CHAPTER 6

THE FUNDING AND MANAGEMENT OF RESEARCH

> Only by supporting research where the returns are not guaranteed can we ensure the steady, gradual progress that underpins front-page news stories that accompany each new success. Taking a risk on open-ended research, where cost-effectiveness is often difficult to guarantee, sometimes generates the greatest economic returns.[1]

6.1 Several of the inquiry's terms of reference direct the Committee to consider the capacity of public universities to pursue high quality research programs across a broad range of disciplines that contribute to longer term economic growth and social and cultural development. The Committee has also been asked to examine the commercialisation of universities' research activities in the context of their increasing reliance on private income. The central question is whether the current policy settings and funding levels and arrangements support the development of a research capacity that meets current and longer term needs for economic, social and cultural development.

6.2 While the need for additional funding for research was a recurrent theme in most of the submissions and much of the evidence to the Committee, concerns about the direction of policy and the models underpinning research funding and management loomed equally large. Particular areas of concern relate to the balance between basic and applied research, the distribution of funds among disciplinary areas and institutions and the concentration of research funding and activity (including research training). Policies promoting the increased involvement with the private sector and the commercialisation of research are also subject to debate. Approaches to the commercialisation of research have generated tensions within some universities and research teams. There are also complaints of a lack of coherence and consistency in government policy and funding arrangements for research.

The role of research

6.3 Research is sometimes described as the process of 'discovery' or of developing knowledge or fundamental insights or ideas. Research is, with teaching, a basic role in higher education, particularly in Australia. The capacity to undertake research at the highest levels, is one of the defining characteristics of Australian public universities. In 1998-99, the higher education sector was responsible for conducting 29 per cent of all national research expenditure (to the value of $2.3 billion) and 84 per cent of all basic research.[2] The Government's *Knowledge and Innovation* policy

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1 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.28 (quoting Dr Neal Lane, Assistant to the President for Science and Technology in the US, June 2000)

2 Submission 351, Australian Research Council, p.10

statement described the 'crucial role' that universities play in the national research and innovation system:

> They are major contributors to the generation and transmission of knowledge in Australia. Many of our leading researchers have world standing in their fields of research, enhancing Australia's reputation as a serious and credible contributor to the global development of knowledge. Our universities are the key providers of training and professional development for our future researchers.[3]

6.4 Government support for research in the public sector, including higher education, has traditionally been justified on the basis that it produces a 'public good', where 'the benefits are widely dispersed and the payoff is not immediate'.[4] The Australian Research Council (ARC) notes that the role of research in 'increasing our pool of knowledge, and improving our quality of life, for example through new medicines, new materials and energy sources and means of communications'[5] has generally be seen as something worthy of government support. The annual value of the spill-over effects from the research and development activities of universities was recently estimated at over $2 billion.[6]

6.5 The development of the global knowledge economy, where economic performance is linked to success in knowledge-intensive industries, has been accompanied by increasing focus on the potential for research and 'innovation'[7] to improve Australia's economic performance. Government statements emphasise the notion of 'return on investment' in publicly-funded research and universities as an integral part of the 'national innovation system.'[8] Government policy on research in the higher education sector is increasingly dominated by these considerations. This focus on capturing the benefits of research is the subject of some debate, with a number of submissions and witnesses raising questions about its implications for longer-term research capacity. This 'utilitarian' approach to research is also said to encourage research at the expense of teaching.[9]

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3 The Hon Dr D A Kemp MP, Minister for Education, Training and Youth Affairs. *Knowledge and Innovation: A policy statement on research and research training* December 1999. Para 1.3

4 Submission 49, Professor John Quiggin, p.27

5 Submission 351, Australian Research Council, p.10

6 Submission 351, Australian Research Council, p.11 (quoting a report by the Business/Higher Education Round Table)

7 The Chief Scientist defined innovation as 'the activity that utilises the results of research.. the process that translates knowledge into economic growth'. .. 'as sunlight is to photosynthesis, so knowledge is to innovation. *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.15

8 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.81

9 Submission 205, Centre for Independent Studies, p.4

Policy framework and directions

6.6 Recent policy on research funding has been concerned with rectifying identified problems with Australia's performance as a knowledge economy. For example the low level of private sector research in Australia has been identified as a barrier to innovation:

> Basic research, which is a keystone of innovation, has a strong foundation in Australia. Public investment in government and higher education R&D as a proportion of GDP is strong by international standards, with Australia ranked third of OECD countries. This investment has resulted in Australia producing 2.5 percent of the world's knowledge, well above our share of population base and share of world trade. This is an outstanding achievement by Australia's institutions and their researchers .. [but] in proportion to our GDP, our business expenditure on R&D (BERD) is below the ratios for large industrialised countries, ranking 11th out of 17 OECD countries.[10]

6.7 The *Knowledge and Innovation* policy statement proposed to address this by increasing linkages between universities and the business sector to assist business to capture more of the benefits of university-based research. Universities are being encouraged to become more 'entrepreneurial' in their culture; and incentives are provided for greater private sector involvement in university research, including the commercialisation of research. Research and research training are to be concentrated and aligned more closely with national goals and priorities.

