the room during any discussion and is not informed of the outcome of the discussion.

While this process is equitable it is not perfect and opportunities remain for influence to be exerted in favour of a particular application or against a particular sub-discipline or method. An audit of ARC processes (The Auditor General, 2006) commented that this was an area that required further attention, observing that the process of absenting a panel member occurred in almost all instances. The ANAO also recommended that:

to maintain public confidence and the accountability of ARC's administrative and decision making processes, ARC needs to strengthen its guidelines to meet current standards of better practice. In particular, ARC needs to regularly update conflict of interest

declarations and establish mechanisms to monitor its processes in this area (Auditor-General, 2006, p48).

Comments from former staff and panel members shed a little more light on the management of conflict of interest. Both of the following comments are from people familiar with both the ARC and the NHMRC:

Sometimes I think conflict was managed too strictly (in the ARC) ... there were some occasions when under pressure of time they (panel members) may not have followed the letter of (the) law, where they were not supposed to hear the words of other people but stayed to speed up the process ... (that) did not seem to be a deliberate attempt to subvert the rules. (Interview 1)

A member of a committee (of the NHMRC) declared conflict of interest prior to discussion about funding allocation, but before leaving the room gave a passionate speech in support of a junior colleague who was below the funding cut-off, after being asked by the Chair to leave. (Interview 19)

A former panel member reflected on stories of conflict of interest management in research councils outside Australia:

I was hearing stories about processes in other countries and about conflict of interest that just make our ARC toes curl up ... Our system has worked hard to make sure that conflict of interest and bias had been ironed out. (Interview 9)

In both the National Health and Medical Research Council and the Australian Research Council processes panel members are allowed to be applicants. Applications from panel members are managed by the ARC staff through a process separated from the rest of the field and subject to additional scrutiny.

Negotiating and Voting

The ARC and the NHMRC panels use different methods to arrive at their ranked lists of applications. Within the ARC, from 2001 to 2004, the

processes used by panels varied across Expert Advisory Committees (EACs) and even within EACs for the same funding program. These differences arose largely as a result of the fact that each EAC was managed by a different Executive Director. An audit of ARC processes noted this, “the discipline groups sometimes adopted different approaches to similar processes” (The Auditor General, 2006). Differences between EAC approaches were very significant. During the period 2001-2003 at least two of the EAC Executive Directors led a process of considerable effort to create shared understandings of the relative standing of research performance across disciplines and create a merged ranked list for all the disciplines under their coverage. This process created a negotiated outcome that settled relative merit and a collated rank based on agreed markers of excellence. Another EAC Executive Director divided the EAC funding allocation into small parcels for each of the many disciplines. This effectively assigned decision-making power to only one panel member in some disciplines, without panel negotiation about relative merit.

NHMRC panel processes, based on those used by the National Institutes of Health in the USA, were rigidly defined and communicated to the panel members before selection meetings. Each panel with 100 applications and ten members had a week to produce scores and feedback for all applications. While a panel member may have read only the 20 assigned applications (as first or second spokesperson) discussion of each application involved all members. Following discussion and questions all the panel members then voted in a secret ballot to assign a score, on the surface a democratic and robust process. The administration officer then generated a mean score from the ballot papers. However, the process was constrained by other rules, which required the first spokesperson to disclose the score they planned to assign. Other panel members could not assign a score that differed by more than one point from the spokesperson’s score without explaining this decision to the entire panel. Effectively this meant that one person determined the possible score for the application, as one interviewee who had worked with both councils commented:

Statistically it's got a lot wrong with it because the base score depends on what one person starts off with, and the others have to follow ... the experts on the committee cannot say what their expert opinion is, they are limited to a one point range. (Interview 1)

This interviewee went on to comment on the process differences between the councils:

The NHMRC process is over-engineered and overly busy. ... They might achieve a margin of 1% improvement over the ARC process by having 3 external assessments for each application and 200 panel members for 1800 applications compared with 72 panel members for 4600 applications. ... I am not sure the final decision list would have been any different if they had swapped places and done each other's work (ARC process and NHMRC process). (Interview 1)

Council rules, advice and training

Research councils provide guidelines or advice to external assessors and selection panels to guide them through the process. Such advice varies from reasonably short Assessor Handbooks, to much larger volumes including relevant legislation and advice about the legal implications of working on a selection panel. Both the ARC and the NHMRC have, at various times, arranged training for panel and committee members in administrative law relevant to research funding decisions. The EPSRC in the UK provides continuous training for all selection panels, monitors individual panel member performance and obtains feedback from all participants during each selection cycle.

The ARC provides to its external assessors a handbook that covers such topics as confidentiality, conflict of interest, ethics, program objectives and selection criteria and examples of useful and unhelpful assessment text. Assessors are encouraged to provide detailed assessments that will assist both the applicant and the panel:

Good assessment text is written with both the applicants and the EAC in mind. It is objective, pointed and balanced. It addresses only the

issues relevant to the application, generally in terms of the selection criteria. It provides a sound and adequately comprehensive account of, and justification for, the assessor's views about the application. While respecting the care with which applications have been prepared, it avoids platitudes and is bluntly critical if appropriate. (ARC, 2002)

Panel members receive both the Assessor Handbook and particular advice about selecting for the funding program under consideration. This advice could include: program guidelines, selection reports from previous rounds, data about the application field, lists of past grants (eg infrastructure funding) as well as suggestions about how to manage the ranking of a large volume of applications.

The NHMRC provides a handbook for panel members that includes information about the function and organization of the council, the NHMRC Act, and advice about obligations under relevant legislation, including administrative review mechanisms.

Process differences between the ARC and NHMRC

Those panel members and staff who worked with both ARC and NHMRC selection processes provided interesting insights into the differences and similarities of the funding selection processes.

It became clear to me that the big difference there is that the NHMRC has more people to do fewer grants. (Interview 7)

NHMRC has 100s of committee members, many more than the ARC. In the ARC people can't hide. It is obvious that someone is trying to capture funding for their area, whereas in the NHMRC it is not so obvious, they can hide behind the fact that there are 10 of their colleagues there in a particular discipline. (Interview 1)

The NHMRC is more intense. I was impressed by the quality of the panel members and how thoroughly they had read all the grant

applications. This is related to the size of the workload and to the focus within a sub-discipline. All 10 people on the GRP would be under the same discipline. (Interview 7)

I have no idea how (funds) are distributed in the NHMRC because the panel members have no say in that. That is the part I dislike most about the NHMRC, it is not necessarily transparent. It is not as transparent and absolutely squeaky clean as the very open distribution of grants as it was at the ARC EACs. (Interview 10)

In contrast with both Australian systems is the process that one informant experienced with a process run by a Canadian organization: I was involved in the Canadian process for very large infrastructure and it was almost the same model as the ARC infrastructure committee. I was waiting for the usual 4 feet of paper for this 200 million dollars. It came and was about 2 inches. That was all assessed by a panel, people from all over the world. (Interview 5)

Rules, Selection Criteria and Priorities

Research councils claim they fund the best, the most competitive and excellent projects from the field of applications. However, these judgements are made inscrutably as such academic judgements fall outside the boundaries of justiciable appeal and explanations for decisions are not offered. The Australian Research Council has provided specific selection criteria for more than a decade for its funding programs, to guide applicants, assessors and panels and provide a basis for comparative judgements. The Discovery-Projects selection criteria and weightings in 2004 were:

- track record of the researchers relative to opportunities (40%);
- significance and degree of innovation in the proposed research programme (30%);
- relevance and adequacy of the proposed approach (20%);
- national benefit (10%). (ARC, 2004a)

Panel members and assessors are required to assess against each criterion, and many appreciated this tool:

I found that by adopting that criterion based approach to things you get it right, agree with the experts. (Interview 5)

The National Health and Medical Research Council did not provide specific selection criteria during the period of this study. The NHMRC did provide lengthy instructions to panels about speaking order, voting processes and administrative arrangements (NHMRC, 2005 d) but made no mention of how panels may judge relative merit.

Both Australian research councils have been required to implement national research priorities from time to time. The most recent, in 2002 when the Commonwealth Government determined that research should be directed to key matters that it determined were of importance to the nation:

- An Environmentally Sustainable Australia
- Promoting and Maintaining Good Health
- Frontier Technologies for Building and Transforming Australian Industries
- Safeguarding Australia

There were 19 specific goals across the priority areas. A fifth priority was added later in response to pressure from the social sciences and humanities research communities. The councils were required to develop processes to ensure that the priority areas would be funded appropriately.

The ARC added the details of priority areas to its Funding Rules and advised the applicant pool that these priorities would be applied as part of the selection process. Applicants had to indicate whether their applications fell within one or more of the priority areas. The selection panels and assessors were advised of the priorities. In practice, the priorities were broad enough to cover most research and 70.8% of ARC D-P applications submitted in 2003 named one or more priority areas. Of the successful applications, 70.8% were in priority areas. This outcome looked like a real attempt to meet the

goals, but as one former panel member indicated, priorities were not very popular with panels:

As for national priorities, I have avoided these. I think that I am better placed to make decisions of that nature than politicians. (Interview 7)

In the NHMRC priorities were not applied initially as part of the flagship programs but were managed as part of the strategic research development approach that the NHMRC had adopted to encourage empirical research in response to particular problems. Committees were established to ask researchable questions and panels were set up to assess the eventual applications. A lot of activity occurred and yet the expenditure on priority areas remained a small component of the overall research budget. By 2005 the NHMRC had varied its approach and over 80% of its research budget was tagged to priority areas, with some special initiatives in centres and fellowships. However, the Promoting and Maintaining Good Health priority area was so clearly within the primary objectives of the organization, that applicants experienced little difference.

The ARC Federation Fellowships were also subject to Government priorities. This program awards 20-25 fellowships annually to researchers at the peak of their field. Salaries are set above the maximum professorial salary paid in Australia, as one of the intentions of the program was to attract great thinkers into Australia, both expatriated Australians and people of other nationalities. It was an attempt to reverse the brain-drain. A multi-disciplinary panel is created each year for the purpose of selecting the recipients which is a complex task:

It is a difficult thing to do ... somebody tries to convince me that this poet is as good as this theoretical physicist. (Interview 14)

After the first couple of years of Federation Fellowships the Government decided that more of the awards would be made to Australian citizens, a policy decision that was not liked by many in the research community:

One thing I particularly don't like is turning away very good applicants (for Federation Fellowships) in favour of Australian citizens. It is jingoistic. We should fund the best. (Interview 7)

Panel Members

Shaping the Task

Regardless of the rules and the advice given to panel members, each of them retains considerable latitude to determine how they will manage selection tasks and they reflectively develop their approach to selection. This commitment is reflected in the views of the majority of panel members, who held firm beliefs in the integrity of the process:

I know that people outside panels think that they are done in a willful or random fashion but I think they are all looked at very carefully indeed. (Interview 6)

Panel members revealed in interviews that they had reflected deeply on the way they conducted their assessments, and had experienced self-doubt in the process of making judgements, as the following detailed response reveals:

I would ask myself a few common questions each time. Do I understand what the key objectives of the project were? How did that fit internationally, and did they have a methodology that seemed reasonable to do it, and could I articulate those?

I'd actually try to summarise them. It was a very clarifying point, for all 120 applications I was assigned. If I couldn't articulate what the goals of the project were that meant to me that they weren't clear and that was where many people fell down. Then I'd try to see if it was internationally relevant. If it fell down on both of those then that meant the project was not well described and probably meant that they had not thought clearly about what they were going to do.

I found it incredibly hard to do that ... some applications were so badly written that in the first year I spent hours trying to understand them

but by the third year I realised that if I spent more than two hours on an application then it wasn't well written. If you are doing good science then you should be able to articulate it. People who are not doing that, chances are they are not publishing in high impact journals. (Interview 8)

Panel members are asked to consider applications with assessments from external assessors and applicant responses and to make judgements about the relative merits of each. This task requires skill and acuity that is sharpened with experience:

(ARC Australian-based) Readers are obviously critically important, absolutely central. That doesn't mean they contribute equally and I think the committee is good at recognising where particular personal concerns are evident in an external review, or where they are so way out from other assessments that they are outriders. (Interview 3)

Representing their discipline?

Research councils appoint panels to provide judgements about the quality of the proposed research. In addition to considering the external reviews and applicant rejoinder, panel members are expected to assess proposals against defined selection criteria using their knowledge of current developments in the discipline as well as technical requirements of research in the field. They are expected to consider the nature of the research proposed and the capacity of the researcher to accomplish the work and to recommend the best possible ranked order of applications. However there are different views among panel members about their roles in relation to their field of research and the council.

My role was to make sure the panel knew the advantages of the particular discipline approach. Knowledge of enmities and issues in the discipline and monitoring extreme outlier scores. (Interview 11)

This informant sees the role as that of an informed expert who can bring specialised knowledge to the meeting. Other panel members may have

observed that function but were aware of another role, that of discipline defender in the multi discipline panels of the ARC.

You do promote your own but not when the quality is lower than the other discipline. But if the two are comparable then you can do that comfortably. (Interview 4)

I never felt I was there to defend or promote (the sub-discipline) at the expense of other areas. I was an interpreter rather than a representative. I was there because I understood the context of the stuff. I was part of a whole panel and we would put the best application at the top rather than worrying about which discipline it came from. (Interview 12)

Panel members understand the importance of their role to both the applicant and to the council, however, they may have other goals to accomplish during selection processes. In some cases it is loyalty to a discipline or sub-discipline. When panels cover more than one discipline area, that leads a panel member to actively work in favour of his or her particular field.

We did know how to get the best out of the system. If one is aware of the weaknesses (in the way the final list is merged) then one can put the best case to ensure the best outcome for the discipline. That is part of being a good advocate for the discipline. I fall very firmly into the advocate group. One of our jobs was to do the best for our discipline, within reason. (Interview 9)

This conduct is not surprising, when at the margins of success, so little differentiates applications that the process could be determined by toss of a coin without loss of quality.

We all knew that at the boundaries that there was quality work all over the place and we all knew that the best we could do was advocate in the most effective manner for our community. The outcome has to be respectable but at this margin of the line there is no absolute here that our guy is better than your guy but all we can do is advocate in the strongest possible terms. (Interview 9)

Other panel members hold different views:

We worked more as a collective ... and avoided splitting into discipline areas and competing. I have tried to encourage people that there is no point in it (pushing their discipline) it really has to be excellence. In general I would say it is pretty well balanced. (Interview 8)

I never felt these were people with axes to grind. We discussed our role in the first year, we asked, “are we here to represent the physics community, defending against the onslaught of chemists and geologists or are we here for better Australian science”. It is really good to discuss it openly. I was confused when I came in about what my role was. After this I took a much broader more strategic view of science. There are times when you are tempted to defend your own discipline. It is actually a really responsible thing to be on one of those panels and integrity is extremely important. It is a slippery slope ... (Interview 14)

Panel members bring different qualities to the tasks, a fact that one former panel chairperson recognized by referring to the role of chair as being about bringing the best out in people and ensuring that differences were acknowledged. Other panel members saw differences between the standards members brought with them and the time they had spent in preparation for the meeting:

Standards are different between panel members ...Panelists have got to try to understand all the applications and try to see why an application is judged as extremely good in its field. (Interview 7)

... decisions about quality can be based on the quality of the representative too - the work they have done before the meeting (Interview 6)

the people on the panel have been incredibly fair, high integrity, with one or two exceptions. (Interview 8)

Panel Decisions

What is Excellence in a Grant Application?

Excellence is the goal of research councils although it is rarely defined, but usually identified by example. Panel members were able to describe what they saw in excellent applications. This comment from a long-term and committed participant in research funding processes highlights the importance of communication in reaching excellence:

Excellence is more than being good in a lab or being good at developing a theory, excellence prevails in the way that they are able to express themselves, in the way that they understand their work in the context of the field, it prevails in the presentation. (Interview 4)

Quality of writing is a theme that is reflected in comments by others:

They shine off the page, the ones that are clearly going to be successful. They are people who can explain their research in simple enough terms that you can see they have thought it through right from the real discipline base, from basic principles. They have gone right back to fundamental ideas and can really explain where their research is coming from and where it fits into the discipline. (Interview 6)

The most significant thing is how well written they are, it is crucial that the document is clear and concise with useful diagrams and data. It must cut to the point, present what they aim to do, why they aim to do it, demonstrate they have the means, resources and track record to do it. (Interview 10)

Writing an application well is not all that is required, for several panel members excitement in the writing was a key:

I can think of a couple that were like a “who done it” right to the last word on the page and you think I wish I could write like that. It’s so compelling. The application is convincing, no loose ends and you just want to give them the money and let them get on with it now. (Interview 10)

In the field of 600 or so applications that the panel saw there were always 10% at the top of the field that stood out. They were about exciting science, by exciting scientists and told in an exciting way. They gripped you because of the story they told. (Interview 12)

This panel member also described the difference between the top applications and the others, and highlighted the strength of the applicant field under consideration at that time:

There were 20-30% down the bottom that were poor science, didn't hit the mark or with poor track records. Then there was a group in the middle, that other 50-60%, which were all potentially fundable, sent in by smart people with smart ideas to solve various issues and that's where the nuances took place. That meant there were 60-70% fundable, they would have produced good science and good publications to do credit to Australia. But because the money was short the 20% that got funded were excellent by definition. (Interview 12)

The notion that those in the top 20% were "by definition" excellent is problematic. It assumes that the assessors and panels were always able to make accurate, predictive, quality judgements in a field where many panel members believe that 60% could have been supported.

Michèle Lamont refers to research conducted on decision-making by social sciences and humanities funding panels in five organisations in the USA and Canada and the way that panelists define excellence. Eleven defining characteristics form what Lamont calls scripts of excellence and to these are added more evanescent qualities such as clarity, excitement, elegance, intelligence, integrity, and risk-taking. Lamont goes on to explain that panel members believe that cream rises to the top, because some proposals get universally high ratings (Lamont, 2009). There is a similar theme in the responses of these Australian panel members that excellence is something that reaches out to them:

The top end ones weren't safe, they were out there. Many times I almost wept, thinking if I had one idea like this I would be happy. (Interview 12)

One panel member described the impact of well-written applications on those who were not experts in the field of the research:

If the application is excellent then it resonates with the experts and the generalist readers. There is something there for everyone. Even on the infrastructure committee you know when you read about something very useful and you are reassured when one of the experts in the field makes a comment that is a very good proposal. (Interview 10)

The notion of resonance is interesting, recognizing an intuitive judgement that occurs for both expert and non-expert readers. It implies both a fair process and a quality about those 'best' applications that is, as Lamont describes, cream rising (Lalaki, 2007).

Some panel members locate excellence in the project. In particular, they cite its contribution to discipline, novelty, international importance and clarity of vision:

Outstanding novelty and creativity at all levels, significance and innovation ... (Interview 7)

Excellence is in the project and innovation ... a sense of the excitement and the innovation in it. (Interview 8)

Clarity of the vision ... Novelty and significance are the most important things ... (Interview 9)

Excellent research, high quality, interesting and internationally worth doing ... (Interview 13)

Understanding how judgements of excellence are made can arise from noticing small details. In this case a panel member refers to matters of competent scholarship:

Invariably that top group of applications, they know that presentation is important, the really good researchers know that it is important not to duplicate track record, not to count publications three times and to have publications in a logical sequence, that attention to details, along with a basic insights into the science that stands out for at least the top 5% of applications. (Interview 4)

Excellence is an emotive value-laden term and panel members are well aware of the subtle shifts in meaning between contexts and the value of work that does not fit the top categories:

Not sure excellence is the right word to be used on all the occasions it is used. For Discovery, the top ones, they really are excellent. Below that there's a lot of solid science, people slugging away doing incremental science, won't set the world on fire, but that's actually how a lot of the steps forward are made. Bold visionaries are not any good without people slogging and doing the groundwork. (Interview 14)

Excellence can also be seen as contextual, varying with the field:

I sit on a lot of panels and often what you take to be excellence can vary from one setting to another. An excellent Discovery application may be a very mediocre Federation Fellowship application. Sometimes we academics try to pretend that there is an objective reality called excellence and I suspect that our actual behaviour does not mirror that fondly held belief. You are not allowed to be arrogant in today's society but you are allowed to be excellent and you are allowed to make judgements about excellence. Excellence is definitely a political term, but, especially evaluating research, it is necessary to have something like that to get across to politicians and the public that there is an incredible range of what people do that is called research. (Interview 6)

This panel member stated what many others believe, that the term excellence has usefulness beyond the description of the best applications. The research councils use the notion of 'supporting excellence' as a tool for

political leverage; it is a concept that cannot be countered and it over-rides other notions, such as equity.

Track record

Australian research councils place a significant value on the track record of applicants. ARC Discovery-Projects selection criteria award 40% of assessment weighting to “track record of the researchers relative to opportunities” (ARC, 2004a). Emphasis on this component of selection is not confined to Australia, according to Kostoff, in a submission to the Parliament of Canada on the allocation of research funding:

Team Quality, a euphemism for performer track record, is the dominant factor in determining reviewer overall quality score for existing and proposed research. (Kostoff 2002, p10)

Panel members in both the NHMRC and the ARC systems confirm that view:

Track record of the research group was very important ... I would look at that first and then look at the proposal. A group that has got a clear track record in the field, that has an impact on the way that you read the proposal. (Interview 9)

Appropriate track record for the stage of their career so it was clear that the person could deliver ... convinced the committee that it was worth doing, over and above something that was good science ... so having the spark, and being able to convey the spark. (Interview 4)

Assessing track record is a complex task that is made more difficult when the panel member is working outside their own field:

(Track record) is one of the hardest parameters to score accurately. You have to take into account simultaneously several different factors. How experienced the person is, what resources they have had available to them and what is the quality of their output, their productivity and the impact of it. That's not easy when you go out of your own area and I had to. I have a huge pile of those printouts from ISI telling me what the impact factor of journals I have never heard of before. You have different expectations of what somebody's track

record might be, depending on their age and experience as a researcher and resources available to them. (Interview 10)

Despite the difficulty of assessing track record, many panel members believe that this is something they can do well:

The committee assesses track record better than anything else ... (they) get a pretty good understanding of the differences between disciplines, subtle differences, output and quality both count for publication assessment. (Interview 4)

However, several informants raised questions about how track record is used and how the qualification, 'relative to opportunity', is applied:

There's a lot of money going into some places but they are doing it rather comfortably compared with other people not getting that kind of money because they are not in a research institute ... this track record business is relative to opportunity. (Interview 10)

This use of track record has other more subtle implications, particularly in relation to publishing judgements:

There's a broader problem in the social sciences, if we want to do rich grounded work on Australian institutions we are unlikely to be able to publish that work in high prestige, high impact journals, which in our discipline are all American, because those journals will not be interested in complex institutional studies relating to Australia ... That's a form of colonialism that is being encouraged by this emphasis on high impact journals. (Interview 11)

There are critics of reliance on track record, in both ARC and NHMRC processes. Several interviewees, with experience in both councils, posited that it is selection process design, in particular the load that panel members carry, that is the largest driver of the reliance on track record:

Excellent research is not getting funded. The old boys' club is growing as track record becomes more important for the selectors because of the weight given to the selection criteria. (Interview 2)

The ARC uses track record to assess its applications because it's the cheap way to do it. Ability is different from track record but harder to assess. (Interview 1)

The cost of assessing applications relates to the load assigned to panel members for the week-long selection meeting. The NHMRC meeting arrangements are expensive, with many panel members. In contrast, the ARC keeps meeting costs and panel numbers down by assigning large numbers of applications to each panel member for the week-long meeting. ARC members carry up to ten times the load of NHMRC panel members and up to 20 times the load of EPSRC and NSF panel members (Refer to Chapter 4 for further details of panel processes).