6.8 Following the implementation of this policy and in response to a series of reports highlighting other OECD countries' significant public investments in research capacity in recent years,[11] the Government issued the *Backing Australia's Ability* statement, with a commitment, among other things, to doubling funding for the national competitive grants program and associated research infrastructure support over a five-year time frame. While reaction to the statement has been generally positive, many have argued that it does not go far enough in addressing the problems and needs. The increased funding still leaves Australia falling far short of OECD competitors in terms of investment in research. On one estimate (from the AVCC), Australia would need to provide an additional $13-14 billion for research and development over the next five years to restore our competitive position in the OECD. The package announced in *Backing Australia's Ability* 'will only succeed in slowing our relative decline not reverse it.'[12]

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10 The Hon Dr D A Kemp MP, Minister for Education, Training and Youth Affairs. *Knowledge and Innovation: A policy statement on research and research training* December 1999

11 *The Chance to Change* Final Report of the Chief Scientist, November 2000; Submission 351, Australian Research Council, p. 4

12 Professor Ian Chubb, *Aspirations for an Innovation Nation*, Presentation to the Rotary Club of Melbourne, Wednesday 18 July, p.4

6.9 Details on the basis for distribution of the additional funds announced under *Backing Australia's Ability* are still emerging. However there are concerns that the context in which the proposals were developed (that is, the reports of the Chief Scientist and of the Innovation Summit), will result in a disproportionate emphasis on science and technology at the expense of the humanities and social sciences.

6.10 The package, with its focus on research grant (project-based) funding and specific initiatives is said to also fail to address the need for increased funding for non-project based research and research infrastructure:

> The major problem with *Backing Australia's Ability's* proposals for research funding is that they do not address the critical issue for universities – the urgent need for increased funding for deep infrastructure supplied through the Research Quantum and Institutional Grant Schemes… Coupled with cuts in government funding for university operating grants, this failure to increase the level of infrastructure funding will adversely affect Australia's ability to maintain, let alone extend, our capacity to undertake high quality research.[13]

6.11 Professor Ian Chubb, Chair of the Australian Vice-Chancellors' Committee, described the current university research infrastructure as 'eroding' and observed that:

> when you see all your equipment and your capacity to provide the resources you need for the staff to do the work that they want to be able to do slowly but surely degrading, then that does not make me—or a majority of my colleagues—very happy at all.[14]

6.12 The submission of the University of Western Australia also argued forcefully that 'research infrastructure, and research support generally, requires a major infusion of funds greater than that proposed under the Innovation Statement.'[15]

Separation of research policy from broader funding policy

6.13 These responses touch on one of the main criticisms that many submissions and witnesses made of the Government's strategies for research funding and management, that is the absence of coherent policy framework that integrates the various research funding arrangements and initiatives and overall funding for the higher education sector.[16] The result is a series of policy initiatives that do not address some of the fundamental problems in university-based research, such as the deterioration in research infrastructure, and that are not supported by broader policy and financial settings for the sector. As the University of Western Australia explained:

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13 Submission 310, University of South Australia, p.10

14 Professor Ian Chubb (AVCC), *Hansard*, Sydney, 17 July 2001, p. 987

15 Submission 134, University of Western Australia, p.2

16 Submission 49, Professor John Quiggin, p.26: See also Submission 257, Professor Mairead Browne, pp.1-2

> This divergence between policy and funding arrangements and desirable outcomes is primarily a result of a significant reduction in the level of public funding accompanied by a highly regulated system with heavy reliance on across-the-board formulaic funding. [17]