ARC panel members, who assess applications in pairs and then jointly create a panel merged ranked list, tend to rely heavily on track record as a quick guide to possible success. Their workloads are such that detailed discussion of projects is constrained by time, and tends to be done in detail at the margins, or in cases of conflicting assessments. Nevertheless, even the informants who support blind assessment of projects recognize the importance of peer assessment of track record:

Projects should be assessed in isolation of the researcher's track record, to fairly judge the science. It should go without the details of the people on it. Assessors would then focus on the nature of the work proposed. The panel would then make judgements about the environment and the capacity of the people to do the work, they have that knowledge. (Interview 2)

This suggestion does require a variation to process and panels taking a subtly different approach to track record.

People or projects? EPSRC and NSF

Observations of selection panel meetings in the National Science Foundation in the USA and the Engineering and Physical Sciences Research Council in England provided examples of different emphasis in selection decisions. This researcher observed a full day of selection meetings in both councils and

noted significant differences from those reported and observed in the ARC and NHMRC.

The NSF panel of eight persons considering 40 applications within one sub-discipline had two or more external written assessments for each application. All panel members were broadly familiar with the applications on the table and each application had at least two panel members who were familiar with the details. Discussion commenced with the project, what it proposed, its value to the discipline and the likelihood of advancing knowledge. Once the panel had agreed on those features they briefly considered the people proposing the work and asked whether these people were able to do this work. Did they have sufficient skills and resources available to the team? This latter conversation was confirmatory in most cases and did not involve extensive assessment of publications or other track record features. It focussed on likelihood of completing the research. The phrase track record was never used during the assessment meeting.

An EPSRC selection panel of nine members and 50 applications in a sub-discipline were also armed with two or more assessments for each application. Their job was to evaluate the written assessments and create a ranked list, not to re-assess the applications. Discussion of each application commenced with the project and its place in the field of knowledge. Once those questions of knowledge, design and need were established the panel turned to the protagonists. They discussed the likelihood of the proposers being able to complete the work. The panel spent little time on this aspect of the application and, like the NSF panel, did not use the term track record.

Lamont, in an interview about research for her book, *How Professors Think: Inside the Curious World of Academic Judgment* (Lamont, 2009), refers to several peer review processes in the USA and Canada. She confirms the observed NSF panel approach to selection among the panels she observed and interviewed in other funding organisations.

The quality of the proposal is the decisive component of an application ... Many panellists oppose taking into consideration reputation because people who have great reputations often turn in bad proposals. The good reputation helps a lot if your proposal is very good. It is the logic of cumulative advantage, cumulative pieces of evidence of your excellence and the excellence of the project put together (Lalaki, 2007, p101).

In both the NSF and EPSRC panel meetings the load on panel members was relatively light, with 40-50 applications considered over one or two days and each member assigned as primary reader on ten applications. Their roles excluded detailed analysis of budgets and management of funding cut-off points, matters undertaken by staff after the meeting.

Selection at the funding margin

Wood (1997) discussed a workshop on peer review, held in 1995, attended by ARC panel chairs and Council members, NHMRC representatives, higher education peak bodies and other researchers. Five strategies were identified to assist panels to discriminate between proposals at the margin:

- Track record in relation to opportunity;
- Time commitment to the project;
- Number of grants already held;
- Early career, first time ARC grant holders; and
- Excitement factor (Wood, 1997, p86).

The evidence of interviews has shown that the first and last items remain key factors. Other factors do come into play and some panel members regard chance as important, despite their efforts to justify the process. The notion of lottery and chance is a solid and disparaging theme in the responses of applicants (discussed in Chapter 7). Panel members are more circumspect, confining their observations of chance to events at the margins:

There's an awful lot of chance whether you go above the line or below the line. There's a band of good solid proposals worth doing and unfortunately the funding comes in the middle of that band and

whether you are above or below that line is chance really ... take the middle group out of the hat ... that is essentially what we did, but we had a very complicated process. (Interview 14)

I have been very impressed with the process. In general it gets more or less the right results. There's that band where it is just luck, depending on the assessors you've got, where you might just be below one year and just above the next year. (Interview 8)

For the best 40% of researchers it is a lottery. I can pick the bottom 50% of applications, but it is impossible to estimate which research proposals from the top group will get funding. (Interview, 15)

For some panel members, judgements at the line can be explained, as reconsideration or as application of one of the selection criteria:

Mostly it's something that one of the assessors has pointed out that sets you wondering. Sometimes one of the committee members knows the detail and can explain the reasons. Sometimes it is just one bad review that causes a reconsideration a discussion and re-evaluation of an application. (Interview 4)

Track record appears as important at the margins for the following panel member, who describes a process very like those used in the NSF and EPSRC:

... it's at the margins that track record matters. Once we have identified the scholars with good projects then track record would determine if it succeeded or not. (Interview 3)

Early Career Researchers

Applicants for funding often see research council funding as locked up in favour of established researchers, with those who have already had significant funding continuing to win grants and lock out newcomers. These comments are discussed more fully in Chapter 7. Panel members recognise that there is a tension between the council goals of building on strengths and building new capacity in both people and research areas.

There is a tremendous tension there, trying to do both. (Interview 7)

There was always a clear tension between well established group and bringing on the ECRs. (Interview 9)

Do we want another young person coming up, and we would have to sacrifice an established group, this was always in the back of my mind. (Interview 13)

Some panel members engaged in active interventions to secure grants for Early Career Researchers, in a context where approaches varied widely:

Sometimes we would find a big grant or two and reduce the budget to something like 85% of funding to fund an ECR application. (Interview 13)

We did take very seriously opportunity the person has had. It is not an absolute concept - "weight for age" where age is measured since PhD. (Interview 9)

At the margin the decision between say a senior and a junior person the panel would tend to select the junior person - to build capacity. (Interview 7)

However, the notion of capacity building and who should be responsible for it is contested and career structure funding varies between the Australian research councils:

You have to keep funding the quality - the good researchers, because invariably the outcome of that will be that those people will give one of the early career researchers a job and experience of working in a high quality research environment ...What's important is for them, to make them competitive, is developing track record and I see that as an issue for the universities more so than the funding bodies. (Interview 4)

There is a genuine attempt to take into account the problems faced by ECRs. The ARC is slightly better with ECRs, but the NHMRC has a good career structure for fellowships. (Interview 10)

Risk and Innovation

Peer review processes in research funding have been identified as favouring clever, but safe research. Proposals that push hard against existing paradigms and knowledge are less likely to be funded, particularly when funding is limited.

Drawing on the work of Kuhn and others, Gillett posits that peer review must favour incremental research supporting the existing body of knowledge of a subject (Gillett and Harrow, 1993). Funding councils use established successful researchers to form peer review panels and committees and these people have an interest in maintenance of existing models and are likely to be hostile to really innovative proposals (Gillett and Harrow, 1993). Kostoff believes that “there are few incentives and motivations for promoting truly high-risk research, and many disincentives” especially when committees perform peer review, a process which, “intrinsically leads to conservative judgements” (2002, p12). Many panel members in this study commented that very risky research was hard to support when so much good incremental work could not be funded.

The term innovation is used extensively in Australia as a synonym for good outcomes of research, or for good changes in systems or processes. However, it does not apply in all research fields:

The word innovation makes no sense in the humanities and social science, it needs to be translated. It could be work towards a new paradigm, building on existing paradigm ... when humanities applicants see the word innovation they run. They don't know how to translate that word into what they do. (Interview 3)

Differences between panels

Discipline Differences

Lamont and Maillard (2005) worked with a Canadian research council and found evidence that epistemological differences are expressed across panel selections, particularly in understanding quality. Their finding is corroborated here by evidence, in survey, observation and interview data, of discipline differences in relation to ARC selection processes. Differences were most marked in panels that covered several disciplines, where a single ranked list of applications required considerable negotiation about what was meant by publication quality and standing in the field.

Panels also vary in their approaches to capacity building, not only between research councils but also across disciplines. Interview data captures some of those differences and observations of selection meetings provided more detail. Former panel member comments on resolving tensions between supporting existing productive groups and capacity building follow:

Physics: There is a tension - not a bad thing. You have to look hard at the existing group and weigh them up against the bright ECR and make that decision, sometimes to relinquish one for the other. Asking what is better for Australian science. (Interview 14)

Chemistry: There was a common expression that the community tended to devour its own young. In other words, we the panel members, the senior end of the community were allowing the rest of the community to gobble up the youngsters. (Interview 9)

Physics: I realised after my first two years on a panel that young researchers and women were not well served, so ... I made both priorities for the panel - to ensure they got a good hearing and were supported appropriately. (Interview 8)

These remarks show more than subtle differences, with some disciplines prepared to sacrifice early career researchers while others actively seek to

facilitate career paths for the good of the community. Research track record as a discriminant crosses from the science into the humanities:

Humanities: There certainly has to be provision for new fields, but new fields come with a track record, these are developed by people ... who already have success and track record from other work. I would want people to do it first and then come for funding ... even if we started up a new greenfields scheme we have to make judgements on the basis of excellence ... and I find it hard to make those judgements without referring to fairly traditional kind of academic judgements, including track record. (Interview 3)

There is also a conservatism about novelty as reflected in the comment from the humanities researcher, a facet that has been reflected in other studies of the impact of peer review.

Multi-Discipline Selection Panels

Peer panels that work across disciplines to select prestigious individual fellowships or to select large equipment projects face a different set of difficulties as they grapple with concepts completely outside their research expertise:

It's so difficult to compare say what someone wants, some database in history with a mass spec in chemistry, that you had to have some broad norms. (Interview 5)

Other panel members who served on both discipline panels and multi-disciplinary special purpose committees found that they learned new approaches from the latter:

I took that information back to the (grants panel) about projects and parameters and technical aspects of the application. I found my experience ... very, very instructive for my work on the research grants program. (Interview 3)

Negotiations within interdisciplinary committees provide experiences for panel members that are quite different from the discipline-based panels.

Some members referred to tougher scrutiny of experts for biases and of detailed examination of issues:

There have been cases where half a dozen people said yes and two said no and when we have explored it, it actually turned out the other way. ... A fact or an interpretation, which became clear to the committee, not subjective but objective judgements. (Interview 5)

Multi-disciplinary panels assessing facilities applications were regarded by all who had taken part in them as positive experiences, not only for learning new ways of assessing but for reinforcing decision-making processes:

I was amazed at how easy it was to do. A group of smart people willing to learn, and that one, two, three ranking, almost without fail we identified the number ones and threes. We got good advice from staff and panel chair about how to do it. We used track record, connections, a well told story ... You didn't need to be the discipline specialist to see that ... there was enough trust around the table to share the discussion. (Interview 12)

Working styles

Differences between panels and disciplines may go to more than interpretations of excellence and knowledge values. ARC selection meetings, with all of the panels in adjacent rooms along a corridor of temporarily converted hotel suites provide a rich ground for observations. Several respondents referred to the fun that some panels had, in particular a raucous group that spent much of the selection panel week engaged in hearty laughter, unlike some more sombre groups.

The particular panel I dealt with may have had excitable people, it was always loudest ... (Interview 12)

Interactions between panel members were recognized by informants as crucial to achieving a result that everyone could live with:

We challenged each other on the panel... one thing about panel dynamics is to make sure panel members had respect for each other and .. if you can build that respect you get the dynamic happening

just right. The peer review process isn't just black and white and this is where the panel dynamics are important. (Interview 12)

Selection panels do not always experience good dynamics as the following example of competition for limited funding shows:

... Clearly the decision was to be politically based, as the panel representatives jockeyed for position, trading, balancing, not based on the review but on discipline negotiations. I was disgusted at that behaviour. (Interview 5)

Panel chairpersons have considerable influence over the proceedings, setting specific agendas within the broader program goals and facilitating debate:

I think I ended up as someone who could streamline the logic of the process, keep them on track. That sort of ability to move them along and not bog down, and ensure that the outcome was equitable. (Interview 4)

I often as chair liked to let those intense debates run their course because they played a part in setting the ground rules. ... Sometimes it would develop into a thing of real substance. I always valued those because they would become a case, part of the program history and people remembered those ones. I do like people to air their views. (Interview 5)

The thing I am most concerned about is that people do come to a general agreement. I don't have radical views but I do want to discuss things if people do have strong views because there is generally a reason for it. (Interview 8)

The impact of the panel chairpersons was a matter of comment for many respondents, all of whom agreed that the role was important:

It is clear to me that the ARC spent a fair bit of time deciding who they were going to make chairs of the committees because you had to get the right person. (Interview 12)

Council Staff - inside selection processes

Research council staff in Australia are usually specialist administrators. Some senior appointments are made from the research community to provide direction at a policy level but process administration generally rests with public servants. In 2000 the ARC, under then CEO, Professor Vicki Sara, commenced a process of recruiting recent post-graduates to work within discipline groups managing funding in their area of expertise. However, the work was process administration and was severely constrained by regulations and the requirement of a singular process for each funding scheme, across all the disciplines. The recruits did not stay, preferring to work in positions that better utilized their research training.

During the same period the ARC appointed Executive Directors, originally to lead discipline teams and to act as program managers in similar ways to the NSF system. However, these staff were also constrained, with most of their time focussed on administration and usually taking low key approaches to the tasks.

I don't think the panel chairs or EDs play a key role. The power of the ED is a mythical reputation out in the scientific community but I never saw any of our EDs pushing anything, they were always very careful to not push their views. They were facilitators for the process. (Interview 6)

Following criticism in the ANAO report (Auditor-General, 2006) staff reporting structures were reorganised, with program staff reporting to senior administrators. Panel members noted these matters:

I was surprised that there were differences between the panels. I thought the ARC would have had a way of doing things that they knew worked best say for the Discovery program. But it seemed that each Executive Director had to work out how to do it. They were thrown in the deep end and by three years had worked it out and gone to a different job. (Interview 14)

Other panel members commented on differences between the roles played by academic Executive Directors and the administrators (Assistant Directors) in the ARC:

Staff play an important role in curbing inequities. (Our Assistant Director) did that very well. The ED was very unassuming. Their role was mainly in monitoring process and appropriate comments. (Interview 4)

One of the tremendously valuable things about being on the panel was to get to know some of the ARC staff. They know so much about the process and are helpful, (our Assistant Director) for example is absolutely wonderful. She is a main contact now for ARC business. (Interview 7)

I found the technical advice of the support staff extremely good, particularly when it came to defining the parameters of a particular scheme. (Interview 3)

The NHMRC administrators report to a CEO appointed from the research community, but during the period of the study funding programs were directed by external committees that set process rules. The complexity of this arrangement created problems of accountability within the organization, which was at this time within the Commonwealth Department of Health and Ageing. The Australian National Audit Office (Auditor-General, 2003) identified this among other issues as problematic, but noted that the organization had taken steps to change, commencing with providing training in relevant administrative law for both staff and committee members.

Overwhelmingly, panel members believed that the system they worked in was staffed by hard-working people. This comment was from a former ARC panel member:

I came out of the four years feeling a sense of respect for the process and the people who work within it ...The actual bureaucracy came

down to a very small number of people ... a bunch of very hard working and dedicated individuals. (Interview 9)

Management vs peer decisions

Process changes introduced by the ARC in 2001 were designed to guarantee peer assessments for all applications and bring leading researchers into the administrations. The Australian-based Readers, assessing and ranking groups of up to 20 applications relieved the strain of finding three external expert assessors. However, the new arrangements had unexpected impacts:

In the first year (2001) the power lay with the panel but by the 3rd year (2003) it had gone to the Oz Readers and we had very little influence. I think they didn't realise that. (Interview14)

I thought the Executive Directors had less influence than people outside the sector would believe. (Interview 4)

The Readers became the dominant peer reviewers and the panels and senior staff had less influence over grant rankings. A former panel member, who had first hand experiences with processes in the National Science Foundation, supports this situation:

In the NSF I've seen program managers dictating the field, with everyone in a field rewriting their work to what they think the program managers are wanting to see ... I am not convinced that the Program Managers are doing a better job (NSF) than our system which is hands off. In the ARC the Executive Directors have very little power. (Interview 13)

However, another informant disagrees with this reading of the advantages of the ARC system, believing that panels retain capacity to influence events and bring agendas into the process:

Panels introduce politics into their decisions, such as whether grants are distributed to all universities fairly and whether grants are being shared across all the sub-discipline areas. Panel members need to go to the US and to England to see how panels there operate. They don't mention the politics of distribution but focus on the quality of the

research proposal. Both the American and English research councils manage those politics post-selection. (Interview 15)

National Science Foundation Program Directors

Program Directors at the NSF wield significant influence over their discipline. Their work involves significant time in the field, discussing research activities, attending conferences, monitoring and supporting research in their discipline. This field-work ensures that NSF projects are closely monitored for quality and outcomes, a fact which has a large impact on the operation of grant selection panels. Program Directors also determine the peer review model used to rank grant applications and make the final decisions on which grants are funded. The panels discuss applications in considerable detail, arriving at an agreed rank order and cut-off point, below which applications are deemed not fundable.

Reviewers focus on two primary criteria – the intellectual merit of the proposed activity and the broader impacts of the proposed activity, e.g., how well the activity promotes teaching, training, and learning and the potential benefits of the proposed activity to society. Reviewers also consider how well the proposed activity fosters the integration of research and education and attracts a diverse set of participants, particularly from underrepresented groups in science and engineering. (NSF, 2004a)

Within a panel meeting the process is heavily influenced by the panel members who usually employ a form of triage to rank applications on a scale such as; highly commended, commended, not recommended. Panels take into account the two primary criteria, intellectual merit of the activity and the broader impacts of the activity. They do not take much account of track record, only considering whether the proponents have the necessary skills.

This researcher was invited to observe a selection meeting at the NSF in September 2004. The panel of nine people were considering 40 applications of which the Program Director would be able to fund 12–16, depending on

grant size. The panel was well briefed and engaged in thorough debate about the relative merits of each application before the members scored it by holding up a card with a number from one to seven. An average score was then assigned to the project. To check relative merit the panel revisited scores and positions in the ranked list several times during the process. Panel discussion was heavily focussed on the nature of the science proposed and its potential impact. In three hours of observation (one quarter of the selection meeting allocated time) the phrase 'track record' was not used once, nor was there reference to any similar construct. There were questions, at the end of debate about two of the lower scoring projects, whether the applicants had the knowledge and skills to undertake the project. One panel member, expert in the research area, answered in the affirmative and the matter was not revisited.

One NSF Program Director stated that track record accounts for less than 10% of judgements made in that discipline and is only drawn upon at the margins in consideration of capability, not of past successes. This particular discipline operated with panels of eight or nine persons, considering 100 applications and external reviewer comments over a couple of days. Each panellist read and assessed 25 applications.

The treatment of track record in the NSF is highly significant, given its prominence in Australian peer review processes. Observations of selection processes conducted by four research councils has provided evidence of a relationship between reliance on track record as a tool to determine likely success and the number of applications managed by a peer review panel.

Program Directors and Capacity Building Risk-Taking

A list of recommendations goes from the panel to the Program Director who then takes into account a number of other factors, moderating the recommendations. Cole (Cole and Cole, 1981) emphasised this important role played by the NSF directors, who make final funding decisions and do not always support the mean ranking given by reviewers. They balance the

“conservatism of the panels” (Interviews with NSF Program Directors, 2004); some take into account early career limitations and gender, as well as applying national research priorities to the list.

A key priority for US research funding is the Experimental Program to Stimulate Competitive Research (EPSCoR), a merit-based program created by mandate in 1978 “to expand the scientific and technological capacities of the States with developing research infrastructures” (Office of Legislative Policy and Analysis, 2005). In 2001 research and development spending was still heavily concentrated with 85% directed to 20 states, but 5 states capturing 50% of expenditure. The lowest 20 states received only 4% of R&D spending (OLPA, 2005). The NSF has in place particular procedures to advance applications which meet EPSCoR co-funding criteria, that is, they are rated by the panel as fundable and near to the cut-off of available funds. However, there are other means available to Program Directors to implement affirmative action to meet the intention of EPSCoR.

One Program Director recounted a decision made to advance an application. This was a solid application from a research group located in a targeted state, but it was ranked in position 17, fundable, but funds would be exhausted after the 15th grant. The Program Director examined the 17th application carefully and noted that there were several early career researchers to be employed, as well as a relationship with local industry that would have flow-on effects. This was a grant that would create employment and build much needed capacity in a state that was at the bottom of the research league table. But if it was to be funded another grant had to drop off the list.

The Program Director decided that this was a risk that had to be taken, to provide opportunity and make a significant difference in one location. The Program Director conducted a careful examination of all the recommended applications, the current activities of the proponents, existing funding provided for that research, and decided to drop, not the 14th or 15th on the

list but, the 1st placed application. This highly rated application was from a group rich with research funding, in possession of grants worth several million dollars a year, a group already very busy with research projects, located in a resource-rich institution. So, the decision was made to fund the 17th position grant and not the 1st position grant, to build new capacity rather than extend existing strong capacity. At the time of the interview the Program Director believed the risk was proving to be a good one, with the research project delivering training and other outcomes much needed in that institution and state (Interview 18).