6.14 Some claim that the deterioration in universities' research infrastructure referred to above is the result of a legacy of changes to funding arrangements under the UNS,[18] including a larger number of institutions competing for research funds, and competitive grants funding formula that failed to cover the full costs (including research overheads costs) of grant-based research. The 20 per cent reduction in the purchasing power of operating grants since 1996 has clearly intensified the pressures on research infrastructure, particularly libraries, which are funded out of general university revenue. At the same time, evidence was presented of cost escalations as a result of the declining value of the Australian dollar, the actions of monopoly forces in the publishing industry and the pace of technological change.[19] The NTEU submission, as indicated in Chapter 3, catalogued what this had meant in terms of library resources: over $15 million in library subscriptions had been cancelled since 1996, many of these in the science and technology fields.[20] Professor Anthony Thomas, Chair of the National Committee of Physics, in his submission to the Committee, attached a copy of a letter he had written to the Prime Minister, indicating, among other things, the seriousness of the problem:

> University library collections have been in rapid decline for more than a decade and few have 50% of the periodical subscriptions they had 10 years ago; this in a world where the rate of production of knowledge is accelerating![21]

6.15 The reductions in library purchases are continuing. One submission forwarded a copy of a recent email from the University library advising staff of the need to cancel a large number of subscriptions to save money:

> .. the Biomedical Library at the University of NSW is going to cancel $287,000/year worth of subscriptions, which equates to 22% of journal subscriptions. In 2000, subscriptions to the value of$120,000/year were cancelled. No doubt other sections of the University of NSW Library have the same problem. .. This is catastrophic. We cannot just blame the dollar, we must fund these subscriptions or face a real reduction in the quality of research in our Universities.[22]

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17 Submission 134, University of Western Australia, p.2

18 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.66

19 Submission 236, Council of Australian Postgraduate Associations (CAPA), p.21

20 Submission 283, NTEU, Appendix A

21 Submission 327, Professor Anthony Thomas (National Committee of Physics), Attachment, p.2

22 Submission 361, Dr Gorman, p.1

6.16 The Chief Scientist has also identified resourcing of libraries as a major problem and recommended a pilot to examine whether a national site licence for libraries would provide a more cost-effective way to acquire scholarly journals in future.[23] The Committee notes the Government's claims that the funds to be provided under *Backing Australia's Ability* for improvements to Australia's systemic research infrastructure, will be available, among other things, for addressing some of the problems with library holdings, including access to serials and low-use journals.[24] However much of this funding will not be available for several years into the future and, in the view of many vice-chancellors, will fall far short of addressing the need.

6.17 The Committee notes in this context that one possible solution to the problems associated with reduced budgets and the rising costs of books and journals is to adapt innovative solutions that have been trialed in a number of countries, including Canada, Britain and Korea, (and along the lines of a proposal recommended by the Chief Scientist) including collaboration between universities to negotiate National Site Licences and with publishers for on-line access to journals by participating universities. Such strategies have the potential not only to restore the range of journals available for reference but also to enable many newer universities to have access to journals to which they have never subscribed.

Recommendation Seventeen

The Committee recommends that the Government contribute to the funding of the collaborative development of National Site Licence agreements with publishers to enable university libraries to gain greater access to the widest possible range of on-line serials and other research materials.

6.18 The Committee also heard evidence of a serious decline in other research infrastructure, particularly laboratory equipment. The submission of the Australian Council of Engineering Deans stated that it is 'embarrassing to see the quality of university laboratories in Singapore, Hong Kong and Malaysia' in comparison to Australia.[25] The Chief Scientist, Dr Robin Batterham, advised the Committee that this assessment by the deans 'to the best of my knowledge, is reasonable.'[26]

6.19 In evidence to the Committee, Professor Barry Brady, the President of the Australian Council of Engineering Deans explained the problem further:

> In terms of our laboratory infrastructure, if you have been to Singapore, for example, and had a look at the polytechnics – not the universities – you would have seen the standard of infrastructure in our engineering laboratories is lower than it is in the Singapore polytechs. The fact is that

23 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.68

24 Dr Evan Arthur (DETYA), *Hansard*, Canberra, 13 August 2001, p.1351

25 Submission 201, Australian Council of Engineering Deans, p.2

26 Dr Robin Batterham (Chief Scientist), *Hansard*, Canberra, 22 June 2001, p.521

> the only thing that allows us to deliver competitive programs in our best engineering schools is the quality of our staff – not our laboratories. There has been no substantial investment in laboratory equipment over the last 10 years.[27]

6.20 He and his colleague then went on to explain that university engineering departments in Australia are no longer able to offer salaries to academics that are internationally competitive, and that their best staff - until now their main area of advantage - are now being 'recruited away.' [28]

6.21 These problems are not limited to engineering: the President of the Australian Council of Deans of Science advised the Committee that, for the sciences generally, 'the infrastructure equipment that is now being used for training graduates and for doing research is getting older and older.'[29] To give an example of the problems he explained:

> we did at one stage have probably one of the best equipped laser laboratories in the world. Several of the lasers are now in excess of 10 years old and it is not obvious where they are going to be replaced. I think that is repeated around the country. I note that the Backing Australia's Ability funds for university infrastructure seem to be pitched at the major infrastructure level, which is fine—we need equipment in the half a million dollar and higher area. It is more in the area of the $100,000 piece of equipment that I think we are running into problems, both in the postgraduate training and in the research area.[30]

6.22 The large staff cuts flowing from the reduced purchasing power of operating grants (described in Chapter 3), have resulted in increased teaching workload for remaining staff, limiting their capacity to undertake research and reading. They have also thinned the ranks of able researchers:

> due to the funding constraints [..], various fields of pure and applied research conducted by individuals of high renown will come to an end once these researchers leave the University. There are no funds to build up research strengths which would enhance the region's and Australia's long-term capacity. [31]

6.23 Many who remained are also demoralised:

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27 Professor Barry Brady (Australian Council of Engineering Deans), *Hansard*, Perth, 2 July 2001, p.643

28 ibid.

29 Professor William MacGillivray (Australian Council of Deans of Science), *Hansard*, Townsville, 12 July 2001, p.852

30 ibid., p.858

31 Submission 188, University of New England, p.4

> the academic profile is aging, many of our best researchers are moving overseas while those left are often demoralised by the ever-growing demands on their time. The current position of universities - inadequately funded by government yet tightly regulated - is simply unsustainable if Australia aspires to have universities capable of teaching and research to world standards.[32]

6.24 The Committee notes, in this context, that the recent report by Monash University's Centre for Population and Urban Research, suggesting that claims of a 'brain drain' from Australia were unfounded, dealt with the general question of migration of educated professionals.[33] It did not distinguish between particular groups, nor did it deal with the specific question of academics, whose salary structures have fallen far behind both their overseas counterparts and domestic professional equivalents. More detailed discussion of this matter is provided in Chapter 9.

6.25 Other effects of staff cuts on the long term research capacity of the sector include: the loss expertise in underpinning disciplines such as statistics, which had serious implications for future research capacity in the social and natural sciences as well as business;[34] and the loss in diversity of teaching, particularly in the sciences[35] and the smaller number of academics undertaking the supervision of research candidates[36] both of which would reduce the pool of research staff in the longer term.

6.26 The poor salaries and conditions of employment meant that it might not be possible to attract replacement research staff in future, even if funds were available for that purpose:

> In the international market for top quality staff, the Australian universities are becoming increasingly uncompetitive. This will have serious long-term implications for the quality of our universities' research and their international standing.[37]

6.27 The University of South Australia agreed and added that the poor state of research infrastructure in some Australian universities is also a deterrent to recruitment:

> The current low salaries for academics and poor career prospects for researchers in many fields mean that too many of our brightest students are no longer attracted to research careers. This is a very dangerous situation for Australia, particularly when it means that necessary basic and applied research and research education is not occurring in areas like ICT. Whilst

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32 Submission 263, University of New South Wales, p.3

33 Dr David Kemp Media Release no K162, 17 July 2001

34 Submission 231, Australian Mathematical Society, p.2

35 Submission 208, Australia and New Zealand Association for the Advancement of Science, p.5

36 Submission 176, CPA Australia, p.2

37 Submission 8, Professor Peter Karmel, p.3

> the Federation Fellowship initiative is welcomed, there is little prospect of attracting or retaining our brightest and most capable researchers if the infrastructure base to support their research is lacking.[38]

6.28 The submission from Professor Simon Marginson argued that the rundown of university infrastructure might also partly explain the comparatively low levels of industry investment in university-based research:

> Given that in the 1990s universities were highly responsive to market opportunities, explanations for their failure to secure greater industry investment must lie partly on the industry side. At the same time, the erosion of university capacity and energies, brought about by the coupling of rapid entrepreneurial development with declining levels of public investment per student, intensified cost pressures and a reduced capacity to carry out sustained programs of basic research, has probably impaired the attractiveness of universities as sites for industry.[39]

6.29 There are good grounds for concern that the current under-funding of operating grants, including the component for funding of general research, will both undermine our capacity to benefit from the increase in targeted research funding announced under *Backing Australia's Ability* and have serious long-term effects for our research capacity. The decline in this source of funding has particularly serious effects for the humanities and social sciences which receive a much smaller share of grants-based funding than science and technology disciplines, and which are comparatively more reliant on funding flowing from operating grants. This in turn is compounded by funding models that use external income as a driver of research funding, further undermining the scope for such disciplines to contribute to Australia's economic, social and cultural development.

6.30 Ironically, as Professor Marginson noted, the erosion of research capacity will also limit universities' capacity to attract additional investment from industry, a major objective of current Government policy.

6.31 Policies on research funding and management appear to have been developed and implemented in isolation from the broader policies governing higher education. This is encouraging the separation of research and teaching within universities, to the detriment of both the quality of teaching and the quality of research.[40] These issues are discussed in more detail in the section dealing with the concentration of research. The Committee believes that the Government needs to develop a policy framework for

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38 Submission 310, University of South Australia, p.6

39 Submission 81, Professor Simon Marginson, p.17

40 The Committee notes, in this context, that Professor John Quiggin, in his submission to the inquiry explained that the 'links between pure research, applied research and teaching are complex and resist the application of simple accounting techniques. A commitment to knowledge is at the core of the values of the university.' (Submission 49, Professor John Quiggin, p.24)

higher education that supports the development and maintenance of a longer-term research capacity across a broad range of disciplines.

Funding and management framework

6.32 Funding formulae or models are the main mechanisms for the implementation of Government policies on research. There is clear evidence that universities respond strongly to the incentive structure in the formulae and have introduced a range of management and other strategies, including recruitment and promotional criteria, and internal allocations, to maximise their income under the formulae. However the higher education sector is not a level playing field and institutions' capacities to engage in the activities rewarded under 'one-size- fits-all' formulae vary significantly. The same is true for different disciplines. In addition, unless they are carefully framed, formulae may be less than perfect instruments for achieving the desired outcomes. Where this is the case, and particularly where universities have internalised the formulae, there may also be a range of perverse outcomes.

6.33 The current framework for the funding and management of research is essentially that established under the Unified National System (UNS), with subsequent changes by Labor and Coalition Governments designed to rectify identified problems or steer research activity in the desired direction. The most recent changes were introduced under the *Knowledge and Innovation* statement and *Backing Australia's Ability* statement.

Management framework

6.34 The framework for management of research in the higher education sector comprises three main elements:

- the Australian Research Council (ARC), with a charter of advising Government on research funding and policy and of promoting research and research training 'that is of the highest quality for the benefit of the Australian community,' mainly through the national competitive grants program.[41]
- the requirement for universities to provide DETYA with Research and Research Training Management plans as part of the educational profiles process and to report on a range of research performance measures; and
- a series of funding mechanisms or formulae to ensure that research funds are allocated on the basis of policy priorities (including performance). These include programs funded and managed by DETYA or the ARC as well as programs funded by other government bodies including the National Health and Medical Research Council (NHMRC). (The latter are not discussed in this report).

6.35 Flowing from the *Knowledge and Innovation* policy statement and the *Australian Research Council Act 2001*, which implemented most of the changes in the

41 About the ARC (at http://www.arc.gov.au/about/default.htm)

statement, the ARC has been re-established as an independent body with an enhanced strategic role in contributing to innovation. Under its new charter the ARC plays a pivotal role by helping to form and maintain effective linkages between the research sector and the business community, government organisations and the international community. It is also required to report on Australia's comparative research performance and the national return on investments in research.[42]

Funding mechanisms

6.36 There are currently four main mechanisms for distributing research funds managed by DETYA to universities:

- block grants of support for research through the Research Quantum component of the operating grant (amounting to approximately 4.5% of total expenditure on total operating grants);[43]
- targeted, competitive research (project) grants administered by the ARC and a number of other targeted programs;
- support for 'Research Training Scheme' (RTS) or research-based higher degree studies (provided under operating grants up to 2001); and
- infrastructure support to provide for the costs associated with national competitive grants funded through the Research Infrastructure Block Grants scheme (RIBG) administered by DETYA.

In addition, there is also a range of programs supporting collaborative or partnership programs funded by other portfolios including the Cooperative Research Centres (administered by the Department of Industry, Science and Resources).

6.37 The relative importance, in financial terms, of these various funding programs is set out in Table 6.1

6.38 The ARC has characterised this set of funding arrangements as a 'dual' approach of broad institutional support (primarily through the Research Quantum) and competitive, peer-assessed grant funding. This dual approach is said to have many advantages. The institutional support component is intended to provide institutions with the flexibility to determine their strategic priorities and develop areas of research strength and the competitive grant component is designed to promote research of the highest quality.[44] Submissions and evidence to the Committee identified a number of areas where these arrangements fell short of meeting those objectives.