Capacity building is another significant theme and point of comparison between the NSF and the Australian research councils. NSF models of peer review, grant approval and quality assessment, combined with a Congressional mandate for affirmative action to build capacity, provide scope for flexible and targeted delivery of research funding in ways that are not used in Australia. Capacity building, of new research fields and new researchers appears to be hampered by assessment processes that rely on track record as a key selection criterion, even when it is considered relative to opportunity. Capacity building is discussed in relation to Australian research councils in Chapter 7.

External Assessors

External assessors are experts in the field of the application and are usually senior researchers with strong reputations in the field. They may be located outside the country of the application and they are not paid for this role in Australia. Senior researchers may complete up to a dozen assessments each year and often turn down invitations to assess. The ARC has reported falling acceptance rates for its International Readers, with approximately half of all requests accepted.

I returned most of the proposals for assessment because they did not cover my field close enough to allow for an expert opinion that would have met my standards of such a task. (Survey 95)

When the NHMRC removed external assessors entirely and replaced them with many more panel members, they effectively created an in-house equivalent of the ARC Australian-based Readers.

Applicants still believe that the external assessors are the most important reviewers, regarding them as similar to the peers who review publications. As for publication review, some assessors are better than others:

The selection of assessors is crucial, some are better than others ... Corporate knowledge of panel members is significant in this. They remember from year to year those assessors who are reliable. (Interview 2)

However, there have been power shifts in both the ARC and the NHMRC processes, as this comment from a senior informant demonstrates:

The Australian Readers were very important and the international readers were not. The international readers are just a bureaucratic nightmare designed to satisfy a political imperative that the work be seen to be refereed internationally. I don't think they add a lot of value to the process. (Interview 4)

How do Assessors judge merit?

Like panel members, assessors receive advice about program criteria and providing quality advice:

I tried to follow the process described in the supplied materials and I used ranking of the small number of applications I read to decide the scores. I was quite happy with the correctness of the rankings ... However, it was impossible to define meaningful scores after reading just a few applications. (Survey 150) (ARC)

The ARC recognised the limited value of scores where only a few applications were read and in 2001 focussed on the scores of the Australian-based Readers and the text of the International Readers. Scores are not provided to applicants as they have little meaning outside the context of the entire field

of applications, whereas the textual comments usually provide applicants with solid criticism or advice.

As an assessor it is difficult to compare applications - for instance, it is difficult to say to the committee that application x was better than application y for some reason. The assessment text has to be self contained, and cannot compare this application to others. (Survey 79)

The Burden of Peer Review

Grant selection processes are heavily dependent on the good will and contributions of the peer reviewers, most of whom could not contemplate a funding system that did not use expert review. However, there are consequences, proposal writing initiates a cycle of burden:

Proposals beget reviews, panel meetings, and administrative actions within the funding agency (Chubin, 1994, p27).

A detailed discussion of the amount of time spent on various peer review processes, including developing applications, mentoring and assessing occurs in Chapter 7 and the volume of applications carried by panel members is detailed in Chapter 4. This section reflects on the panel members' views about the process and its impact on their lives.

There is evidence that the ARC is overworking its committee members and that the goodwill of the sector is under stress. Research Councils in other countries tend to load their panel members with a slightly larger application load than the NHMRC panelists. The ARC load is significantly greater than any load carried by panels working with the NHMRC, the NSF, the EPSRC, the Medical Research Council (UK), and the New Zealand funding bodies.

I was drained at the end of the week - and I am one of those who does take it seriously, it is quite a burden ... You feel pretty lonely when you do it. For those years hardly anyone talked to me. I expected people to lobby and the opposite happened, people avoided me. (Interview 13)

It's hard to get inside other people's minds given the time you've got. The 600 plus applications make it torrid, the pace is furious. (Interview 10)

This torrid pace and isolation has other consequences, one former staff member observed that at the end there is a fitness factor:

It's stamina, who on the committee is still going and able to say something at the end of the process. (Interview 1)

Despite the burden that ARC panels carry, compared with the much lighter NHMRC panel load, there is no evidence to suggest that the NHMRC process produces better results:

There is no evidence that the NHMRC has better outcomes for its more expensive much larger model. At the margins of success applications could be funded, or not, without loss of quality, often the determining factor is whether an application has a spokesperson committed to its support. (Interview 1)

Everyone involved in it, afterwards, thinks it is a lot more robust than they thought it probably was. The level of suspicion among DVCRs about the process had gone down, partly because of the Executive Directors, and because there are people who have been part of the peer review process and appreciate how robust it is. (Interview 4)

The question is whether the process funds good science or not ... The peer review system is a bit spotty because it's so random who you actually get (to assess), they send out five and you get two back ... with a one in two success rate you can get it pretty right. In fact you can do this for one in three. Once you get below this it starts to get harder. When there are only 20% funded the noise on the assessment is 30%. It becomes the luck of the draw. (Interview 5)

Summary

This chapter has examined the inside of the 'black box' of grant selection, particularly the ways that the ARC and the NHMRC have operationalised grant selection through peer review, and how the panel reviewers

understand and work within that system. It has examined the roles of panel members and their contributions to the task of assessing. Discipline level differences emerged, as did commonalities across panels, in judgements of the highest quality work. The impact of the peer review workload was briefly considered, as were the contributions and obligations of staff to the selection process, including comparisons with two external research councils, the NSF and the EPSRC.

Excellence emerged as a multi-faceted or polymorphic (Lamont, 2009) construction but clarity and writing dominated opinions about what was the best. Every panel member interviewed held that the difference between the best (5-10%) and the rest is the way that the Text component is written. Applications “resonate”, are “compelling”, “convincing” and “shine off the page”. They “tell a good story”, “convey the spark”, and are “gripping”. They make the reviewer read straight through like a “who done it”. These applications demonstrate the place of the research in the discipline and do so with “clarity of vision” and a “clear explanation” of the details proposed. They are “worth doing”, leave no doubt that they “can deliver” and bring “novelty” and “creativity” to the fore. They are like “really good literature”. Panel members believe that communicating the work of research is an integral part of the activity and that all researchers have an obligation to deliver clear stories about their work to the world at large, that in fact, as one influential Panel member said; “get over it, it’s the job”. In summary, the best applications are well articulated, professionally prepared and exciting to read. Panel members believe that people who can tell the story also do the best science.

After the best are selected and panel members set about defining the rest, the tools they use differ with the selection context. Processes in the NSF, the EPSRC and in organizations studied by Lamont (2005, 2006b, 2009) where panels were formed within disciplines to consider up to 50 applications tended to retain focus on the quality of the work. Broader multi-disciplinary panels with very large numbers of applications (greater than 500) placed

more emphasis on the track record of applicants as a dominant discriminant. In part, this is because track record is measurable and comparable and manageable. When the evanescent, sparkly applications and the un compelling, under-prepared applications are identified then a manageable tool makes it possible to separate the rest. For panels with small numbers of applications workload is not the force that drives reliance on track record, but the process documentation can take over when track record is defined as a dominant selection criterion with a lion's share of the weightings.

Chapter 7 is about grant selection and peer review processes from the perspectives of the applicants. Chapter 8 will revisit the key issues of peer review processes and consider the implications for grant applications.

PART THREE – WHAT IT LOOKED LIKE FROM OUTSIDE THE COUNCILS

7 APPLICANT EXPERIENCES

Research councils provide third party, quality controlled service for the allocation of government funding to support research. The research communities provide their services to councils, as peer reviewers, as panel members and as applicants for competitive funding. Council officials understand that their work requires the support of the research community. Panel members demonstrated in Chapter 6 both support and show a keen understanding of the complexities of grant selection and the impact of subtle changes to administration. In contrast, the data in this chapter will show that applicants for funding hold wide-ranging views about the grant selection processes and many of them consider the process to be a black box. They hold misunderstandings about the nature of the grant peer review processes and the roles of external peer reviewers, panel members and council staff.

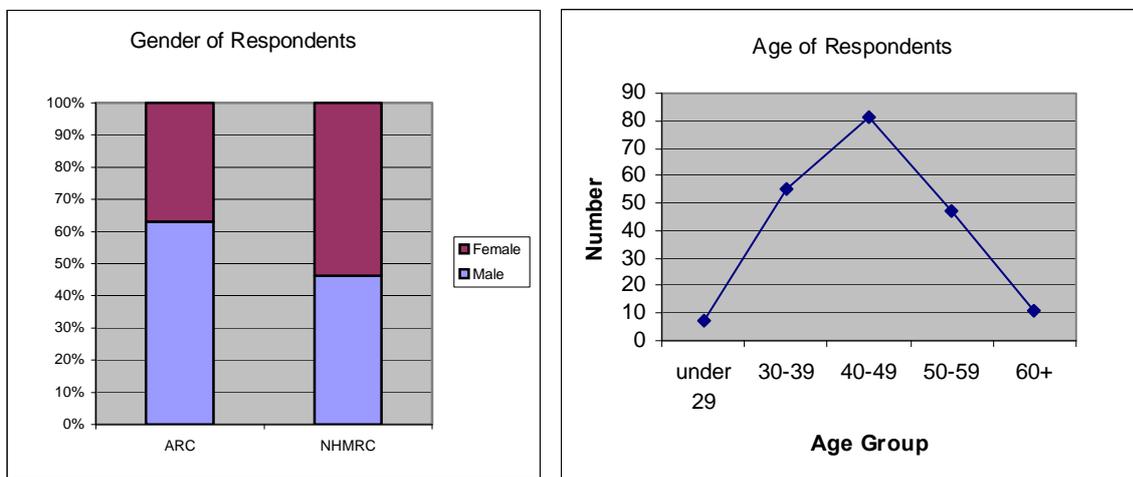
This chapter draws on data gathered in a survey of applicants for funding. Applicants to the ARC or NHMRC in 2004 were invited by their institution research office to participate and 202 researchers completed an anonymous internet-based survey over the summer of 2004-2005. The characteristics of respondents, their views about components of grant selection processes, their assessments of the performance of the research councils and their understandings about what works in grant applications are discussed here. Analysis of responses reveals some important gaps in the knowledge that applicants hold about grant processes and some strongly held criticisms. Grant application processes are shown to be very time-consuming and these data on the Australian sector are compared with data on similar processes in the United Kingdom.

Profile of the Survey Respondents

As discussed in Chapter 3, the survey respondents included 144 who identified the ARC as the council from which they normally seek funding, and 58 identified the NHMRC. Additionally, 12 of the 144 ARC identified applicants had sought funding from the NHMRC in the period 2000-2004 and 20 of the NHMRC identified applicants had sought ARC funding in the same period.

Demographic information about the respondents follows.

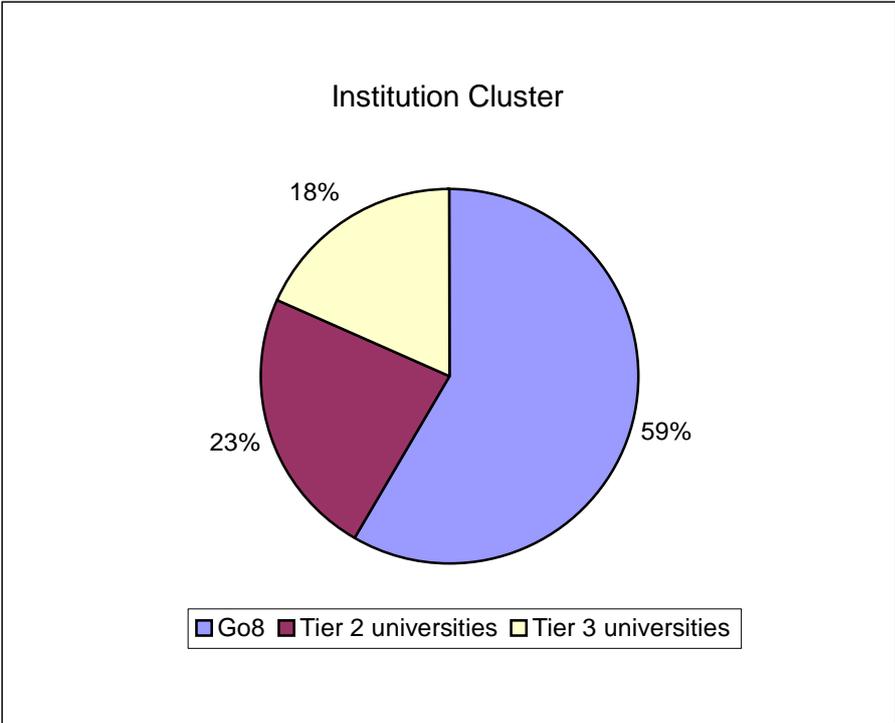
Figure 7.1 and 7.2: Gender and Age of Respondents



The distribution of respondents by age and gender is shown in figures 7.1 and 7.2 and are generally similar to the community of applicants; that is, a majority of males and more than two thirds (69%) over the age of 40. In comparison, ARC DP applications in 2004 included 1,612 women, 23.7% of all named applicant investigators and an overall success rate of 30.1% for female investigators. Early Career Researchers (ECRs) made up 21% of the respondent field (43). Applications that only named ECRs in the ARC DP round of 2004 included 869 persons. Other applications in that round included ECRs with other researchers, but the total number of ECRs is not known.

Responses include researchers located in 29 Australian universities, a medical research institute, a research hospital, and the CSIRO. Figure 7.3 shows the distribution of the respondents by location cluster.

Figure 7.3: Distribution by Institution type



The Go8 cluster is a well known grouping, consisting of: the University of Sydney, the University of Melbourne, the University of New South Wales, the University of Queensland, Monash University, the University of Adelaide, the University of Western Australia, and the Australian National University. The small number of responses from a medical research institute and CSIRO have been added to the Go8 for this analysis as both are prestigious research institutions. There are 118 respondents from this grouping, a proportion which reflects the size and research concentration of the Go8 cluster. The second grouping, for these purposes, includes universities of technology, the higher performing new generation universities (based on Department of Education data used for allocating Institutional Grants) and the research hospitals. The second grouping includes 47 respondents and the final grouping 37 respondents. The third grouping is the remaining universities from the new generation cluster.

All of the respondents had been applicants for grant funding in the period 2000-2004 and many held roles within the peer review processes run by the ARC and the NHMRC at some time during the same period.

Table 7.1: Roles of Respondents

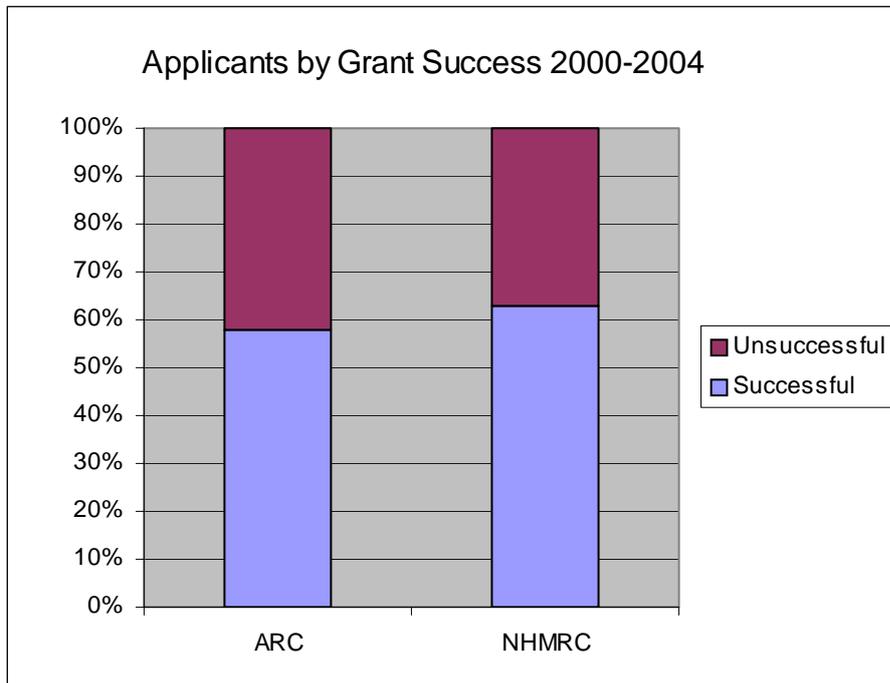
<i>Research council</i>	<i>External Assessors</i>	<i>Panel members</i>
ARC	55*	5
NHMRC	15*	13

* Includes 13 people who served both councils as assessors.

Many of the panel members in this field also served as external assessors in years when they were not on panels. This group of 70 respondents is well informed about processes and provides insights into the selection process as well as their experiences applying for funding.

The ARC and NHMRC success rates for applications to their flagship programs vary according to the amount of Commonwealth funding budgeted in the year and the number of applications submitted, ranging from approximately 20% to 30% in the five years studied. Respondents in this study include a higher than expected number of successful applications. This group of 202 respondents includes 58% (ARC) and 66% (NHMRC) who won grant funding at least once in the survey period of 2000-2004. However, when frequency of success is considered then success rates are closer to council outcomes, with 35% of ARC applicants and 28.3% of NHMRC applicants reporting consistent success (Figure 7.4 shows successful respondents grouped by frequency of success). There were 31 respondents who reported 100% success with grant applications (18 ARC and 13 NHMRC), the balance of the successful field commented on success following failure and 54% (92) described steps they took to improve their application for the successful funding attempt.

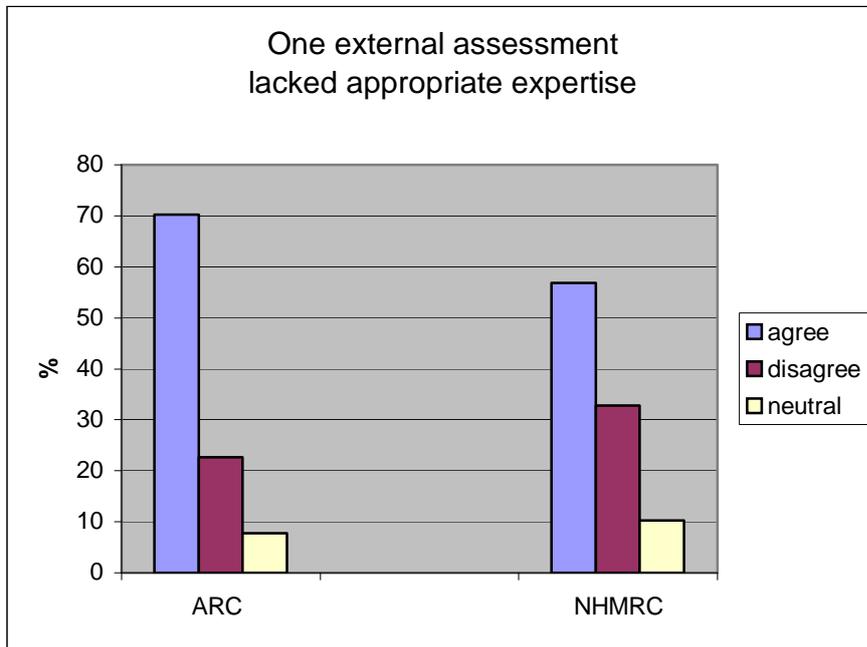
Figure 7.4: Grant Success by Research Council



Applicant Satisfaction with Grant Selection Processes

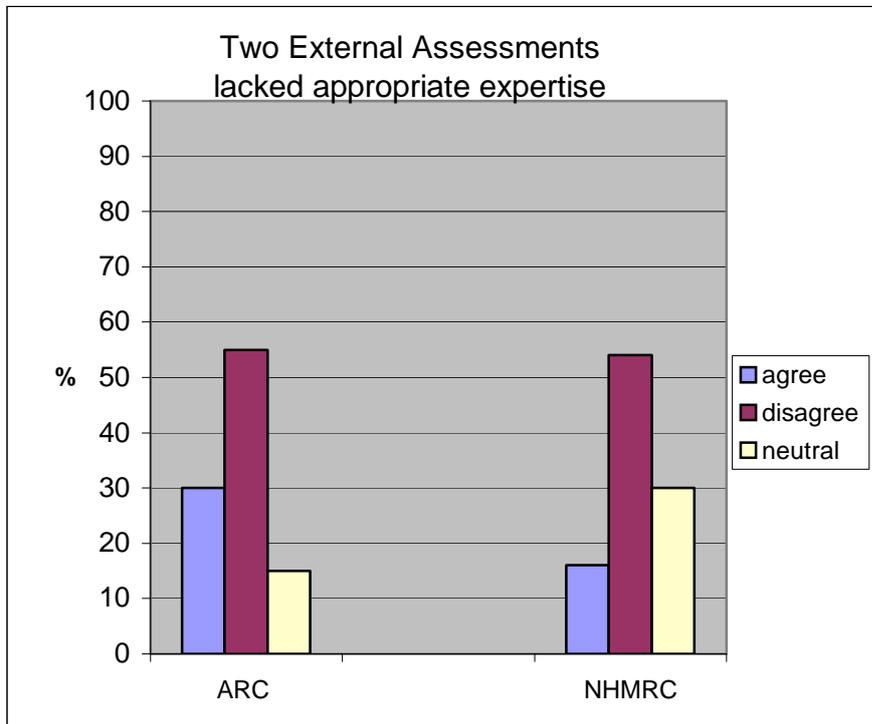
Applicant satisfaction with aspects of council selection processes was tested with a series of questions about the administration of the grant selection process in the last round they participated in. Seven questions provided a Likert scale for responses and two questions sought text responses from the applicants. Responses to each question follow, with data separated into ARC and NHMRC, the council that applicants last applied to for funding.

Figure 7.5: One External Assessment did not demonstrate appropriate expertise (Q16).



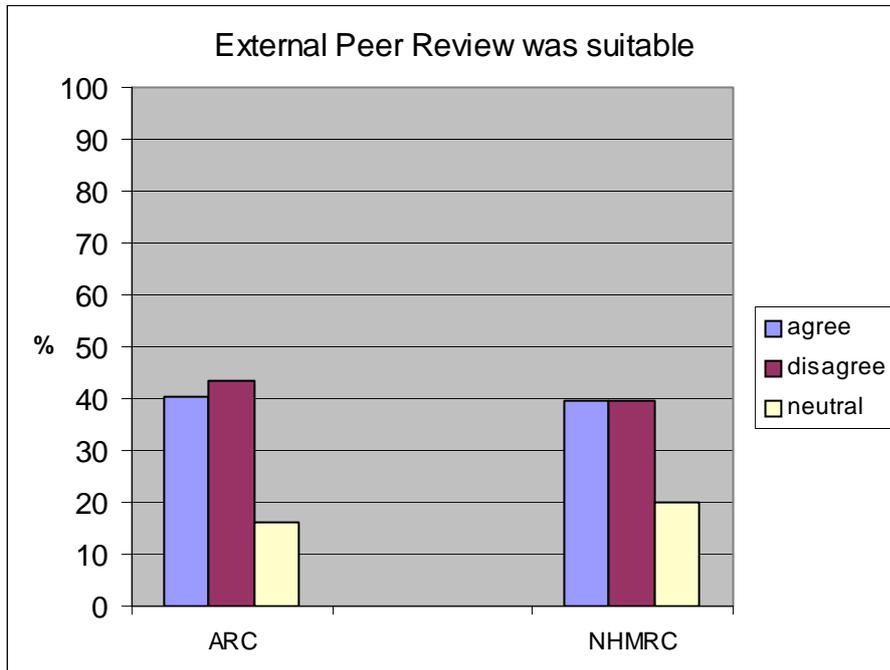
The majority of applicants to both councils agree that one of their assessments was not of a suitable standard; 70% of ARC applicants and 57% of NHMRC applicants supported this proposition.

Figure 7.6: Two or more of the external assessments of your application did not demonstrate appropriate expertise (Q17).



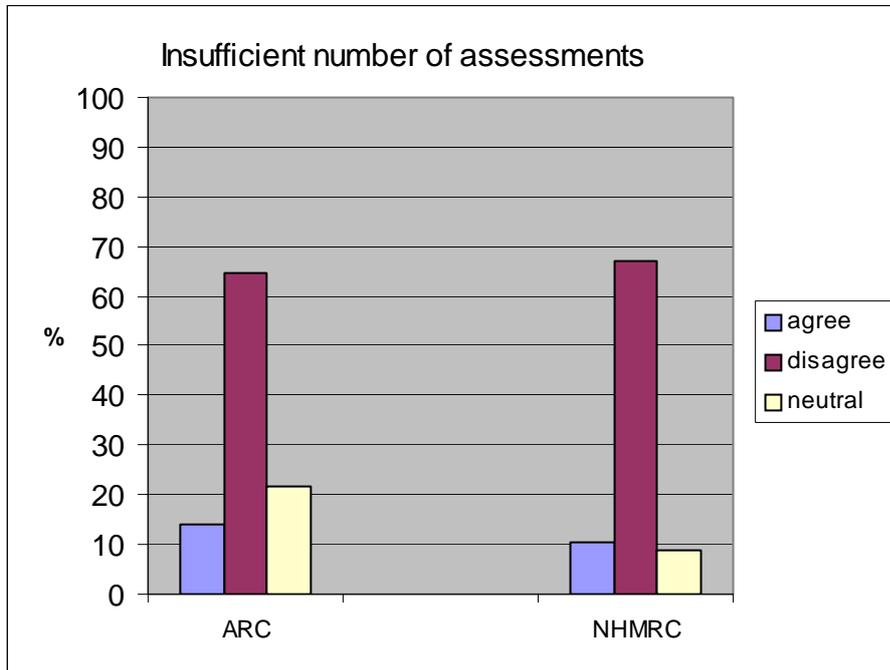
From the previous question, where one assessor was not appropriate, there is a significant drop in the percentage agreeing. However, there remain 30% of ARC and 16% of NHMRC applicants who think that two or more assessments demonstrated a lack of expertise. Their faith in peer review processes generally must be challenged by this belief and this is captured in the following data.

Figure 7.7: You were satisfied that the external peer review process was suitable (Q18).



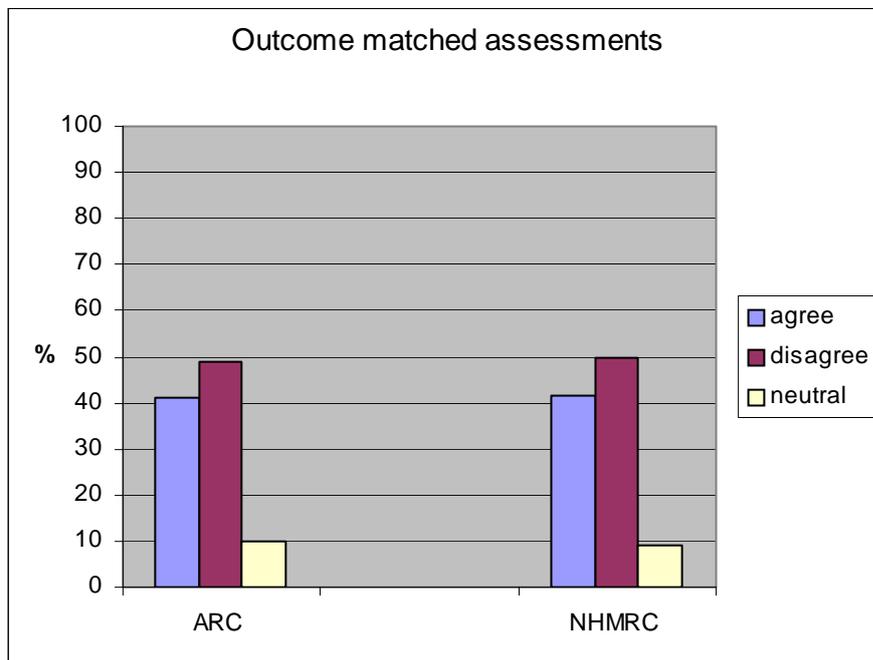
External peer review processes were evaluated similarly for both councils, despite their process differences. The respondents demonstrate unease with the grant peer review process, with 40% or more believing that it was an unsuitable process. A similar number hold an opposing view. The reasons for disagreement with the peer processes emerge from the free text discussions of the strengths and weaknesses of the research councils later in this chapter.

Figure 7.8: Your application did not receive a sufficient number of assessments (Q19)



Very few respondents believe they did not get sufficient assessments, but there remain 10% or more in both council application fields who do hold this view. This response indicates that the applicants know how many assessments they should receive and that the councils are in the most part delivering the expected number of assessments.

Figure 7.9: The outcome of the process matched what you thought your assessments indicated (Q20)

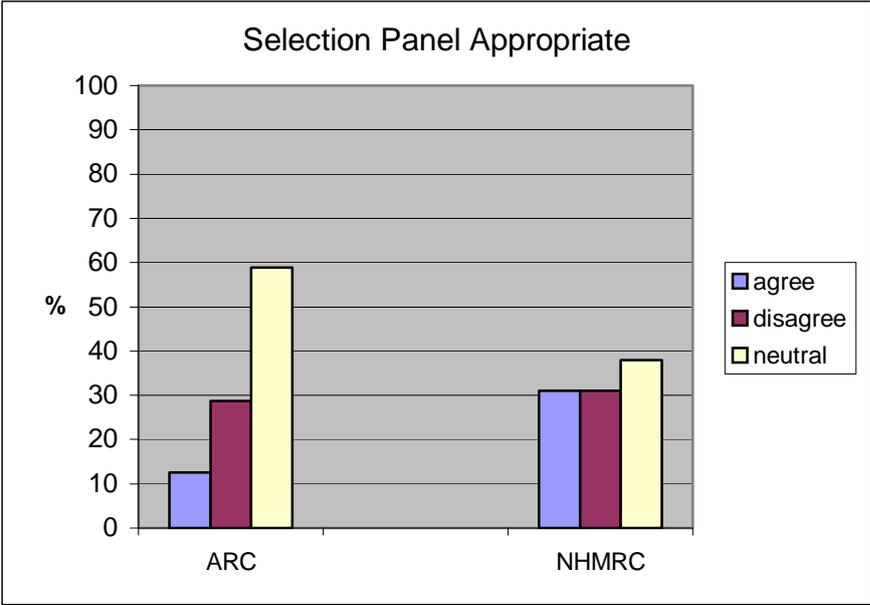


These almost identical results for the research councils indicate a problem of plausibility for council selection processes, with 49% and 50% of respondents believing the outcomes did not match their understanding of the external assessments. There are a number of possible explanations for this belief, primarily that applicants usually see only their own assessments. Assessors tend to be generous in their comments, very few declare an application to be unfit for funding, so applicants tend to believe their application has been supported. Assessment interpretation is a skill that develops from seeing many assessments and knowing how those assessments have been valued by the panel. Experienced panel members understand that 'good' and 'worthwhile' work is not competitive with 'outstanding' and 'world-leading' work when less than one third of applications can be funded. These subtle evaluations within the text of assessments are not widely understood.

Many applicants believe that external assessors decide the outcome, despite the councils publishing details of the selection process, including the role of the panels as key decision makers (recommending ranked lists of

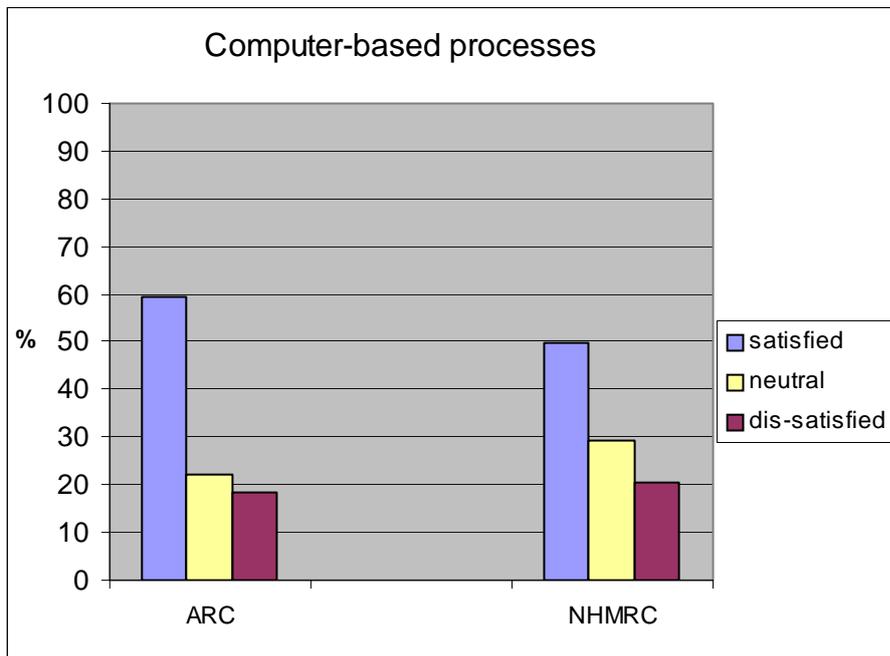
applications to decision-makers who usually accept them). Thus, they are unable to reconcile the supportive assessments and lack of grant success. This view is discussed in the text provided by many respondents later in this chapter.

Figure 7.10: The Panel or Expert Advisory Committee was appropriately constituted (Q21)



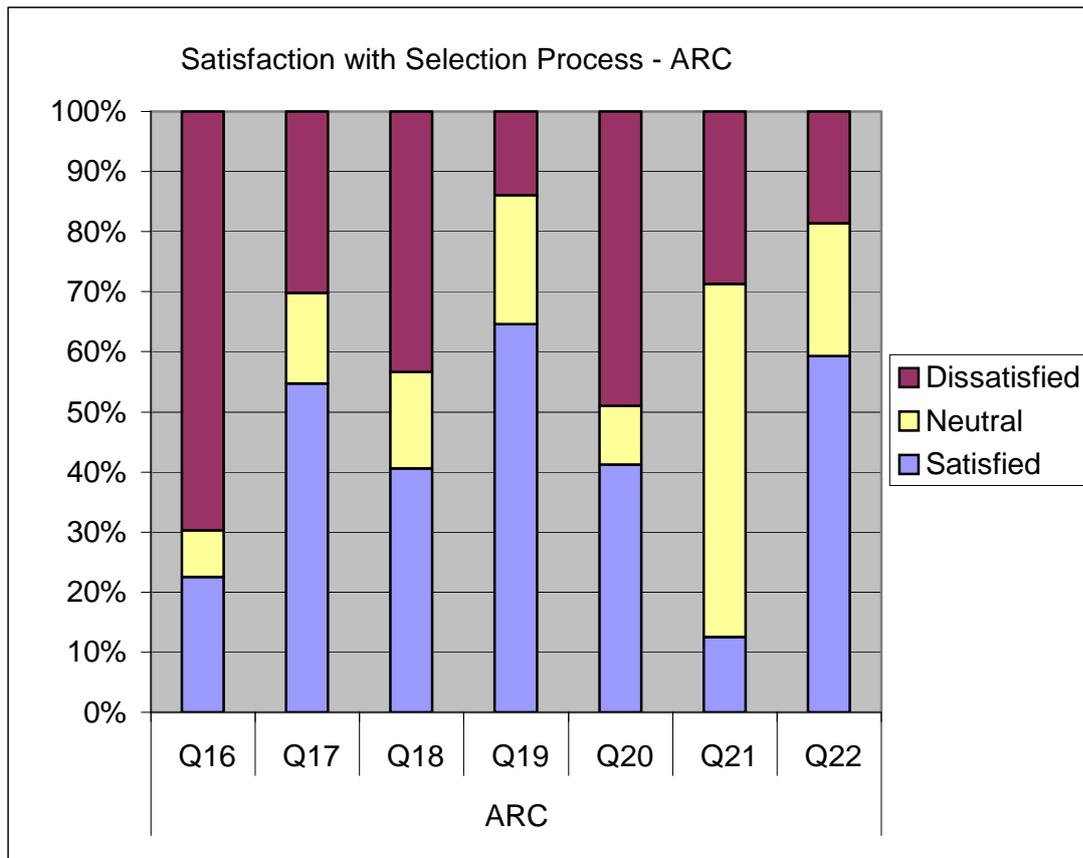
Respondents reflected on the membership of the selection panel that considered their application. For both councils around 30% of respondents think the panel membership was not appropriate. The reasons for these views, which are discussed in detail later, include; coverage of the discipline or sub-discipline area, the small size of the Australian research community militating against freedom from conflicts, panel member applications creating a conflict within the panel, and other forms of bias. A significant proportion of respondents (ARC 59% and NHMRC 37%) did not hold a view about the selection panel membership. This may indicate a lack of knowledge about the panel rather than lack of interest or concern.

Figure 7.11: The computer based processes used by the research council were efficient (Q22)



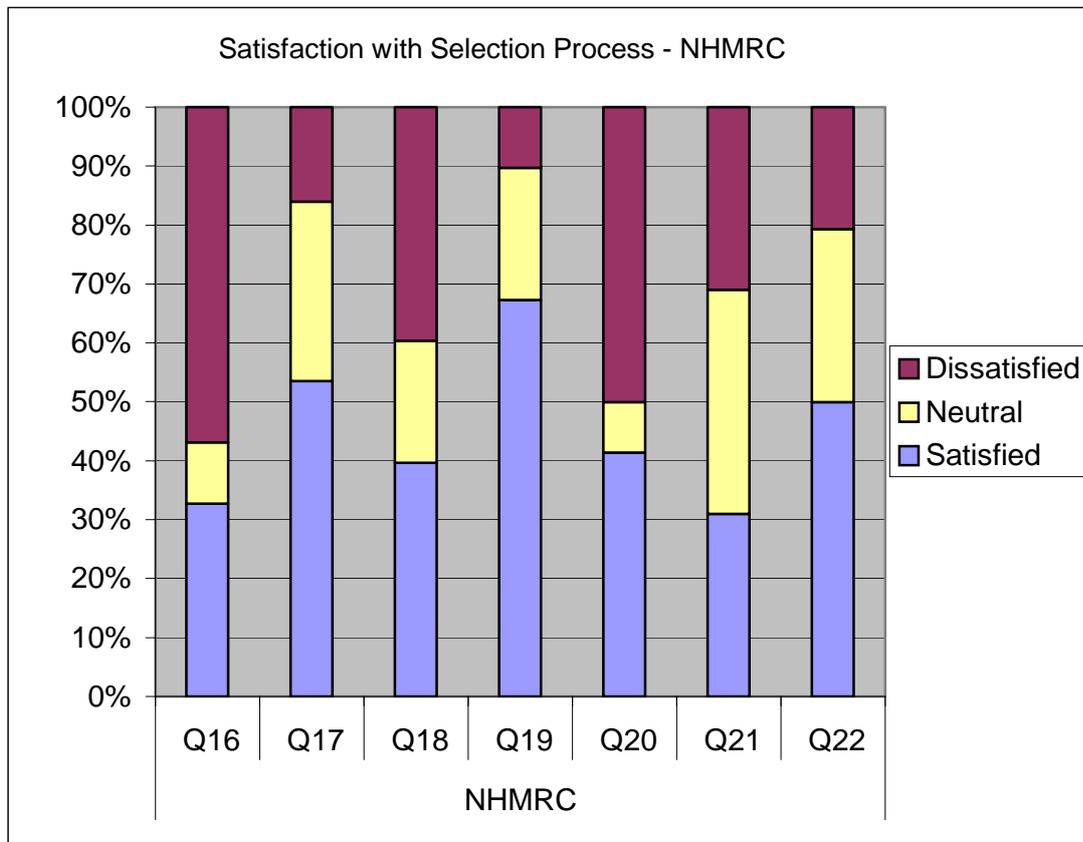
The time that applicants spend preparing and submitting a grant application is considerable and any aspect of the process that takes more time than applicants think it should is widely discussed in research communities. The ARC Grant Application Management System (GAMS) was purpose-built for the process by ARC staff and contracted staff of the Royal Melbourne Institute of Technology University, commencing in 1995. In the first years it operated, 'GAMS' was almost a term of abuse as the system struggled to cope with demand, bandwidth and peak-time service failures. The NHMRC electronic systems changed several times over the period of this survey, suffered similar problems, but used quite different submission methods from the ARC. They too were widely regarded as unreliable and difficult to use. The results for this question indicate a higher level of acceptance of the technology than expected, with 50% (NHMRC) and 58% (ARC) satisfied and approximately 20% remaining dissatisfied.

Figure 7.12: All Selection Process Attitudes - ARC



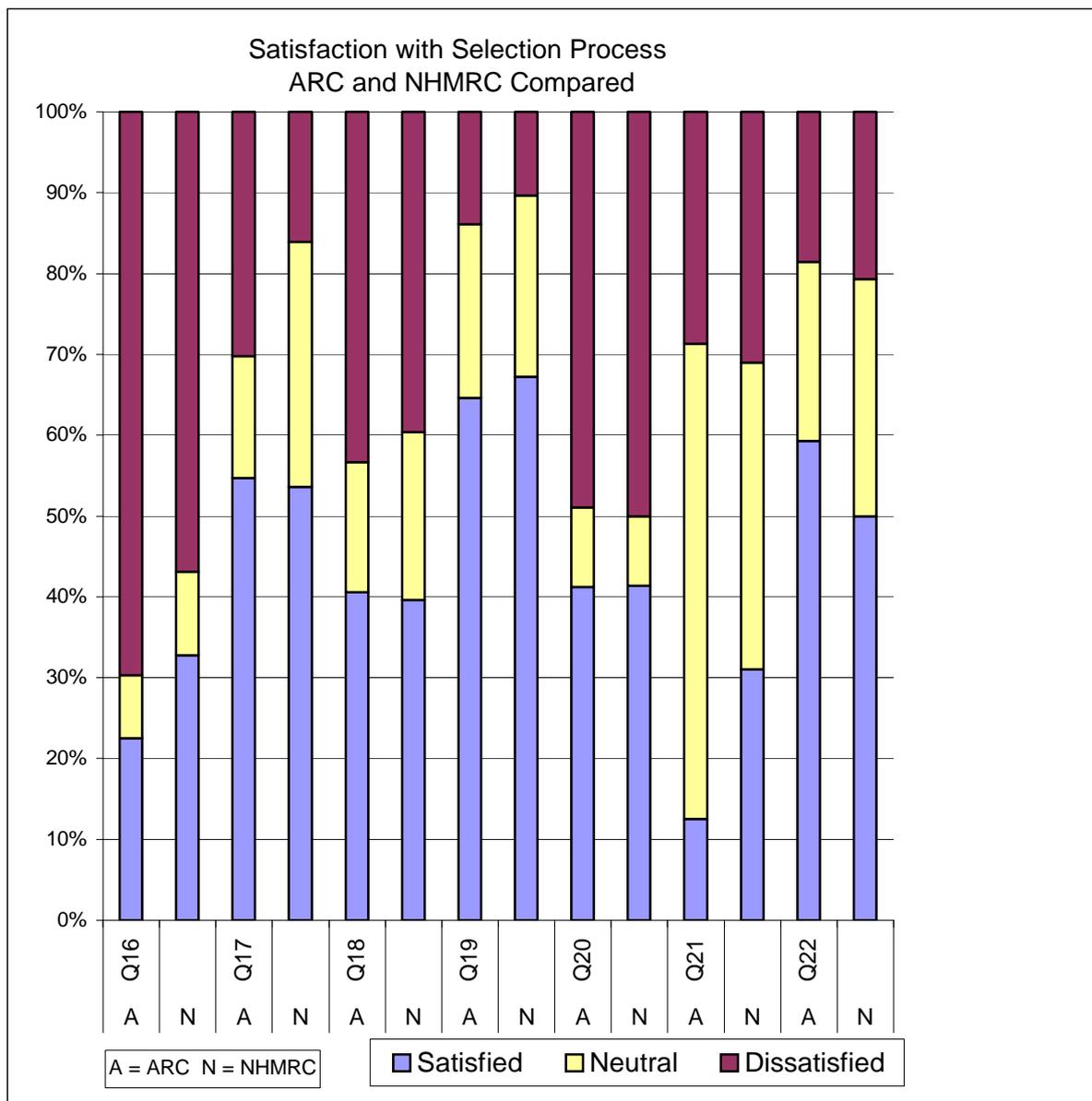
This figure (7.12) brings together, for ARC respondents, responses to process satisfaction questions from the previous seven figures (7.5 to 7.11). Items with fewer than 50% of respondents indicating satisfaction include general satisfaction with peer review processes (Q18), the match between assessments and outcome (Q20), the single unsuitable assessment (Q16) and the constitution of the panel (Q21). The latter question, about panel composition produced significantly different responses from the other questions, with 59% neutral.