42 Submission 351, Australian Research Council, p.2

43 Submission 351, Australian Research Council, p.3

44 Submission 351, Australian Research Council, p.3

Table 6.1 Funds provided from DETYA portfolio for research activities in universities

Program/measure	$ million	Proportion
Research Training Scheme	504.495	43.6
Australian Postgraduate Awards Scheme	83.418	7.2
Research Quantum	228.061	19.7
Research Infrastructure Block Grants Scheme	82.014	7.0
ARC managed Schemes	260.25	22.5
Total	**1,156.618**	**100**

Source: DETYA, *Higher Education Report for the Triennium 2001-2003,* March 2001,.pp. 149-212

Note on table: The $ allocation for New Research Fellowships for 2001 was not provided and so has not been included in the total. In 2000, Fellowships accounted for $26.7 million (see Chart of ARC Funding Schemes - Table 6.2). If a similar amount were included for 2001, this would bring the total to $1,183 million and increase the ARC managed schemes proportion to 24.2 per cent. Note that funding for specific projects such as the Anglo-Australian Telescope have also not been included.

Research Quantum/Institutional Grants Scheme

6.39 The Research Quantum will be replaced by the Institutional Grants Scheme (IGS) from 2002. As many of the submissions to the Committee discussed the current arrangements for the Research Quantum, and these are broadly retained under the IGS, the Research Quantum will discussed before some general changes under the IGS are examined.

6.40 The concept of the Research Quantum originated in the 1988 White Paper on Higher Education, in which the Government indicated that, under the UNS, research funds (at that time 5 per cent of operating grants) would be allocated on the basis of research performance. Initially the Research Quantum was simply distributed in proportion to universities' success in obtaining Commonwealth Competitive Grants to undertake research, with the purpose of providing infrastructure support for existing research.[45] However from 1995 a composite index was developed by to calculate each university's Research Quantum allocation.[46]

6.41 Funds provided under the Research Quantum now represent about 4.5 per cent of total operating grants. The level of operating grant funding therefore has a major effect on the level of funding under the Research Quantum. The reductions in the forward estimates for operating grants from 1996 have reduced the level of funds available under the Research Quantum, and as the purchasing power of operating

45 M Considine and S Marginson, The Enterprise University, CUP, 2000, p.138

46 The Research Quantum at http://www.DETYA.gov.au/highered/research/documents/rqsumy2000.rtf

grants reduces over time, this will continue to erode the real value of this component of funding. This may explain universities' complaints about inadequate funding for research, notwithstanding the increases recently announced under *Backing Australia's Ability*.

6.42 The Research Quantum has been described as providing funding for the 'general research activities of institutions.' DETYA explains that institutions have considerable discretion in the way they spend these funds, and can use them to fund their own grants or awards schemes, research equipment, infrastructure 'or whatever other research activities they decide.'[47] The flexibility associated with the Research Quantum makes it particularly valuable to universities as almost all other research funding is either tied to a specific purpose or project or at least notionally required to support the infrastructure costs of specific projects.

6.43 In 2001, $228.06 million was allocated under the Research Quantum, representing approximately 20 per cent of the total allocation of research funds to universities through the DETYA portfolio. Institutions' share of funds under the Research Quantum is based on their past performance against the 'composite index.' The index weights performance in attracting research income from a range of sources including ARC and NHMRC grants, other public sector sources and industry (80 per cent) and in producing 'outputs' in the form of research publications (10 per cent) and research training completions (10 per cent).[48]

6.44 Individual institution's 2001 allocations under the Research Quantum varied enormously, from $26 million for the University of Melbourne to $60,000 for the University of the Sunshine Coast, Australia's newest public university. This illustrates one of the main criticisms of the Research Quantum as a mechanism for supporting universities broad research capabilities: that is, the scant opportunity for newer universities to develop a research capability and the capacity to compete for contestable funding in future. The submission from the University of the Sunshine Coast argued that:

> The current funding arrangements for a new university are a matter of serious national concern. .. A DETYA official described the funding climate as 'hostile' for a new university, and the West Committee commented that 'the system is stacked against new entrants.' These comments apply to the length of the planning period, the low level of establishment funding, the lack of support for basic library and IT infrastructure, inappropriate research formulae that disadvantage a university without a proven track record [..].[49]

6.45 The Committee notes however, that over the past six years the proportion of Research Quantum funding allocated to universities ranked in the third and fourth

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47 Institutional Grants Scheme at http://www.DETYA.gov.au/highered/research/igs.htm

48 DETYA, *Higher Education Report for the Triennium 2001-2003,* March 2001, p.155

49 Submission 101, University of the Sunshine Coast, p.2

quartile in terms of overall income, more than doubled (admittedly from a very low base) while the proportion allocated to the Group of Eight declined from 74.18 to 67.49.[50] The latter trend, is, of course, a concern to the Group of Eight who see their research income being eroded, undermining their status as research-intensive universities.