Figure 7.13: All Selection Process Attitudes - NHMRC



This figure (7.13) brings together, for NHMRC respondents, responses to process satisfaction questions from figures 7.6 to 7.12. Items with fewer than 50% of respondents indicating satisfaction match those of the ARC respondents. These include general satisfaction with peer review processes (Q18), the match between assessments and outcome (Q20), the single unsuitable assessment (Q16) and the constitution of the panel (Q21). The share of neutral views on panel composition is much lower than the ARC responses, but high in this group.

Figure 7.14: All Selection Process Attitudes – ARC and NHMRC compared



The research councils have different administrative structures and processes, different panel and committee structures and different application systems, but the applicants hold very similar views about the councils. Large clusters of neutral responses on the constitution of the selection panels (Q21) may indicate a lack of knowledge about the details of the processes.

Applicant satisfaction compared with grant success

Researchers who had success with their grant applications were expected to hold more positive views about the research council processes. This was not borne out by the first examination of data, where success was defined as having had at least one grant in the period 2000-2004. In that analysis successful applicants were as likely to hold negative views as unsuccessful applicants. To explore these views further, a process used to analyse data from a survey of National Science Foundation applicants (Kruytbosch, 1989), was adapted to this data set. In that analysis, Kruytbosch used six categories of success to describe applicants. The data here have been collated into four categories according to frequency of grant application success, varying the original model by collating one time success and failure with two or more successful or unsuccessful applications. The four groups used are defined as:

1. Consistent awardee - 100% success rate, one or more applications.
2. Frequent awardee - 50% or better success rate, two or more applications.
3. Frequent declinee - more than 50% unsuccessful, eg 2 in 3 not funded.
4. Consistent declinee - 100% unsuccessful, one or more applications.

All respondents, applicants to both the ARC and NHMRC, have been combined in figure 7.15.

Figure 7.15: Applicant Satisfaction by Success

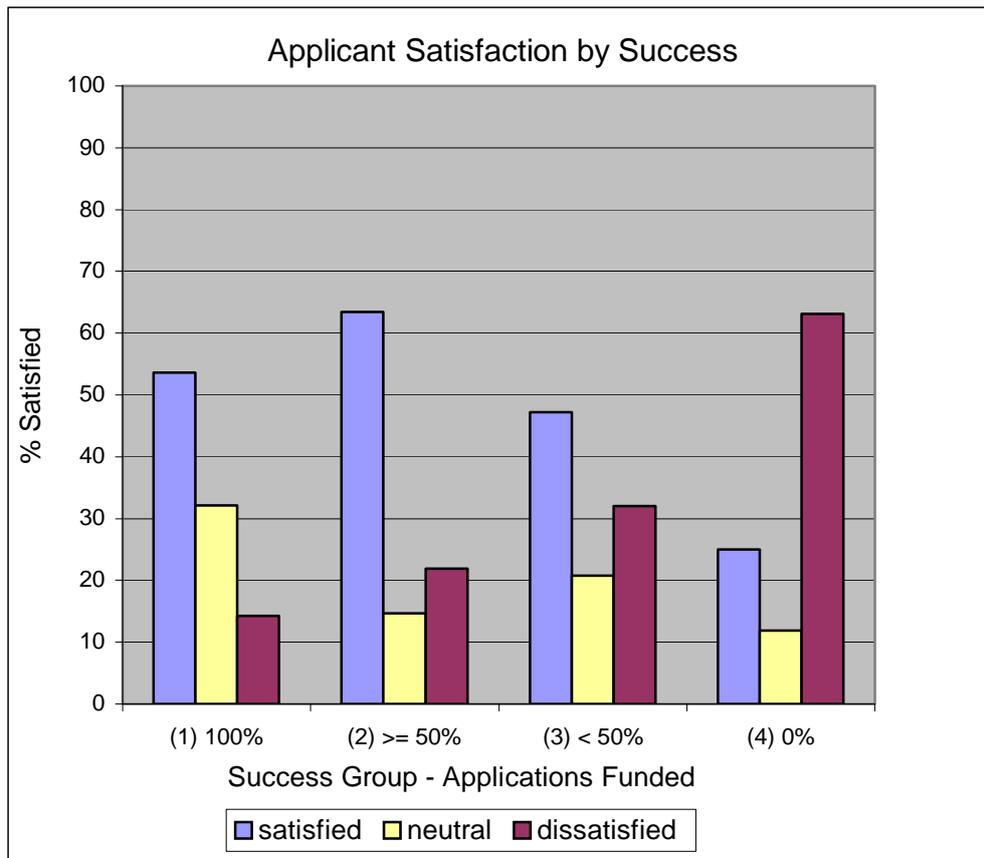


Figure 7.15 demonstrates that applicants who consistently or frequently receive grants are more likely to regard the selection processes used by the research council as satisfactory. It is worth noting that those who frequently receive grants hold the process in higher regard than those who have a perfect success rate. The satisfaction rate for this group is 63%, the same percentage as those in group 4 who are dissatisfied. Dissatisfaction increases with lack of success, as predicted, but even the successful groups have a significant share of dissatisfied (14% and 22%) or uncommitted (32% and 15%) members. Almost half (47%) of the frequent declines are satisfied with the process and a quarter of consistent declines think it satisfactory.

Strengths and Weaknesses of Council Selection Processes

Survey respondents had an opportunity to elaborate about their views on the selection processes used by the research councils in free text sections that sought comments on strengths and weaknesses. Most respondents chose to complete these sections, some used all of the space allocation of 150 words

and others wrote brief remarks. These comments have been coded using NVivo and summarized to generate an overview for each council.

Responses by 93 applicants who identified the ARC as the council from which they last sought funding are summarized in table 7.2. In the table *Peer review* comments are those that are about use of peers and the decisions and actions that applicants attribute to those peers. There are twice as many negative as positive comments on peer review processes run by the ARC. The single largest criticism is of external peer review, in particular, the expertise of assessors selected to review applications. Comments about lack of transparency in the peer review process (n=11) tend to occur together with comments about the roles of panels in the process. Suggestions of bias and favouritism (n=11) were mostly concerned with the small size of the community, conflict of interest and personal preferences:

...members of the panels evaluating proposals often also have proposals submitted themselves. This indicates a potential for conflict of interest that is the subject of some skepticism...(Survey, 131)

Table 7.2 Strengths and Weaknesses of ARC Funding Processes

Strengths of the ARC	No.	Weaknesses of the ARC	No.
Peer Review – 41		Peer Review – 81	
General support	27	General	14
External review	8	External review	32
Panels (EACs)	2	Panels (EACs)	10
Feedback from assessors	4	Bias, nepotism	11
		Inconsistent/ unclear	12
		Feedback from Assessors	2
Processes – 22		Processes – 42	
On-line submission GAMS	8	Arbitrary, lottery, luck	11
Clarity of rules, instructions	5	Bureaucratic, applications too time consuming	6
Consistency, lack of bias	3	Too long from application to decision	6
Anonymity/confidentiality	2	Does not fund innovation	6
General	4	Bias against ECRs, Women	2
		Multi-disciplinary work not supported	4
		Not transparent	7
Design – 25		Design – 39	
Rejoinder (Rebuttal)	9	Use of track record as principal selection tool	15
What is funded – range	10	What is funded - range	6
Emphasis on track record in selection	4	Lack of feedback to unsuccessful	10
Selection criteria	2	Funding insufficient - low success rates/grants too small	4
		Selection criteria	4
Impact on researchers – 5		Impact on researchers - 1	
Application forces learning and better understanding of research	4	Left research job	1
Gain promotion if successful	1		
No strengths – 16			

Process comments are those that are about the impact on applicants of decisions by peers or administrators. The ARC runs processes that are akin to lotteries according to 11 comments, and these processes are not transparent (n=7):

The main objection is the opacity of the process. Because of this, applicants are given the impression the panel of non-experts is able to completely ignore referees' comments and do whatever they like. (Survey, 70)

Other concerns are that processes inevitably create a bias against innovative research (n=6) and multi-disciplinary proposals (n=4) and that applications take too long to prepare (n=6) and that the process takes too long to announce decisions (n=6):

It is a completely hopeless dysfunctional system. It would not grant anything to Einstein for his work, as it was too original. It would grant money to any overambitious twerp who showed enthusiasm for jumping through all the hoops required, provided their research did not look too novel. (Survey, 167)

Design comments are those that are about the policies of the research council or the government, matters which are not determined by peer reviewers, but which arise from Government processes or form part of the guidelines or funding rules of the councils. The major concern in this category for ARC applicants is the use of applicant track record as a key to selection success (n=15). This use of track record is seen by some as inhibiting the possibility of new applicants gaining funds:

Track record (40% weight) is overemphasised compared with the contents of the project description ... This strongly favours established professors and discourages the development of outstanding scientific content. (Survey 194)

The absence of detailed feedback (n=10) to unsuccessful applicants is seen as hampering applicants who want to improve their performance in the next round.

Some ARC applicants see the application development process as a useful tool to improve the clarity of their research plans and one applicant connected grant success with promotion at work. Another reported disillusion with the complexity and duration of the process and had left research employment. Sixteen applicants saw no strengths in the processes used by the ARC.

Responses in free text by 44 applicants who identified the NHMRC as the council they last sought funding are summarized in table 7.3. NHMRC responses in Table 7.3, include *Peer review* comments (use of peers and the decisions and actions that applicants attribute to those peers) as a major criticism, with 56 comments from 44 applicants. The largest group of comments report personal bias, favouritism and old boys' clubs affecting grant decisions:

..funding tends to go to an "elite" sub-group of applicants, generating the "club" criticism often levelled at the NHMRC. (Survey, 30)

Table 7.3: Strengths and Weaknesses of NHMRC Funding Processes

Strengths of the NHMRC	No.	Weaknesses of the NHMRC	No.
Peer Review - 26		Peer Review - 56	
General	11	General	6
External review	5	External review	7
Panels	6	Panel	12
Feedback	4	Feedback	6
		Inconsistent/unclear	8
		Bias, Old Boys' Club	17
Processes - 16		Processes - 38	
General	7	General	9
Transparency	1	Arbitrary	1
On-line submission	3	Too long to decision	11
Conflict of Interest limited	2	Does not fund innovation	6
Communication	2	Bias against ECRs, Women	2
Application format	1	Multi-disciplinary work not supported	6
		Electronic submission system	3
Design - 5		Design - 18	
Rebuttal (rejoinder)	3	Use of track record as principal selection tool	1
What is funded - range	1	What is funded - range of disciplines	4
Funds for ECRs	1	Lack of feedback to assessors	2
		Funding insufficient - low success rates/grants too small	5
		One round p.a. insufficient	5
No strengths - 5		Lacks accountability - no independent review	1

Panels are biased by the single disciplinary focus, nepotism associated with some panel composition ... (Survey, 161)

The GRP seeks three external referee reports which it uses to mark a grant down, but rarely up... then it comes down to whether the Primary spokesperson likes the grant ...These comments are provided in the light of serving on a GRP ... (Survey, 68)

Another 12 comments concern the capacity of the panels, including non-evidential bias built into the panel processes. However, 26 comments supported peer review:

The peer review system is in general fair and efficient. (Survey, 62)

Process comments (impact on applicants of decisions by peers or administrators) included 38 on weaknesses, including length of time to decision (n=11), bias against multi-disciplinary proposals (6) and innovative proposals (n=6):

Peer review processes promote conservative research by funding only those grants that are guaranteed to produce results i.e. the research program is a sure thing. This “puts a brake” on innovation and scientific progress. (Survey, 30)

Strengths include comments about real attempts to conduct a thorough process and communicate with applicants.

Design comments (policies of the research council or the government) include criticisms about funding levels (n=5), only one grant round each year (n=5) and limits on the range of sub-disciplines funded (n=4). Five comments suggested that there are no strengths to NHMRC processes for grant selection.

Lessons from the Application Process – Learning and Confounding

Participating in grant selection processes teaches applicants many things about the process. Some applicants learn what is inside the black box of grant selection and how to refine and improve their applications for later success. Some applicants may learn what works but remain confounded by what they see as inconsistencies in quality outcomes as very good applications fail and lesser applications succeed. This latter perception is likely to arise as a consequence of decisions taken at the funding margins, where the panels find proposals to be of the same standard but have to select some to be funded and leave others unfunded. Other applicants

remain convinced, regardless of their success, that the process is a matter of luck.

The survey included a free text section for respondents to describe any differences between the most recent successful application and the most recent unsuccessful application for grant funding. Responses are grouped into five clusters for discussion. The first grouping has a majority of responses clustered around work done by the applicants to improve the quality of the application or their track record. The second group includes responses that identify assistance that made a difference. The third group includes those who suggest they learned something of the politics of the processes or the panel and responded appropriately. The fourth group refer to innovation factors as significant, and all of these respondents suggested they altered very innovative unsuccessful proposals to make them more practical or less challenging in order to gain funding. The last and largest group, with almost 40% of respondents, includes negative comments about council selection processes or confusion about outcomes.

1. The successful application was better as a result of additional work done by the investigators prior to submission or resubmission.

This group included 54% of responses indicating that work done by the applicants had made the difference between success and failure. Within this group, there are four clusters of ideas about publications, research teams, preliminary work and the quality of the written application.

Over one third of comments described work being done on the text of the application, the details of short summaries, budget and other components and discussed the refinements they made to create a higher quality application which better targeted the funding source.

I changed the title and 100-word summary completely, added a broader context for the proposed research, and included a more upfront discussion of the methodology to be employed. The actual

research to be undertaken was more or less the same between the unsuccessful and the successful applications. In this period I also had two journal articles appear to support my track record. (Survey, 127)

Work between applications, assistance with the budget and more coherent application. (Survey, 174)

Title was changed, project summary was reworded, one co-applicant was removed, the budget was subtly altered. (Survey, 89)

Developing a stronger team of investigators, including more collaborators and better track record was nominated by 23% as the strategy that worked for them:

Developed a collaboration with another site and expanded the number of co investigators to cover both sites. (Survey, 149)

More preliminary data, linked up with other collaborators, more publications on CV for track record. (Survey, 77)

Improving the track record of the applicants by increasing publications, gaining promotion and building reputation was the strategy that worked for 22% of this grouping of respondents:

Underpinning scientific papers changed from in-press to published and received attention from various sources. (Survey, 8)

It was the same application, but we ensured that we published several key papers in relevant conferences and journals in the intervening 12 months. (Survey, 39)

Another grouping of 17% found that preliminary work on the topic to produce evidence in support of the proposal was the key:

The grant was successful on our 3rd submission. The main difference appeared to be the additional work that we had undertaken into the topic so that our track records had been strengthened. (Survey, 17)

More preliminary data showing progress in all the aims. (Survey, 192)

2. The applicants had help that made a difference.

A number of respondents (8%) identified various forms of assistance that made a difference to their application. The majority of this small grouping relied on the assessor reports from unsuccessful applications, a few had help from their institution's research office and some had advice from former panel members.

Responses to final comments of reviewers were incorporated. (Survey, 107)

More external reviews of application and better critique of it from someone with NHMRC experience. ... Effort made to understand the NHMRC process and to shape the grant to that. (Survey, 141)

Reworded grant in response to seminar attended on grant writing to highlight novelty and significance. Modified grant to take into account previous referees' questions by explaining methods more clearly and changing experimental protocols that were criticised. (Survey, 82)

We spent more time talking to ex-panel members about what we might have done wrong. (Survey, 39)

3. The applicants identified selection factors that could make a difference and made changes to their application.

This group of 6% identified "political" factors operating in the council or panel and sought to respond. Varying the panel, the research council, the funding program and even the host institution has worked for this group of respondents:

Different grant panel and the grant was submitted through another institution that has a much higher success rate for grant submissions. We are testing this outcome again this year by submission of a rejected grant that received outstanding referee responses. Being lodged through a different institution but with all the writing, prelim data, application etc done at the secondary institution. (Survey, 161)

Changing approach to suit perceived bias of ARC panel members.
(Survey, 86)

Targetted a different committee for review. (Survey, 27)

4. The difference was an innovation factor

Another small group (7%) equate difference between success and failure with the degree of innovation proposed. Some of these respondents gained industry support, others reworked the application to have a more practical focus and some commented on the difficulty of panels selecting innovative projects to fund:

Recent successful application was far less innovative than the unsuccessful one. (Survey, 157)

Most recent unsuccessful applications have been aimed at further developing into untested areas compared to the tested areas of the successful applications. Unsuccessful applications present more challenge to the status quo of knowledge in their area and are more contentious than the successful ones. The unsuccessful applications deal with the exploration of findings that the "experts" (ie experienced peers) would not be as likely to support as they explore as yet undefined areas of the discipline. (Survey, 155)

5. Applicants developed negative views about the process or were confounded by the outcomes.

The final grouping is the largest, with almost 40% of respondents. These respondents cluster into three broad groups based on negative views of the selection process, dissonance between expectations and results, and those who saw either luck or randomness as the major factor.

Process critics raised matters such as the composition and expertise of the panels or the ARC Readers or asserted the presence of old boys' clubs and networks:

There is a feeling that it is who you know, or who knows you, on the committee that makes a difference. (Survey, 147)

Others hold that some topics are not funded:

The unsuccessful grant was better than the successful grant, with better reviews. However, it was a topic ... that has repeatedly not got funding. (Survey, 73)

More than 9% of all respondents expressed an inability to understand what had happened when, in their judgement, the best of their work was not funded, but a 'lesser' application was supported:

My most recent unsuccessful application was infinitely better than my successful application. The outcomes of grant applications are quixotic, random, biased and unrelated to content. (Survey, 183)

The largest (11% of all responses) in this cluster see the entire selection process as stochastic, a lottery, or illogical:

It's a lottery. There is often no logical reason to be discerned between successful and unsuccessful applications. (Survey, 96)

There was no difference at all (between successful and unsuccessful applications). It was word for word the same as the year before. My mentors said that they could not see how to improve my previously unsuccessful grant. There was also no substantial shift in my internal research profile between applications. The external assessor's report was very positive on the grant I did not get and extremely negative on the grant I did: go figure! (Survey, 64)

One respondent reported continuous funding over 30 years, but is convinced the process is random:

I have little faith in the current ARC assessment process. I have had continuous ARC/ARGS funding since about 1975, but I conclude that success is a fairly random process. (Survey, 168)

A surprising amount of insider knowledge of committee and panel deliberations is demonstrated by several respondents, including sufficient

knowledge for the following respondent to assert that direct conflict of interest was evident in the decision of one panel:

Compared to (my) successful application, (my) unsuccessful application had more work time, stronger preliminary data, more external critical input, similar co-investigators and addressed a problem reviewers judged outstanding/excellent significance ... But at committee level the unsuccessful grant received inadequate spokesperson support. The final successful grant listings for the year included two grants awarded to a direct colleague of the subcommittee chair ... my grants spokesperson was probably also a direct colleague of these same two researchers. (Survey, 118)

Time to apply – Australian competitive grant applications

Survey respondents estimated the number of days in 2004 that they spent preparing applications for competitive grant funding, or supporting others who were applying. They provided a time estimate for each of seven types of grant application:

- ARC Discovery Projects
- Other ARC funding
- NHMRC Project Grants
- Other NHMRC funding
- Other National Competitive Grants
- Internal institutional funding
- Commercial funding

Table 7.4: Days spent working on all grant applications in 2004

Funding Source	Discovery or Project Grants	Other Council Progs	Other NCG	Admin. Inst. Internal	Commercial	Total Days	Average No of Days
ARC applicants	2766	918	275	284	323	4566	31.7
NHMRC applicants	1429	316	210	178	198	2331	40.1
Total	4195	1234	485	462	521	6897	

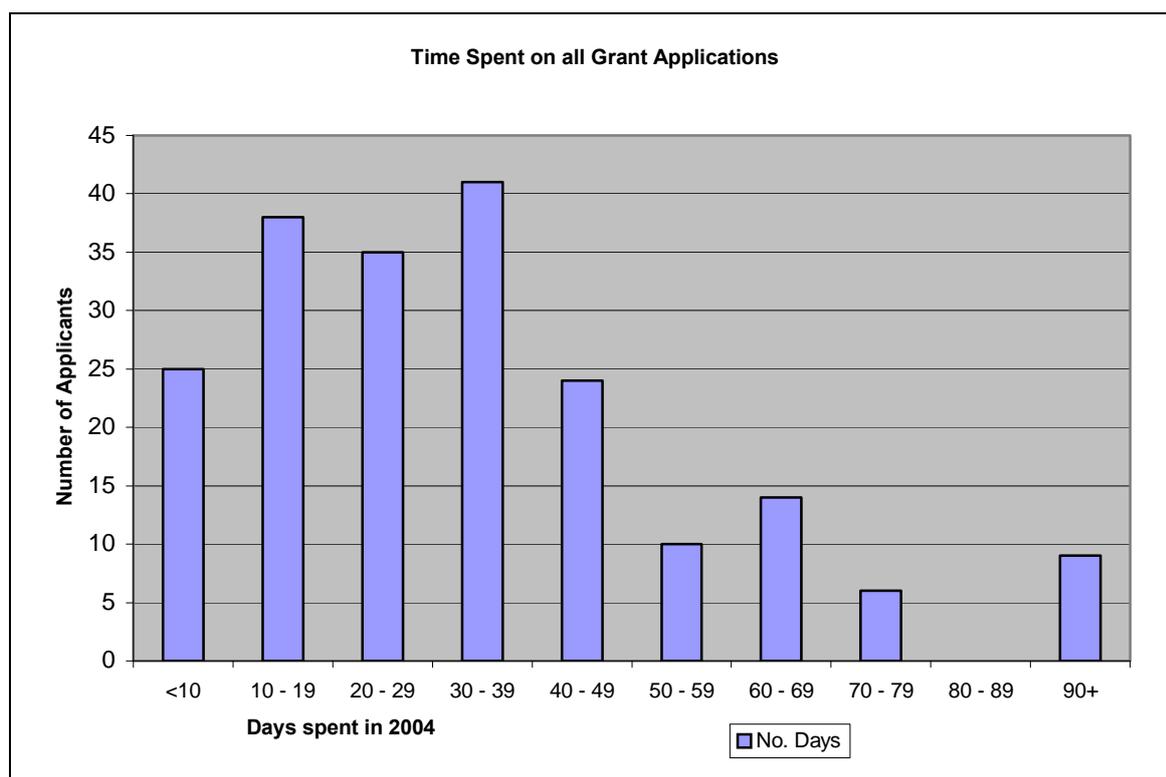
The total number of days spent by 202 respondents, over 12 months, was 6897 in application preparation or support. This represents an average number of days of 34.14 per respondent. The ARC and NHMRC programs, took up most of the applicant time, as expected in a sector where much of the available competitive grant funding is obtained from research councils.