6.46 The Committee heard a range of other criticisms of the Research Quantum criteria including:

- the focus on 'inputs' provides a perverse incentive to inflate research grant budgets and is biased towards those disciplines where research costs, and therefore the size of grants, tend to be highest and which have the most capacity to attract external investment, generally favouring the sciences over the humanities. Wealthier universities also have an unfair advantage because investments they make in their own research, for example using income from endowments or other sources, can be counted for the purpose of attracting further research income.[51] (There is a question as to whether this is consistent with the principles underlying the composite index, that is, to reward quality); and
- the 'output' criteria are given insufficient weight in the index and also favour areas such as the sciences, where single researchers might contribute to multiple publications based on one project, over the humanities, with different publication practices.[52] They also measure, and therefore encourage, quantity over quality (and a 'publish or perish' treadmill[53]) and fail to recognise the varying research outputs of different fields. The publications component of the index is a particular bone of contention. Representatives from humanities faculties complained that it does not include the editing of scholarly journals or other activities integral to scholarship and research in their fields.[54] It also appears to be far from reliable, even as a measure of quantity: a 1997 study found that the data on publication outputs on which the index was based was full of errors.[55]

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50 Harman G, *Allocating Research Infrastructure Grants in Post-binary Higher Education Systems: British and Australian Approaches*, Journal of Higher Education Policy and Management, Vol 22, No 2, 2000, p.120

51 Professor Bernard Moulden (James Cook University), *Hansard*, Townsville, 12 July 2001, p.960

52 Professor Jeff Malpas (Australasian Association of Philosophy), *Hansard*, Hobart, 26 April 2001, p.154

53 Submission 176, CPA Australia, p.2, commented that many research publications in accounting are designed to meet the promotional criteria of universities (which are generally related to the funding formula) and are not much use to the profession

54 Submission 88, Professor Campbell MacKnight, p.8

55 G Harman, *Allocating Research Infrastructure Grants in Post-binary Higher Education Systems: British and Australian Approaches*, Journal of Higher Education Policy and Management,Vol 22, No 2, 2000, p.119

6.47 To the extent that universities allocate funds internally on the basis of performance against the same criteria as the Research Quantum, and many do, the humanities' and social sciences' share of research funds is likely to decline over time.

6.48 Some academic commentators have summarised the effect of the formula this way:

> In the circular economic logic of the quantum formula, grants begat grants. This was decisive. It created the incentive to focus on money income rather than the research activity which the quantum was meant to represent and augment. Exchange value subsumed use value, price became purpose.[56]

6.49 From 2002, the Research Quantum will be replaced by the Institutional Grants Scheme (IGS). The IGS will provide greater recognition of investment income from all sources (including industry) and greater weighting for research training activity. Under the IGS, the weighting for research student completions will be increased (30 per cent instead of 10 per cent) at the expense of research income (reduced to 60 per cent from 80 per cent). The weighting for research publications will remain at 10 per cent.[57] A number of outputs relevant to the performing arts and other areas will also be included in the publications component. While it is too early to predict the effect of the revised formula, some conceptual problems are already apparent.

6.50 The bias in favour of the value of research 'inputs' and the quantity of outputs, remains. In addition, by equally weighting research income from all sources, the IGS will provide a further incentive to seek private sector income. The emphasis on quality and excellence will be diluted because routine research and consultancy work will be weighted the same as research recognised through the competitive peer review system. The weighting may also amount to a subsidy for university-based consulting, which could distort research priorities 'and appears to conflict with National Competition Policy.'[58] The scope for universities to 'manipulate' their performance by investing their own income into research projects will remain. Some state governments have recognised the potential for leveraging additional Commonwealth research funds to institutions within their borders by making strategic investments in research projects.[59] While such an approach might form the basis of a 'virtuous cycle' of excellence attracting investment leading to even further excellence, it might provide diminishing returns for smaller states if it became common practice.