Table 7.5: Days spent working on research council applications 2004

Funding Source	Discovery or Project Grants	Mean No. of Days	Other Council Progs	Mean No. of Days
ARC applicants	2766	32.51	918	15.83
NHMRC applicants	1429	24.64	316	16.6
Total	4195		1234	

However, there was a considerable range between lowest and highest number of days spent on application preparation. Figure 7.16 shows the frequency of responses in clusters of ten.

Figure 7.16: Number of Days Spent Working on All Grant Applications in 2004



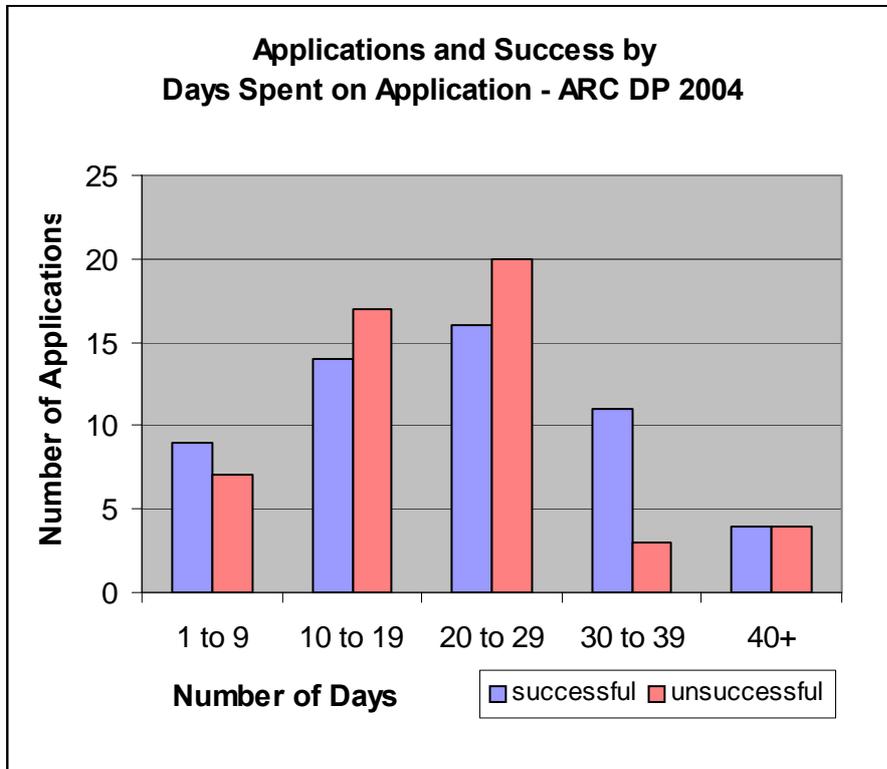
The distribution of responses indicates that some of these respondents, in particular those with 9 or fewer days on grant application work, may not have been the primary authors of applications for research council flagship programs, but may have been participant investigators who edit and assist the application development. Other respondents, in the 20-40 day clusters may have prepared several applications for different funding types. The funding types included in this response range cover national competitive and commercial sources. The nine persons who identified working more than 90 days on grant applications stand out. Some of these respondents may be employed particularly to work on gaining external funding for a research group, such as some science based post-doctoral researchers.

For the two flagship programs run by ARC (D-P) and NHMRC (PG) the mean number of days spent preparing applications for those programs was 18.7 and 20.1 respectively. The ARC had 3441 D-P applications that year.

Figure 7.17 shows time spent by the survey respondents on preparing ARC D-P applications in 2004. There were more successful than unsuccessful

applicants in this field with a 51% success rate, unlike the full ARC DP field, which had a 27% success rate that year.

Figure 7.17: Applicant Time by Application Outcome, ARC D-P



This field of applicants is abnormal, with its high success rate. However, there are some matters of note in this data. The first significant peak in successful applicants occurs with 13 applicants who put in 10-19 days work. The next peak is with 16 applicants who worked for 20-29 days. The last is a group of 12 who worked for 30-39 days. Some successful applicants also spent very large amounts of time, four worked for more than 40 days and one person spent 120 days working on ARC grant applications. Anecdotal evidence suggests that the latter person may hold a post-doctoral position created for the purpose of preparing grant applications.

Cost of Application Preparation

The time data collected here means that it is possible to arrive at an estimate of the direct costs of applicant time spent in preparation of grant applications. Taking average salary rates and applying them to the time

spent by senior (defined here as employed at professorial level) and junior (defined here as Academic level B or post-doctoral researchers) researchers provides an approximate cost in salary terms. *The Australian* newspaper reported that the salary average for Australian professors in 2004 was approximately \$100,000 (Illing, 2004). A conservative estimate of the number of days worked each year by research active academics is 260. Using this estimate, a daily rate (without on-costs) is \$384. The total time spent by the respondent senior researchers on application preparation is 5448 days; a total salary cost of \$2,095,301. Early Career Researchers (ECR) were 21% of respondents and their salary average nationally in 2004 was approximately \$65,000. This salary equates to \$250 per day, based on 260 days per annum, and their total time is 1448 days; a cost of \$362,000.

Therefore, the estimated salary cost of this field of professorial and ECR researcher time spent working on applications for competitive grant funding was in 2004, \$2,457,301. This represents an average cost per person of \$12,165. If these figures are extrapolated across the Australian sector to the known number of applications in that year the salary cost of application preparation time is in the order of \$69 million.

Time spent preparing grant proposals in the United Kingdom

In 2006 Research Councils UK, the co-ordinating body for the councils, sponsored a survey of researchers to determine the external costs of peer review and peer attitudes to it. This data set was collected to enable consideration of the processes used by each of the Research Councils in the UK for various grant selection processes. Data was collected against types of application to differentiate the impact of process requirements for different funding schemes. Table 7.6 summarises some of the data on time spent by applicants and reviewers on peer review processes associated with grant funding applications.

Table 7.6: Time spent on peer review - UK Research Councils

Summary of Time Inputs	Academic Staff	Administrative Staff
Preparation of a research proposal		
* Simple	5 days	2 hours
* Conventional	12 days	4 hours
* Complex	30 days	20 hours
Refereeing a Research Proposal - per referee		
* Simple	2 hours	
* Conventional	4 hours	
* Complex	8 hours	
Responding to Referee Comments	10 hours	
Prioritisation of Proposals by Panel - per Panel Member	4 days	

(DTZ Consulting and Research, 2006, p41)

The conventional proposal category most closely represents the ARC D-P and the NHMRC PG programs. This category was defined as typically up to three years duration, with a limited number of investigators and research staff and some other resources for equipment, travel and consumables. The UK report goes on to estimate the cost of grant application preparation across the research councils:

Based on 2005/06 prices and assuming a demand of some 16,700 proposals across the Research Councils, the annual cost of peer review activity for research proposals is likely to have been between £159 million (adjusted for 10% recycled at 50% cost) and £147 million (adjusted for 20% recycled at 25% cost). ...

Within the total cost, the peer review of research grant proposals represents by far the largest activity. The largest single cost element in

all aspects of the peer review systems is the time taken by applicants in preparation and submission (Research Councils UK, 2006, p42).

The UK survey also asked whether researchers supported peer review and the response was an overwhelming 93% support. However, despite this general support for peer review, “there is a lot of unease about how well the peer review process is operating in practice” (DTZ Consulting and Research, 2006). The issues causing concern were largely about the quality of referees, selection of referees and panel processes.

Capacity Building

Research councils provide very limited support for capacity building through designated fund allocation or scholarships and fellowships. Capacity building is regarded as the responsibility of the employing institutions. Applicants report that capacity building is almost non-existent across the majority of the sector, with only some faculties in the Go8 institutions providing this support. Australian panel members and staff see capacity building as a responsibility of the universities and institutes, but they are providing little or no support to develop capacity. Grant support for existing research strengths competes with funding for ECRs and new research fields.

The NSF takes a pro-active role in capacity building, which can occur at the program director level following panel evaluation. This is in addition to special programs and developmental work done with groups and disciplines. program directors work with researchers and groups to create links, develop research teams and advise researchers. They also have a role in grant selection, deciding the outcome of peer review processes in a range of ways not limited to following rank order recommendations. This is a significant point of comparison between the NSF and the Australian research councils. NSF models of peer review, grant approval and quality assessment, combined with the Congressional mandate for affirmative action to build capacity, provide scope for flexible and targeted delivery of research funding in ways that are not used in Australia. Capacity building, of new research

fields and new researchers, appears to be hampered by assessment processes that rely on track record as a key selection criterion, even when it is considered relative to opportunity.

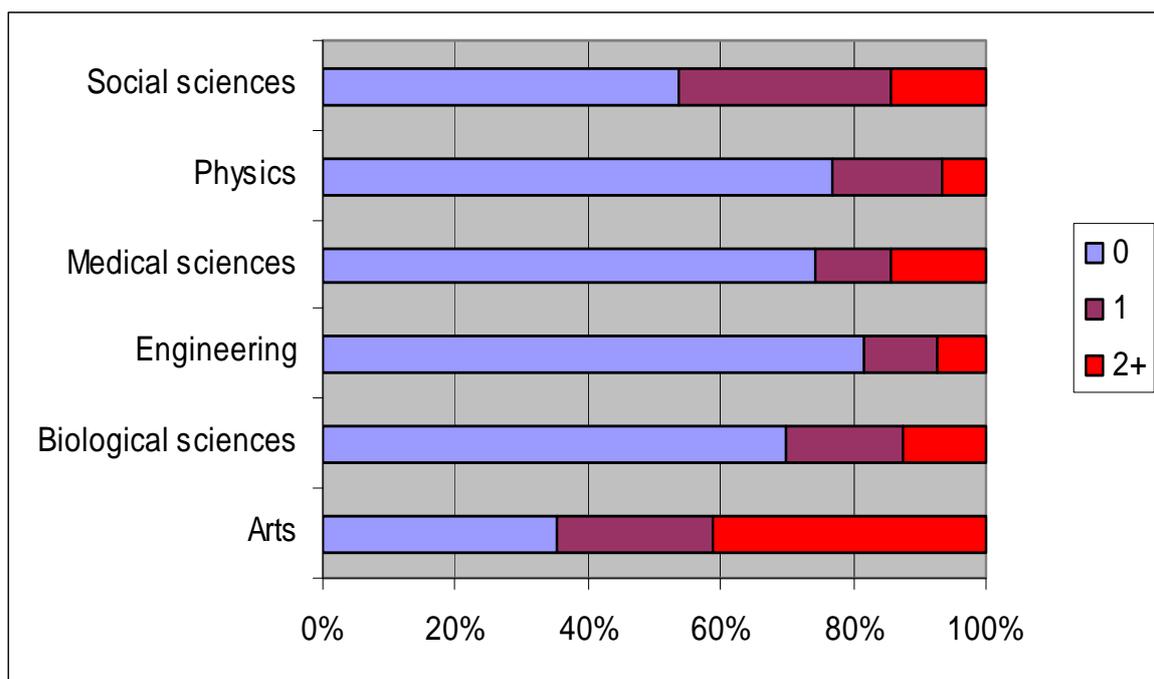
In Australia panel members and policy makers believe that capacity building is the role of the institutes and universities and there is an expectation that this is happening.

I didn't feel that we were cutting off too many people from starting their careers by not funding them. What's important ... to make them competitive, is developing track record. I see that as an issue for the universities more so than the funding bodies. (Interview 4)

Are Australian universities building track record?

Applicants for competitive grant funding were asked in the survey to indicate the types of support provided to them by their institution before and after applications were submitted to the research councils. The results showed patterns by both discipline and type of institution. Figure 7.18 shows the pattern of assistance offered by discipline cluster.

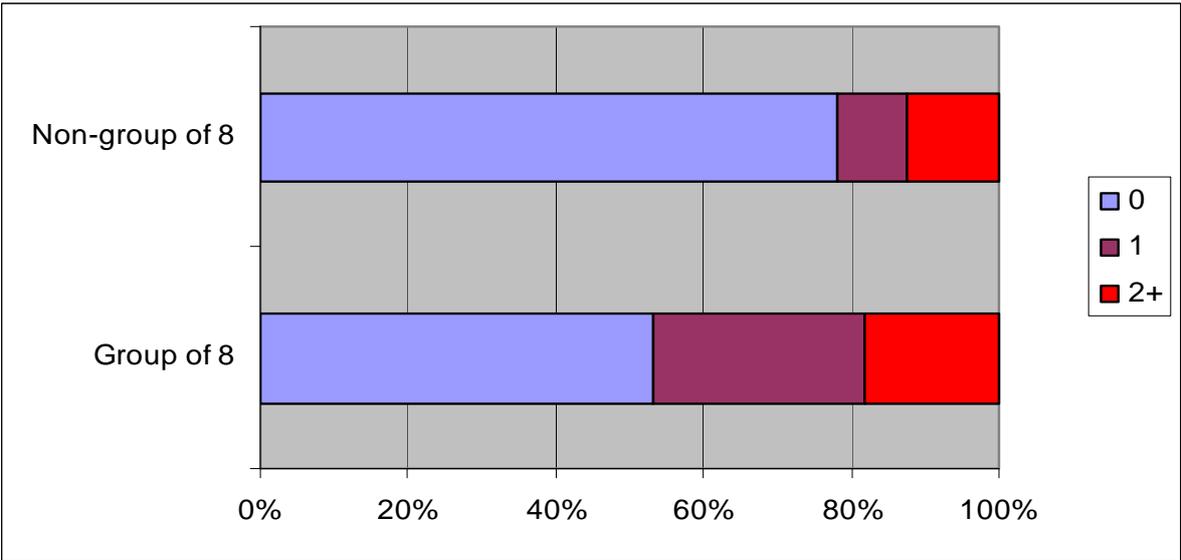
Figure 7.18: Number of sources of help, by discipline group following an unsuccessful application for a grant)



Types of help that were provided in institutions were, in order of frequency of offer; mentoring, seminars, review and feedback on draft applications. Conversely, very little internal funding was offered and training was not provided. However, few applicants received much help, only arts-based researchers could count on one or more help types being available (to 65% of them). The enabling sciences and engineering have a difficult time getting assistance to improve their performance.

Capacity building in the form of assistance to produce competitive grant applications also had a location flavour. Figure 7.19 illustrates the types of assistance offered by institution type.

Figure 7.19: Number of sources of help, by institution type, following an unsuccessful application for a grant



Applicants based in one of the eight leading research universities (the Go8) were twice as likely to receive support as applicants in other universities or research institutes. If those applicants were also in the humanities or social sciences they were twice as likely as other Go8 applicants in other disciplines to receive assistance. However, the survey also revealed that no-one was being offered publication advice, the most important component of track record, according to panel members.

Summary

This chapter has provided some insights into the ways that applicants for competitive grant funding view the process and how institutions support applicants. While they think peer review is essential for grant allocation, many applicants do not support the grant selection or peer review process used by the research council from which they seek funding. Others do not understand how grant selection processes work and regard the process as a black box, which may be random or biased. Many applicants have concerns about the ways that external reviewers and panel members are selected and about the size of the pool of reviewers in Australia. Some applicants consider that the processes stifle innovative research, work against early career researchers and women, and in favour of old boys' clubs and closed networks. However, most applicants demonstrated astute understanding about the differences between their successful and unsuccessful applications, citing factors referred to by the panel members in Chapter 6. Given that applicants spent large proportions of their working days on grant applications, more than their peers in the UK, and that this group of respondents has greater than average grant success, knowledge about what constitutes a good application should be expected. What was not expected is the way that these very clear insights into quality of application co-exist with poor understandings about processes.

8 CONCLUSION

This research aims to explore the relationship between selection process design, peer participation in review and peer judgements about excellence in Australian research funding processes. Five research questions underpin the data collection and analysis, and the views of participants from all parts of the process were collected to create a multi-perspectival understanding of the operations of research funding in Australia.

Peers in Review Processes, Policy and Structures

Two research questions for this thesis concern the nature of peer review, its comparative processes, peer roles in policy and costs in the two Australian research councils, with comparisons from the National Science Foundation in the USA and Engineering and Physical Sciences Research Council in England.

Evidence discussed in Chapters 4 and 5 reveals that decisions about which process to use are not reached in the same manner in the NHMRC and ARC; nor at similar levels of authority and control, despite both organisations being governed under Commonwealth laws and having similar fiduciary and accountability requirements. Professional administrative staff of the ARC make decisions and manage processes under the guidance of senior staff drawn from the research community, and in some cases recommend processes to a Government Minister where required under legislation. In the Engineering and Physical Sciences Research Council (UK) process and program design are continuously reviewed and researched by a team of senior staff and processes and policies adjusted in response to empirical evidence. The National Science Foundation Program Directors take advice from assistant directors and other staff on processes and policies. Only the NHMRC model has the research community controlling policy and administrative decisions through the appointed Chairpersons and members of various program and policy committees.

Peer reviewers are used in all major funding programs in roles including; as external assessors of a few applications, readers of many applications, panel and committee members. Models of the processes created from public documents, demonstrate work flow but do not show how decisions are made, the relative influence of the various peer roles nor do they show the differences between disciplines in their assessments of quality.

The National Health and Medical Research Council process of allocating funds is not transparent, even to panel members. The committee structure with sub-committees, working groups and selection panels obfuscates decision-making. Panel recommendations are considered and adjusted or integrated into other recommendations several times before they reach the Council and the Minister. During the period of this study funding allocations to programs were not finalized until the panel and sub-committee recommendations reach the Research Committee, allowing Committee members to influence cut-off points within programs, potentially breaching conflict of interest principles.

Decisions about processes have resulted in the number of peers involved in NHMRC panels and committees ranging from between seven and twelve times the number on ARC panels, yet the NHMRC had fewer applications from a smaller field of researchers in a smaller range of disciplines. These differences have major cost impacts, as NHMRC panel and committee costs were estimated at 2.5 times those of ARC committees.

Other significant consequences arise from process decisions. The workload of council staff, external reviewers, panel members and applicants varies considerably according to the process. Panel workload comparisons internationally indicate a common panel load of 40-50 applications for a panel over two days. The NHMRC reflects this load with 100 applications over a five-day selection meeting, but ARC panels assess up to 800 applications in two different funding programs over the same period.

However, selection does proceed and grants are awarded with more or less efficiency and cost, and various approaches to meanings about what makes the best applications. There is no evidence of a gold standard best-practice peer review process but efficient research funding allocation is possible with relatively simple processes.

Peer Panels at Work - Defining Excellence

A third question asked what happens inside peer panels and how decisions about excellence are made. Views from inside the black box of grant selection were gathered by observing panel meetings, interviewing experienced panel members and from anonymous contributors to a survey.

Discipline level differences emerged, as did commonalities across panels, in judgements of the highest quality work. Excellence emerged as a polymorphic construction, with clarity and outstanding writing dominating views about the best. Excellent applications resonate, are compelling, convincing, tell a good story and are gripping. These applications demonstrate the place of the research in the discipline and do so with clarity of vision that they are worth doing and can deliver creatively. They are like good literature. This writing has to be done over a few weeks or months, usually after other full-time work. It takes many drafts, successful researchers report 10 or more, as they refine the proposal, spending an average of 34 full days a year preparing grant applications.

Without this time and effort the application is most likely to end up in the 'muddle in the middle', the group of fundable applications where success or failure is unpredictable, despite all the best intentions and efforts of panels to justify decisions at the margins. Panel members are certain that this is fair. They believe that communicating the work of research is an integral part of the activity and that all researchers have an obligation to deliver clear stories about their work to the world at large. In short, the best applications

are well articulated, professionally prepared and exciting to read. Panel members believe that people who can tell the story also do the best science.

After the best are identified, or leap out at the panel, they set about defining the rest and the tools they use differ with the selection context. In the NSF and EPSRC panels focus on the project, the nature of the work proposed and discuss applicants at the margins to confirm capacity to do the work, facilities and team size. Each of these discussions is time consuming and the panel of experts in the discipline or sub-discipline will discuss 40-50 applications in detail over two or three days, recommending those that should be supported in rank order and making suggestions about funding only where they believe the proposal costing is inaccurate.

NHMRC panels have a similar time to undertake assessments and produce a ranked list and they discuss in detail the nature of each proposal. However, with two thirds of the NHMRC selection criteria based on track record and success rates lower than 30%, track record largely determines outcomes. For panels with small numbers of applications, workload is not the force that drives reliance on track record; instead it is program documentation, prepared and authorized by peers on committees.

Panels in the ARC were also constrained by selection criteria, but the data demonstrate that one of the key drivers of their selection behaviour is the number of applications that a panel has to review. This affects what information a panel will use to get the task done within the time allocated. The fastest way to make judgements about applications is to look at productivity over the past five years and some panel members believe this is the only way to be sure a person will produce. Track record of applicants largely determines the top 30% of ranked applications.

Disciplines differ in their understandings of what constitutes excellence and how the research community should be supported. Differences were most marked in panels that covered several disciplines. A single ranked list of

applications required considerable negotiation about what was meant by publication quality and standing in the field. Panel members approach the work of selecting grants in different ways. Some act as representatives of their field or discipline, others attempt to act for the good of their discipline or the nation. Where funds are limited and disciplines compete, panel members tend to support their discipline. Panels also vary in their approaches to capacity building, not only between research councils but across disciplines. Some discipline leaders are prepared to sacrifice early career researchers while others actively seek to facilitate career paths for the good of the community.

Participant Satisfaction

Research question number four concerned applicant experiences of funding processes managed by the ARC or the NHMRC. Data gathered through the survey reveal that everyone loves peer review and thinks it the least worst option for funding allocation. However, few researchers understand the difference between grant peer review and publishing peer review processes and most applicants do not support the program processes in operation. They are unclear about who are the decision makers, what exactly are the roles of assessors in various programs and how to read and interpret external assessor reports. Some applicants are convinced that aspects of the current systems are corrupt or random at best.

Not surprisingly, the most satisfied and well informed participants in grant selection processes are generally current and former panel members. There were differences between the Australian Research Council and the National Health and Medical Research Council panel members, with the latter more likely to express criticisms of the process. However, very few panel members misunderstood the processes of the council they served. Panel members who served on ARC panels were very positive about the quality of the process and the value of the work. They also believed that the volume of work is too large, negatively affecting both their own work and panel decisions. Most ARC

panel members believe the system is fair and as effective as it can be. Most NHMRC panel members broadly support the use of peer review but half believe the processes used by the NHMRC are not effective. Panel members have limited or no training in the work of grant selection. Their performance in Australian research council processes is not supported or formally evaluated. In contrast, the EPSRC provides regular monitoring, feedback and training for all members of its college of experts, both panel members and assessors.

Grant selection reliability emerges as an issue when the success rate drops below 35%. Panel selectors believe that the 'noise' around the cut-off point is too great to make sound decisions and they regard this as a problem for peer review, the research councils and the research community. With success rates in both flagship programs well under 30% the faith of the selectors and the sector in processes and decisions is vulnerable. Researchers invest a significant proportion of their time in grant application processes and receive limited funding returns largely because of very low success rates and limited funding options in Australia (compared with the USA and the UK). Opportunity costs in the research community rise as the ratio of unfunded applications increases.

Relationship between Process Design and Definitions of Excellence

Research question five asked whether the way that peer review is operationalised affects the way that excellence is defined. Evidence from all sources has demonstrated that selection process design is a major factor in determining what assessors value. Once the outstanding applications have leapt from the field then either selection criteria constraints or workload constraints force panels to favour track record above other factors.

Both the NHMRC and ARC selection models use track record heavily as a discriminant in selection, determining which applications are defined as excellent. There is no evidence that either structure has better outcomes yet

there are significant process cost and workload differences between models. ARC panel members have very solid grounds for their complaints about crushing workloads. Process costs are reduced at the cost of selection dependence on past performance and heavy burdens for peers. The NHMRC process has additional costs, other than their high administrative burden, with so many panels and committee members exercising authority over funding. Data reveal criticisms of the power of networks and a 'club' within the NHMRC.

The very large differences between ARC and NHMRC selection panel membership numbers arise from policy positions about the best way to conduct selection. Interview and survey data from both councils do not support such differences in approach, claiming very little difference in outcomes.

Both Australian research councils have a charter to fund and develop the best possible research and this includes supporting new researchers and new fields of research. Research capacity building involves risk taking in one or more of the following areas; research topic or design, people, or location. NSF and EPSRC programs are more likely to achieve capacity building because they allocate funding primarily on the research proposed, rather than the track record of the research team. Process design that leads to track record reliance in funding decisions can serve a dominant class of funded researchers who control access to future grants. Access for early career researchers and new fields of research then has to rely on patronage and mentoring.

Figure 8.1 Process Design and Selection consequences

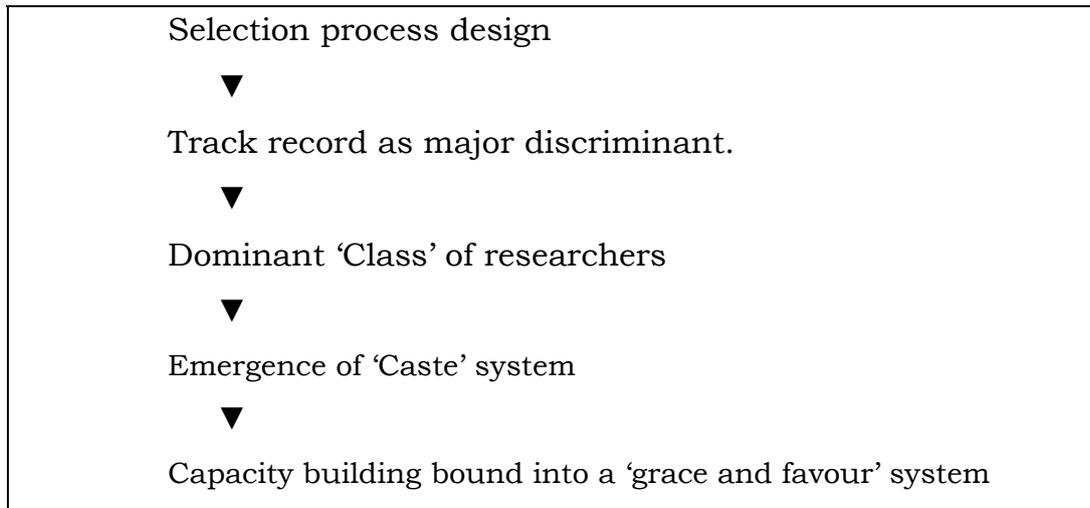


Figure 8.1 shows how continued reliance on track record may lead to a caste system in research, where grant selection processes limit research expansion and the admission of new members to the funded caste by emphasising past performance in the selection process.

The extent to which funding processes are reliant on track record is not generally known by applicants and perhaps not by the research institutions that benefit from competitive research funding success. Capacity building by developing individual researchers is not occurring in research institutions in any strategic manner; nor are any taking on the really significant matter of developing publication profile.

Summary

This research has demonstrated a clear relationship between selection process design, how peers participate in review of funding applications and how peers make judgements about excellence. The black box of grant selection design has been opened.

Neither research council in Australia is using an evidence base to determine its selection processes and both flagship programs are using flawed

processes. The impacts of these processes include panel overload, high administrative costs, funding largely based on track record, loss of confidence by the research sector and loss of capacity building potential.

The NHMRC has an added anomaly with decision-making. Administrative and policy decision-making in the NHMRC should be separated from the panels and committees, leaving them to advise on the specialist subject matter and the quality of peer review, thus allowing objectivity and expertise to be appropriately exercised.

Reliance on track record to determine the outcomes of all but the very best applications is akin to delivering rewards for past work; rewards that build on the success of peer reviewed publications and strengthen the cycle of success. While this is not completely in accord with the Matthew Effect it does harken to a prominent model for research funding that existed before research councils and complex peer review mechanisms were created. This process provided prizes for work completed, rather than the promise of new work. Rules and processes constraining the ARC and NHMRC flagship programs ensure that they operate very like prizes. This leads to questions about the role of complex grant peer review mechanisms, when the outcome (prize) is largely based on work that has already been reviewed for publication. Should the conditions be altered so that peer review is based on the proposed work, or is track record the best tool to decide admission to the grant holding community?

Evidence presented here suggests that the selection and administrative processes used in the EPSRC provide a model for reformed process design. While the EPSRC administration costs only 4% of its total budget it is not clear whether the entire EPSRC administrative model can be supported with the funding available to the ARC and NHMRC, but is a matter for further investigation. Elements of the processes used by both the EPSRC and various NSF Directorates could be adopted by the Australian councils to

improve peer review processes, in particular college and panel size, panel workload, training and support as well as evidence-based process analysis.

There is no gold standard model of peer review in Australia. There is an over-engineered model and an overburdened model. Both need help to maximize the efficacy of research funding.

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APPENDIX 1

SEMI-STRUCTURED INTERVIEWS - INITIAL QUESTIONS

A Your Role

1. Role in grants selection? When and where?
2. What selection processes did you participate in or observe?

B Reviewer and Panel Judgements

3. What do you think were the key factors in determining success of an application?
4. What role did track record play in assessing proposals and how was it defined?

C Excellence and the Margins

5. What did you appreciate about the best proposals that you reviewed?
6. What arguments did you mobilise against the top contenders that were not funded? Why did they fall below the funding line?
7. Were there proposals that had a high ranking that ended up not funded? What was the process in this case?
8. What is excellence, and how is it determined at the margins? Does it prevail in grant funding decisions?

D Tensions and Participants (either Q. 9-11 or Q. 11-14)

9. How is the tension between building successful groups and building new capacity resolved - in particular, building researcher capacity and new research groups?
10. Could you describe how you perceived your role/panel as similar to, or different from, other members/panels? (include general orientation, specific arguments)
11. Who are key participants in grant selection processes? How is influence played out?

Infrastructure Panel only

12. How did you make comparisons across disciplines?
13. What criteria did you use to assess relative merit where there were significant differences between epistemological frameworks and definitions of originality?
14. How was national need assessed? On what grounds were decisions made to fund new infrastructure that would enable new research areas to develop?

Survey of Applicants

INFORMATION STATEMENT

Purpose of survey

This survey forms part of research towards a Professional Doctorate in Public Administration at the University of Canberra. The research project is entitled; Research Funding Allocation in Australia: a Comparative Study of the Australian Research Council and the National Health and Medical Research Council. The research uses case study methodology, and this survey forms part of the data to be considered.

Participants

The researcher is seeking information from people who apply for research funding from the Australian Research Council or the National Health and Medical Research Council.

Participation in this survey is voluntary; participants may withdraw at any stage and may choose to not answer any question that they do not wish to answer.

This survey will take between 10 and 15 minutes to complete. All participants are asked to complete Sections 1,4 and 7. There are directions within the survey about completion of other Sections.

Privacy and Ethics

The University of Canberra is committed to protecting your personal information consistent with the Information Privacy Principles contained in the Privacy Act 1988.

This survey only collects non-identifying user information. The researcher is unable to collect your personal information through the survey. Your e-mail address cannot be attached to the electronic survey.

The information collected will not be collated to identify any participant. Aggregated data from the survey will be included in a thesis and related publications and may be shared with external third parties.

The project complies with the University of Canberra Committee for Ethics in Human Research, Principles and Guidelines for Research with Human Participants.

Data Security and Availability

The University will hold all data provided through this survey for five years on secure servers that may only be accessed by authorised personnel.

Data used in this survey will be aggregated and made available to participants following completion of the project via a website. The location of the data will be provided to research institutions.

Queries and further information

Researcher:

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The survey is located at: <http://survey.blis.canberra.edu.au>

For information regarding the privacy of this survey and any information collected, please view the survey [Information Statement](#).

Welcome

Welcome to the Research Survey.

This survey forms part of research into the delivery of program funding for research. Applicants for funding under Australian Research Council Discovery Projects, or National Health and Medical Research Council Project Grants, in 2003 have been invited to participate. The researcher does not know names of the persons who were contacted to participate.

The survey should take between 10 and 15 minutes to complete

Research Topic

"Research Funding Allocation in Australia: a Comparative Study of the Australian Research Council and the National Health and Medical Research Council"

Instructions

- Please answer the entire survey in one sitting. To preserve your privacy there is no capacity to save a draft and return to the survey
- Answer the questions to the best of your knowledge
- If an answer requires only a single response, please choose the most appropriate.
- Where a question allows for multiple responses, please select all that apply.
- If you cannot answer a question, please leave it blank.

[Start Survey](#)

Section One - Applicants for ARC or NHMRC Funding

Question 1

You normally seek funding from...

- Australian Research Council
- National Health and Medical Research Council

Question 2

What is the name of administering the institution through which your applications are usually submitted?

Question 3

What is your broad field of research?

Select from either ARC or NHMRC lists below

ARC

NHMRC

Question 4

Complete the following table to indicate your participation in the research funding process by selecting the roles you played in each year.

Applicant for ARC Funding	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
Applicant for NHMRC Funding	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
Applicant for Other National Competitive Grant Funding	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
External Assessor or Referee ARC	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
External Assessor or Referee NHMRC	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004

ARC Panel or Committee or EAC Member	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
NHMRC Panel Member	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004
NHMRC Committee Member	<input type="checkbox"/> 2000	<input type="checkbox"/> 2001	<input type="checkbox"/> 2002	<input type="checkbox"/> 2003	<input type="checkbox"/> 2004

Question 5

What was the outcome of your applications to the ARC or NHMRC?

ARC	2000	2001	2002	2003	2004
Number of Successful Applications:	<input type="checkbox"/>				
Total Number of Applications:	<input type="checkbox"/>				
NHMRC	2000	2001	2002	2003	2004
Number of Successful Applications:	<input type="checkbox"/>				
Total Number of Applications:	<input type="checkbox"/>				

Question 6

Did the administering institution provide assistance to you to enhance your chances of success prior to your most recent application?

Yes

No

If you answered **yes** please indicate the nature of that support. Select as many boxes as appropriate.

Mentoring

Training

Advice about the Publication of Work

- Internal funding to develop your proposal
 - Seminars on enhancing applications or on process
 - Preliminary review and feedback
-

Question 7

In the past year how much time did you spend working on applications for competitive research funding, including collaborations and assistance to colleagues? Please enter the number of days against each relevant funding source.

ARC Discovery	<input type="text"/> days
Other ARC	<input type="text"/> days
NHMRC Project Grants	<input type="text"/> days
Other NHMRC	<input type="text"/> days
Other National Competitive Grants program	<input type="text"/> days
University or Institute Internal Programs	<input type="text"/> days
Commercial funding	<input type="text"/> days

If, and only if, **all** your applications to the ARC or NHMRC were successful between 2000 and 2004, [go to Question 11](#)

Otherwise, continue.

Start |

| Finish

Section Two - Unsuccessful Applications

Question 8

Did you subsequently receive funding for the new ideas proposed in your most recent unsuccessful application?

- Yes
- No

If you answered **NO** go to question 10.

Question 9

Please indicate the subsequent funding source(s)

- the same agency and program
 - another national competitive grants program
 - university or institute funds
 - commercial partner
 - other
-

Question 10

After the most recent unsuccessful application were you provided with advice or assistance by the administering institution to enhance your future funding prospects?

- Yes
- No

If you answered **yes** please indicate the nature of that assistance. Select as many

items as appropriate.

- Mentoring
 - Training
 - Advice about the Publication of Work
 - Internal funding to develop your proposal
 - Seminars on enhancing applications or on process
 - Preliminary review and feedback
-

If, and only if, you have **not** had funding awarded by the ARC or NHMRC in the past five years please [go to Question 16](#)

Otherwise, continue.

Continue

Section Three - Successful Applications

If you have had funding awarded in the past five years by the ARC or NHMRC please answer the following questions with regard to your most recent experience of a successful application.

Question 11

What was the total funding awarded for the full term of your most recent grant from the ARC or NHMRC? (Whole dollars, no spaces or commas)

\$AU

Question 12

What percentage of the requested funds did you receive?

- 90% - 100%
 - 80% - 89%
 - 70% - 79%
 - 60% - 69%
 - 50% - 59%
 - Less than 50%
-

Question 13

What was the duration of the funding?

Question 14

What support has the administering institution provided, to enable or enhance your research activity, since you received the award?

- Funding for staff or consumable items
 - Funding for infrastructure, equipment or facilities
 - Funding to enable collaboration
 - Teaching relief
 - Administrative support
 - Other
-

Question 15

Please describe any differences between your most recent successful application and your most recent unsuccessful application.

Refer to any pertinent factor, including such things as: work done between applications, external assessments, the quality of the proposal, applicants' publication history, the co-applicants on the proposals. Please limit your response to a maximum of 150 words.

Continue

Section Four - Selection Process

Considering your most recent experience of a funding application, please tick the appropriate box below to indicate the extent to which you agree or disagree with the following statements about the selection process used by the administering research council.

<p>Question 16</p> <p>One of the external assessments of your application did not demonstrate appropriate expertise.</p>	<table border="1"><tr><td><input type="checkbox"/></td><td>Strongly Agree</td></tr><tr><td><input type="checkbox"/></td><td>Agree</td></tr><tr><td><input type="checkbox"/></td><td>Neutral</td></tr><tr><td><input type="checkbox"/></td><td>Disagree</td></tr><tr><td><input type="checkbox"/></td><td>Strongly Disagree</td></tr></table>	<input type="checkbox"/>	Strongly Agree	<input type="checkbox"/>	Agree	<input type="checkbox"/>	Neutral	<input type="checkbox"/>	Disagree	<input type="checkbox"/>	Strongly Disagree
<input type="checkbox"/>	Strongly Agree										
<input type="checkbox"/>	Agree										
<input type="checkbox"/>	Neutral										
<input type="checkbox"/>	Disagree										
<input type="checkbox"/>	Strongly Disagree										

<p>Question 17</p> <p>Two or more of the external assessments of your application did not demonstrate appropriate expertise.</p>	<p><input type="checkbox"/> Strongly Agree</p> <p><input type="checkbox"/> Agree</p> <p><input type="checkbox"/> Neutral</p> <p><input type="checkbox"/> Disagree</p> <p><input type="checkbox"/> Strongly Disagree</p>
<p>Question 18</p> <p>You were satisfied that the external peer review was suitable</p>	<p><input type="checkbox"/> Strongly Agree</p> <p><input type="checkbox"/> Agree</p> <p><input type="checkbox"/> Neutral</p> <p><input type="checkbox"/> Disagree</p> <p><input type="checkbox"/> Strongly Disagree</p>
<p>Question 19</p> <p>Your application did not receive an adequate number of assessments</p>	<p><input type="checkbox"/> Strongly Agree</p> <p><input type="checkbox"/> Agree</p> <p><input type="checkbox"/> Neutral</p> <p><input type="checkbox"/> Disagree</p> <p><input type="checkbox"/> Strongly Disagree</p>
<p>Question 20</p> <p>The outcome of the process matched what you thought your assessments indicated.</p>	<p><input type="checkbox"/> Strongly Agree</p> <p><input type="checkbox"/> Agree</p> <p><input type="checkbox"/> Neutral</p> <p><input type="checkbox"/> Disagree</p> <p><input type="checkbox"/> Strongly Disagree</p>

<p>Question 21</p> <p>The Panel or Expert Advisory Committee was appropriately constituted</p>	<input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree
<p>Question 22</p> <p>The computer-based processes used by the research council were efficient</p>	<input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree

Question 23

What do you think are the strengths of the selection process used by the research council you usually seek funding from?

Please limit your response to a maximum of 150 words.

Question 24

What do you think are the weaknesses of the selection process used by

the research council you usually seek funding from?

Please limit your response to a maximum of 150 words.

Continue

Section Five - External Reviewers/Assessors

Please answer the following questions about the most recent grant application assessment process when you provided assessments.

Question 25

How relevant to your particular expertise were the applications selected by the research council for you to review, in terms of your knowledge of subject matter and methodology?

Subject Matter:

- All Relevant
- Mostly Relevant
- Some Relevant
- Mostly Irrelevant

Methodology:

- All Relevant
- Mostly Relevant
- Some Relevant
- Mostly Irrelevant

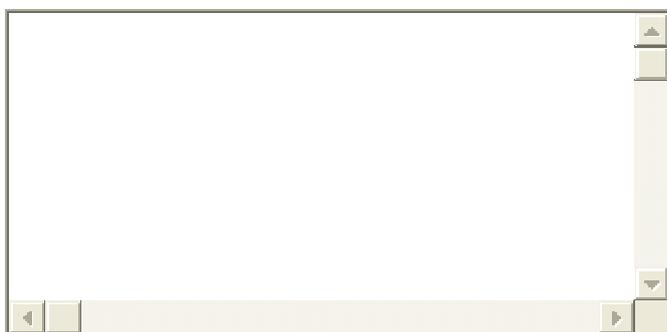
All Irrelevant

All Irrelevant

Question 26

How did you arrive at a decision about the merit of the application(s) you reviewed?

Please comment on the materials provided to you by the research council to assist in this task. Please limit your response to a maximum of 150 words.



Continue

Section Six - Panel or Committee Members

If you were a Grant Review Panel Member (NHMRC), an Expert Advisory Committee or Panel Member (ARC) between 2000 and 2004 please answer the following questions about the most recent round of applications that you considered.

Question 27

For the most recent round of applications you considered as a Panel or Committee Member, consider the following factors and indicate their relevance to the decision-making process of the Panel or Committee.

Scale:

1 - Very Relevant

3 - Moderately Relevant

5 - Not Relevant

Project approach and methodology	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Project significance	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Track record of applicants - grant history	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Number of grants already held by applicant	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Publication record of applicants	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Assessment text provided by external reviewers	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Assessment scores provided by external reviewers	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Advantages of funding this application compared with other similarly ranked applications	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Researcher development - particularly Early Career	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Presentation quality of the application	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Size of the budget requested relative to work to be undertaken	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5

Facilities available in administering institution	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Financial and other support to be provided by the administering institution	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Industry partner contribution (for industry link programs only)	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Collaboration nationally	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Collaboration internationally	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
National need for the research	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Government research priority	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
Innovative, risk-taking proposal	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5

Question 28

Within the selection meeting, did the Panel or Committee largely follow a pre-determined process for reaching a ranked list of applicants or largely develop their own process?

- Largely Pre-determined Process
- Largely Panel Developed Process

Question 29

How did the Panel or Committee determine relative merit between similar

applications in the general vicinity of the funding margin?

Please limit your response to a maximum of 150 words

Continue

Section Seven - Demographic Information

Question 27

What is your gender?

- Male
- Female

Question 28

Are you classified as an early career researcher?

- Yes
 - No
-

Question 32

What is your Age?

Continue

Submit...

Thank you for completing the survey. It is now time to submit your responses.

Before you submit, it is recommended that you read the privacy information regarding the collection of the information you have provided. The survey information statement can be found [here](#).

Submit

APPENDIX 3

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Research Capacity Building: Does History Really Matter?

Karen E Mow, David Tait, University of Canberra

ABSTRACT

Research capacity and productivity is affected by the financial support offered by research councils that award competitive grant funding. Such funding is highly contested and leads to much discussion about the integrity of selection processes, assessor competence and impacts on research capacity. This paper draws upon both qualitative and quantitative data to demonstrate that there are differences across selection panels and research councils. The ARC and NHMRC (Australia) place considerable emphasis on past performance exemplified through track record. However, panels working within the EPSRC (UK) and the NSF (USA) rely less on track record in making decisions about excellence. They judge proposals on relevance to the discipline and the country, and Investigator track record is only of interest to ensure the project can be delivered. The data demonstrate that one of the drivers of selection is the number of applications that a panel has to review. This affects what information a panel can use to ensure that the task gets done within the time allocated. The paper proposes that the way peer review has been operationalised determines which factors have the highest value for panel members to use in selection. The conclusion is that it matters how peer review is conceptualised and operationalised and these choices affect the growth of research capacity.

Introduction

Competition for research funding is fierce, careers and knowledge growth are dependent on the outcomes of selection processes that are not always transparent and which are understood by very few of the applicants. Yet applicants for funding believe that peer review is either a good thing or the least-worst option for allocating funding. A meta-study of the effects of peer review of publications by the Cochrane Collaboration in 2003 concluded that, 'the practice of peer review is based on faith in its effects rather than on facts. Another Cochrane review, of grant giving peer review, reported that:

There is little empirical evidence on the effects of grant giving peer review. No studies assessing the impact of peer review on the quality of funded research are presently available (Demicheli, 2002).

Grant selection processes use a wide range of peer evaluation types but their efficacy is not always clear. Decision making power over funds allocation and policy is located with varying mix of peers and administrators, and, in Australia the portfolio Minister of State. Selection processes and peer

involvement models have changed over time with little empirical evidence supporting any model. Some research councils have been forced to implement design changes because of strain on the peer system and difficulty finding sufficient reviews, but few have done so with evidence about the impact of process shifts.

This paper examines key features of selection methods used by four research councils to select recipients of prestigious grant funding programs. It considers the rules and processes created by the councils, the way that selection panels interpret guidelines and how they get the job done. Similarities and differences between councils and between disciplines are discussed. Of particular focus is the way that selection panels in the councils reach their decisions about excellence and the use that is made of applicant 'track record', which is evaluated by reference to publication quality and quantity, past grant success and employment. Tensions between funding existing strengths (evidenced by track record) and funding new researchers or research fields are exposed and responsibility for capacity building is considered.

Methodology

Data used in this paper were gathered over several years as part of a doctoral research program at the University of Canberra. This research is a comparative case study, using two major cases based in Australia, the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC), with data from comparable international organizations in the UK and USA. It draws on grounded theory and uses a rich range of available sources including survey data, interviews, observations, document analysis and personal experiences.

The research design includes a strong inductive component, with its focus on a small number of cases and how these cases operate. Its primary purpose is "concept formation, elaboration and refinement" and the greater part of the effort in this study is directed towards building the cases and "sharpening the concepts appropriate to the cases" (Ragin, 2004). Multiple sources of evidence were used to enable triangulation, "converging lines of inquiry" (Yin 1994). The multiple case research design used in this study ensured that several perspectives were investigated and examined, leading to a richer understanding of issues (Denzin, 1994). These perspectives included: a survey of applicants, semi-structured interviews with experienced panel members and former staff, observation of selection meetings, and examination of publications by and about the research councils.

A survey of researchers who applied to either the Australian Research Council (ARC) or the National Health and Medical Research Council (NHMRC) for funding was conducted in 2004-2005. Researchers who had made one or more applications in the previous four years (2000-2004) were invited by the Research Office in their institution to complete an anonymous Internet-based survey. The 202 respondents included successful and

unsuccessful applicants across the Australian research sector, covering all research fields and institution types. Twenty-two semi-structured interviews were conducted with former members of ARC and NHMRC selection panels and administrative staff late in 2005 and then analysed using NVivo software. Fieldwork in the USA and the UK included interviews with senior program management staff and observations of selection meetings. Other data was collected from annual reports and other public documents published by the research councils. This rich data set provides the basis of analysis at the level of the individual researcher, research disciplines, institution or university, research council and country.

Grant Selection Processes Differ

Grant selection peer review is operationalised in different ways across and within research funding agencies and nations. The processes and rules adopted by funding agencies vary according to dominant perceptions of efficacy and the available funding for selection models. Some differences are very subtle, others are huge, but the various impacts of funding models are not clear. In particular, which models serve the generally agreed key goals of supporting excellent research and developing capacity in research?

The National Science Foundation (NSF) in the USA employs several models of peer review and the choice of model is determined by the discipline Program Manager, a full-time administrator, originally a researcher in the discipline. In 2004, approximately 47% of all NSF funding decisions were made on the recommendations of expert panels of peers who considered the applications without having written, external peer assessments, a process called “mail review” at the NSF. The NSF had determined by 2004, at its most senior level of policy formulation that this was the model the NSF would move towards and that all disciplines would eventually operate in this fashion. Several factors underpinned this decision. First, that increasing numbers of competitive grant funding applications had placed too much stress on the pool of reviewers, and second, that the cost of managing mail review had become unsustainable (Interview, 2004). The process of change is variable across the organisation. In 2004, the majority of panels working in astronomy did not use mail reviewers, but all the panels in sociology used six expert mail reviews in addition to panel generalists (Interview, 2004).

In 2006, the NHMRC made similar changes, appointing members of 130 panels, avoiding external reviews and applicant rejoinders as well as locking in peers to provide assessments. The ARC changed its selection structures in 2002 to include Australian-based Readers (Oz Readers) who provide written assessments and rankings for a group of applications, between 10 and 25 within a sub-discipline. This change was trialed over several years in two sub-disciplines and was adopted to improve the reliability and comparability of assessor reports. The new system has altered the dynamics of selection considerably, creating powerful new forces within the selection process.

The UK research councils vary in their selection methods but jointly undertake examination of selection processes, reviewer behaviours and the costing of grant selection (Research Councils UK, 2006, 75).

How Peers Review – Research Council Differences

Every research council uses panels of leading researchers to determine a ranked list of applications. Most panels add their expertise to external assessor reports. How they do this is influenced by the way the research council has structured its process. The survey and interview data demonstrate that one of the key drivers of selection is the number of applications that a panel has to review. This affects what information a panel will use to ensure that the task gets done within the time allocated. The fastest way to make judgements about applications is to look at productivity over the past five years (referred to as ‘track record’) and some panel members believe this is the only way to be sure a person will produce.

The committee assesses track record better than anything else. The committee gets a pretty good understanding of the differences between disciplines ... subtle differences between publication output numbers and quality both count for publication assessment. (Interview 2005)

Team Quality, a euphemism for performer track record, is the dominant factor in determining reviewer overall quality score for existing and proposed research. Track record dominates in either the formal policy of Australian research councils or in the panel judgements. The Australian Research Council defines in its Funding Rules the weighting allocated to selection criteria. For ARC Discovery-Projects the track record and capacity of the investigators is 40% of the assessment with the balance made up of significance and innovation, approach and national benefit. The NHMRC advises that the lead panel member assigned to each Project Grant application will score the following three criteria equally; feasibility of the researchers being able to achieve their goals (experience with techniques, research environment, tools available), research productivity, and originality - novelty - innovativeness. Two of these three criteria are predominantly concerned with track record.

ARC panels, with 600-800 applications considered by 10-12 members in five days, are limited by volume and time to discussing the detail of projects at the margins only. Track record of applicants largely determines the top 30%, because those who do not do well on track record (which is one third of the selection criteria) cannot be competitive when only 20% of applications are funded. The best “leap out” at the panel and the cut-off is where detail is considered.

It’s hard to get inside other people’s minds given the time you’ve got. The 600+ applications make it torrid, the pace is furious. (Interview)

Panel members believe that track record is essential to their processes, as indicated by these interview comments from members of different discipline panels:

Track record of the research group was very important ... I would look at that first and then look at the proposal. A group that has got a clear

track record in the field then that has an impact on the way that you read the proposal.

A researcher's track record is a fairly accurate assessment of how likely they are to publish in the next five years. If they haven't published a book in the last 5, 7, or 8 years I can't see them publishing a new one in the next three years out of a project. (Interviews)

In Australia, two distinct panel selection models exist. Firstly, the NHMRC model, where a large number of panels (120-130) of ten persons and no external assessor reports, each panel considers 100 applications in one week. Secondly, the ARC model, with six panels of 10-12, each considering 600-800 applications with external assessments in a week. Both these models use track record heavily and there is no evidence that either structure has better outcomes, although survey and interview respondents refer to a 'club' within the NHMRC.

Excessive emphasis on recent track record promotes the awarding of grants to those that already hold grants, research funds=publications. Consequently, funding tends to go to an "elite" sub-group of applicants, generating the "club" criticism often levelled at the NHMRC. (Survey respondent)

Table one, below, provides a comparison of the structural and policy context of grant selection for key research funding programs across four research councils. Table two compares the number of applications, panel and committee member positions and amount of funding managed within the ARC and NHMRC.

Table 1: Panel and Application Numbers – four councils

	<i>Panels</i>	<i>Application Numbers</i>	<i>Minimum Load per member</i>	<i>Process</i>
ARC.	6 of 10-12 persons	4200-4600 Discovery Project applications pa.	140-220 applications DP	External assessments plus meeting
NHMRC	120-130 of 10 persons	2000 Project Grant applications pa	20 applications PG	Meeting only
NSF	Ad hoc panels of 10	50+ applications per panel	10-50	External assessments plus meeting OR Meeting only
EPSRC	Ad hoc panels of 10	50+ applications per panel	10-50	External assessments plus meeting

Table 2: Panel Members and Funding 2004-2006 ARC &NHMRC

Year	Number of Committee & Panel Positions		Amount of funding	
	2004	2006	2004	2006
ARC	96	101	413.8	556.5
NHMRC	701	1201	333.8	450

Sources: ARC Annual Report 2003-04 and 2005-06, NHMRC Annual Report 2004 and 2005.

The Tables above show differences in numbers of panel members, applications, funds managed and processes. The very large differences between ARC and NHMRC selection panel members arise from policy positions about the best way to conduct selection. Interview and survey data from panel members and staff who working both councils do not support such differences in approach.

The NHMRC process is over-engineered and overly busy. The peer reviewers provide high quality assessments for the most part. They might achieve a margin of 1% improvement over the ARC process. The ARC uses track record to assess its applications because it's the cheap way to do it. Ability is different from track record but harder to assess. (Interview)

In the UK the Engineering and Physical Sciences Research Council (EPSRC) uses external assessors, from a large College of Experts nominated by peers, to provide written assessments and to sit on selection panels. Unlike the ARC and NHMRC the panels are not permitted to re-assess, they are required to rank the judgements provided in written reports. Track record is weighted at 10% or less and the focus of the panel discussion is the quality of the research proposed and its importance to the discipline. Team and institutional capacity is considered once the work is deemed fundable, an approach which was also observed to operate in a National Science Foundation grant selection meeting.

Table 3: Process Outline – four councils

ARC & NHMRC (Australia)	NSF (USA) & EPSRC (UK)
External assessors + panels (ARC) / Many panels (NHMRC)	Ext assessors + panels (both) / panel only (NSF)
Track record in program rules and the major selection criterion	Focus on intellectual merit and broader impacts - track record less than 10% and about capacity
Panel members decide – use own judgement to rank applications	Panel members in EPSRC may not re-assess when ranking NSF Program Managers decide final rank order
Approval by Minister	Approval within organisation

EPSRC panels are constrained to consider evidence “on the table” and not re-assess. Half of the NSF panels do the assessing without external reviews. Neither group relies on track record. The differences between the ARC and NHMRC processes and selection cultures are very significant, but in both organizations track record is the dominant determinant of grant success. They use the same criterion with very different models. The NHMRC policy framework and the ARC number of applications force panels to focus on track record. The NHMRC process is closer to the NSF, where the panels have time to drill down to discuss in detail the impact of the research proposed, however, their policy framework creates a reliance on past work. There are other factors affecting the NHMRC panels, in particular, that NHMRC lead investigators can hold six Project Grants simultaneously, compared with two equivalent ARC grants. This NHMRC model guarantees "star" leaders - who effectively become the gatekeepers of funding, of the council itself, and who control access to the decision making forums by nominating researchers to positions on panels and committees.

Despite the reliance by the ARC on track record, the majority of survey respondents, and every panel member interviewed, consider the ARC to be doing a good job despite its very limited resources. Several former panel members stressed their ‘conversion’ after taking up their position with critical and negative preconceptions about the cost and nature of the work done. The ARC impact on capacity building is another matter.

There’s an awful lot of chance whether you go above the line or below the line. There’s a band of good solid proposals worth doing and unfortunately the funding comes in the middle of that band and whether you are above or below that line is chance really ... take the middle group out of the hat ... that is essentially what we did but we had a very complicated process. (Interview)

Discipline Differences and Peer Panels

Grant selection panels are constrained by research council guidelines and selection criteria yet they do not operate in the same way. Guetzkow, Lamont, and Maillard found evidence that epistemological differences are expressed across panel selections in the social sciences and humanities, particularly in understanding quality. Peer reviewers include seven categories of quality: a new approach, new theory, new method, new data, new topic, understudied area, and new findings. They found that “humanists and historians clearly privilege originality in approach” and “social scientists value most originality in method” and diverse types of originality” (Guetzkow, 2004, 190-212). This finding contrasts with earlier studies (Cole, 1981, Cole, 1978) that found reviewers followed norms based on an appreciation of the scientific quality of proposals.

The current study also produced evidence, in survey, observation and interview data, of differences in relation to ARC selection processes. Differences were most marked in panels that covered several disciplines. A single ranked list of applications required considerable negotiation about what was meant by publication quality and standing in the field.

Panels also vary in their approaches to capacity building, not only between research councils but across disciplines. Interview data captures some of those differences and observations of selection meetings provided more detail. Former panel member comments on resolving tensions between supporting existing productive groups and capacity building follow:

Biology: *There is a tension - not a bad thing. You have to look hard at the existing group and weigh them up against the bright ECR and make that decision, sometimes to relinquish one for the other. Asking what is better for Australian science.*

Chemistry: *There was a common expression that the community tended to devour its own young. In other words, we the panel members, the senior end of the community were allowing the rest of the community to gobble up the youngsters.*

Physics: *I realised after my first two years on a panel that young researchers and women were not well served, so ... I made both priorities for the panel – to ensure they got a good hearing and were supported appropriately.*

These remarks show more than subtle differences, with some discipline leaders prepared to sacrifice early career researchers while others actively seek to facilitate career paths for the good of the community.

Humanities: *There certainly has to be provision for new fields, but new fields come with a track record ... these are developed by people on the whole who already have success and track record from other work. I would want people to do it first and then come for funding... even if we started up a new greenfields scheme we have to make judgements on the basis of excellence ... and I find it hard to make those judgements without referring to fairly traditional kind of academic judgements, including track record.*

There is also a conservatism about novelty as reflected in the comment from the humanities researcher, a facet that has been reflected in other studies of the impact of peer review. Drawing on the work of Kuhn and others, Gillett states that peer review “must favour incremental research which defends the existing body of understanding of a subject – the current paradigm” (Gillett, 1993, p1672). Funding councils use established successful researchers to form peer review panels and committees and these people have an interest in maintenance of existing models and are likely to be hostile to really innovative proposals (Gillett 1993).

Capacity Building

The NSF takes a pro-active role in capacity building. Program Directors work with researchers and groups to create links, develop research teams and advise researchers. They also have a role in grant selection, deciding the outcome of peer review processes in interesting ways. The Experimental Program to Stimulate Competitive Research (EPSCoR), is a merit-based program created by mandate in 1978, “to expand the scientific and technological capacities of the States with developing research infrastructures”(OLPA, 2005). In 2001, research and development spending was still heavily concentrated with 85% directed to 20 states, and 5 states

capturing 50% of expenditure. The lowest 20 states received only 4% of R&D spending (OLPA, 2005).

One Program Director (Interview 2004) told of a decision to advance an application in order to expand research capacity in a new location. This was a solid application from a research group located in a targeted (EPSCoR) state, but it was ranked in position 17, fundable, but funds would be exhausted after the 14th grant. The Program Director examined the 17th application carefully and noted that there were early career researchers to be employed, and a relationship with local industry that would have flow-on effects. This was a grant that would create employment and build much needed capacity in a state that was at the bottom of the research league table. But if it was to be funded another grant had to drop off the list.

The Program Director decided that this was a risk that had to be taken, to provide opportunity and make a significant difference in one location. The Program Director conducted a careful examination of all the recommended applications, the current activities of the proponents, existing funding provided for that research, and decided to drop, not the 14th on the list, but the 1st placed application. This application was from a group with significant research funding, in possession of grants worth several million dollars a year, a group already very busy with research projects, located in a resource-rich institution. So, the decision was made to fund the 17th position grant and not the 1st position grant, to build new capacity rather than extend existing strong capacity. At the time of the interview the Program Director believed the risk was proving to be a good one, with the research project delivering training and other outcomes much needed in that institution and state.

Capacity building is another significant point of comparison between the NSF and the Australian research councils. NSF models of peer review, grant approval and quality assessment, combined with the Congressional mandate for affirmative action to build capacity, provide scope for flexible and targeted delivery of research funding in ways that are not used in Australia. Capacity building, of new research fields and new researchers, appears to be hampered by assessment processes that rely on track record as a key selection criterion, even when it is considered relative to opportunity.

In Australia panel members and policy makers believe that capacity building is the role of the institutes and universities and there is an expectation that this is happening.

I didn't feel that we were cutting off too many people from starting their careers by not funding them. What's important is for them, to make them competitive, is developing track record and I see that as an issue for the universities more so than the funding bodies. (Interview)

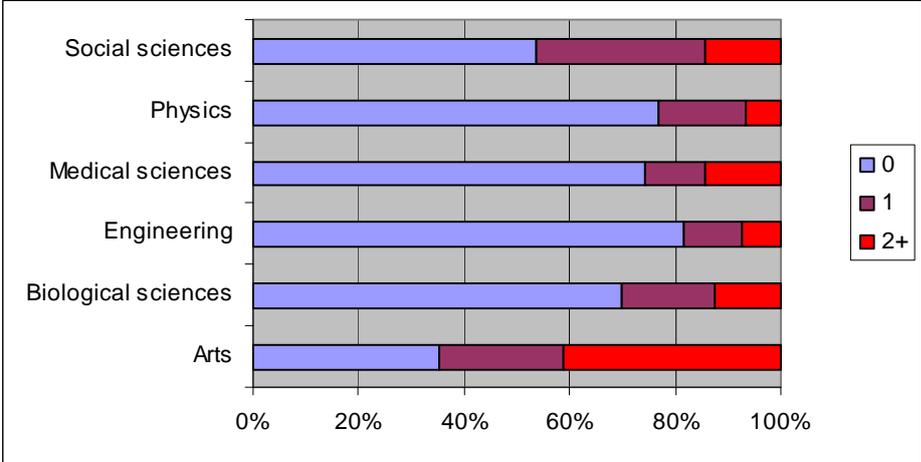
Are Australian universities building track record?

Applicants for competitive grant funding were asked in the survey to indicate the types of support provided to them by their institution before and after

applications were submitted to the research councils. The results showed patterns by both discipline and type of institution.

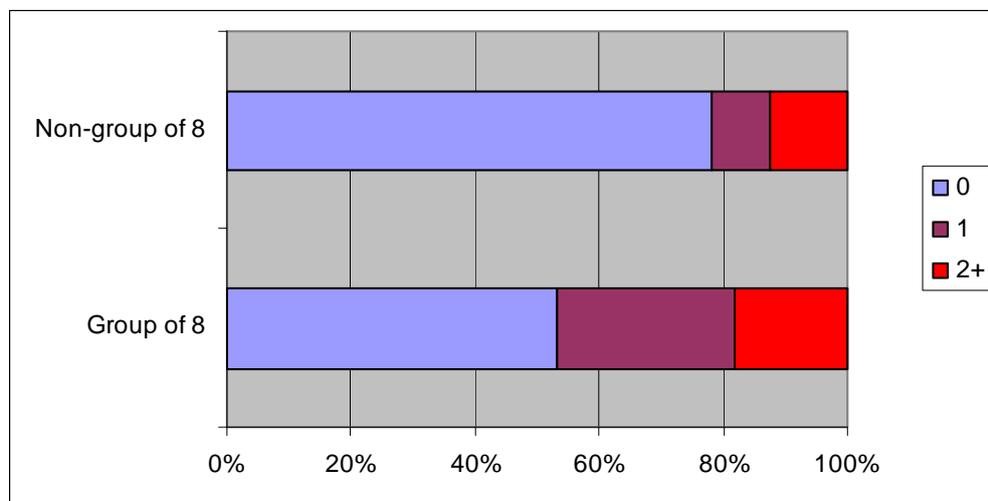
Types of help that were provided in institutions were, in order of frequency of offer; mentoring, seminars, review and feedback on draft applications. Conversely, very little internal funding was offered and training was not provided. Few applicants received much help with only arts-based researchers having one or more help types being available (to 65% of their number). Researchers in the enabling sciences and engineering have a difficult time getting assistance to improve their performance.

Chart 1: Number of sources of help, by discipline group (following an unsuccessful application for a grant)



Capacity building in the form of assistance to produce competitive grant applications had a location flavour. Applicants based in one of the eight leading research universities (the G8) were twice as likely to receive support as applicants in other universities or research institutes were. If those applicants were also in the humanities or social sciences they were twice as likely as other G8 applicants in other disciplines to receive assistance. However, the survey also revealed that no-one was being offered publication advice, the most important component of track record according to panel members.

Chart 2: Number of sources of help, by institution type (following an unsuccessful application for a grant)

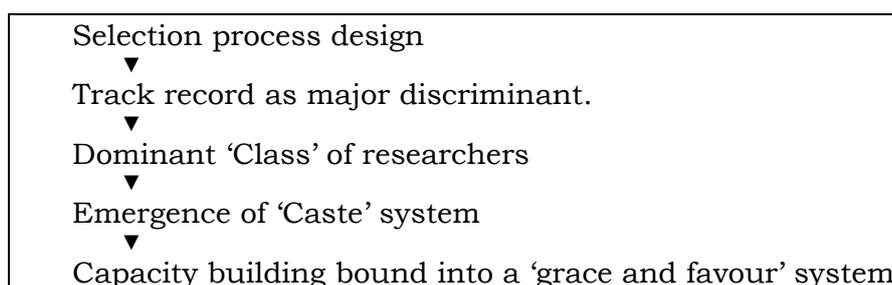


CONCLUSION

Peer review of research grant applications is defined and managed differently by research councils in Australia, the UK and the USA. All councils claim that excellence is their driving force. In Australia, the ARC and NHMRC both use track record as a dominant discriminant. Furthermore, panel members believe that track record is an accessible and quick means of judging some aspects of quality, and that it is a reasonable way of assessing past performance.

Research capacity building involves risk taking in one of more of the following areas: the research topic or design, the people, or the location. Some research councils undertake capacity building through funding allocation and operationalised grant selection where small numbers of applications are considered by panels and selected primarily on the research proposed, rather than the research team.

Where research assessment processes load large numbers of applications to a panel and success rates are low (20-30%) then track record becomes an essential basis for selection. Track record reliance in funding decisions can lead to a dominant “class” of funded researchers who control access to future grants. Access for early career researchers relies on patronage and mentoring, a process not unlike the operation of barrister chambers.



Continued reliance on track record may lead to a caste system in research, where grant selection processes limit research expansion and the admission of new members to the funded 'caste' by emphasising past performance in the selection process. Unlike the expectations of panel members, research institutions are generally not undertaking strategic capacity building, and none, it seems, are taking on the really significant matter of developing publication profile.

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