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56 M Considine and S Marginson, *The Enterprise University,* CUP, 2000, p.139

57 DETYA, *Higher Education Report for the 2001-2003 Triennium*, March 2001, p.57

58 Submission No 49 Professor John Quiggin, p.26

59 Submission 347, SA Business Vision Inc, 2010, p.83

6.51 Finally, by increasing the weighting for RTS activity, the IGS will intensify the anticipated shift in resources from the newer universities towards the more established universities in the wake of the RTS changes.[60]

6.52 A number of submissions suggested that a better alternative would be to implement a variation on the United Kingdom's Research Assessment Exercise (RAE). The RAE is the device used in the UK to 'enable higher education funding bodies to distribute public funds for research selectively on the basis of quality'.[61] It involves a regular cycle (every 4-5 years) of peer-reviews of disciplines across the sector to determine ratings (and rankings) in terms of the extent to which the research is judged to reach national or international standards of excellence. Research funds flow directly to disciplines or departments on the basis of these assessments. This is in contrast to the Research Quantum/IGS arrangements under which funds flow to institutions and there is no way of ensuring that the departments undertaking the highest quality research receive the appropriate level of support.

6.53 Emeritus Professor Karmel recommended that Australia consider such an approach as did the Australian Academy of Sciences, representatives of the Australasian Philosophy Association, and Professor John Quiggin, among others.[62] The main advantages of the RAE approach are a capacity to measure quality and to provide for more continuity of funding. There is also scope to ensure that 'institutional' support flows to specific disciplines, and specific departments, in universities, allowing smaller universities the capacity to develop areas of discipline or departmental strength and excellence. The allocation of funding to departments assessed as making a significant research contribution is also a more effective means of ensuring that funds flow directly to those departments that produce the highest quality research. The discipline-specific nature of the reviews overcomes the problems associated with the 'blunt instrument' of the Research Quantum or IGS and can help to ensure that the humanities and related disciplines are not disadvantaged. Finally, as research quality as measured by the RAE is said to have improved dramatically over the past decade[63] there is reason to believe that this approach may also improve the quality of Australia's research performance.

6.54 The Committee believes that this proposal has much merit. However it also recognises that the RAE is an extremely labour-intensive and costly exercise,[64] and may be difficult to justify when the funds to be distributed are much smaller than in the UK. It therefore considers that the feasibility of adapting some form of RAE system for the Australian context should be examined. There may also be value in

60 Submission 362, Premier of Victoria, p.11

61 What is the RAE 2001 at http://www/rae.ac.uk/AboutUs/

62 Submission 49, Professor John Quiggin, p.38

63 What is the RAE 2001? at http://www.rae.ac.uk/AboutUs/

64 G Harman, *Allocating Research Infrastructure Grants in Post-binary Higher Education Systems: British and Australian Approaches*, Journal of Higher Education Policy and Management, Vol 22, No 2, 2000 p.114

having the feasibility study examine a combination of the RAE and Dutch systems of research assessment as well as recent New Zealand proposals.[65] This issue is taken up in the recommendation in Chapter 4, para 4.133, as a matter that could be referred to the proposed advisory body.

6.55 There is a need to review the balance between the level of 'block ' funding provided under the Research Quantum/IGS (or any successor funding program) and that provided under competitive grants. Block funding arrangements for research are particularly valuable to universities because they allow flexibility and continuity, allowing more scope to undertake the 'blue-skies', speculative research that has led to important advances in knowledge throughout history. By providing continuity and flexibility, block funding supports the integration of basic and applied research and teaching. It also, as the Vice-Chancellor of the University of Sydney argued, facilitates universities' capacity for strategic management, in contrast with the current arrangements under which:

> the earmarking of funds for special projects and the increasing use of the mechanism of seeking matching funds for new initiatives restrict capacity for strategic management at institutional level. Accordingly, we argue that attention must be given to the method of provision of funds as well as to the quantum.[66]

6.56 The distribution of funds between block research and research grants, as set out in Table 6.1,[67] is skewed too far in favour of grant-based research. This imbalance will be exacerbated when the additional funds for competitive grants, flowing from the Backing Australia's Ability initiative, come on stream.

Recommendation Eighteen

The Committee recommends that the Government review the balance between the level of block funding provided under the Institutional Grants Scheme (IGS) and that provided under competitive grants.

Recommendation Nineteen

The Committee recommends that the Government consider removing the following two items as components of research income for the purposes of the IGS:

(a) universities' own investment of funds (from endowment income etc) on research; and

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65 ibid. p.124

66 Professor Gavin Brown (University of Sydney and Go8), *Hansard*, Sydney, 17 July 2001, p.1023

67 Funding provided under the RIBG is not counted as block funding for the purpose of this discussion because it is designed to fund the overhead costs of research grants

(b) income from consultancies that do not involve the development of new knowledge.

ARC funding schemes

6.57 The ARC is now responsible for the administration and allocation of all of the competitive project schemes funded from the DETYA portfolio. These schemes support research across all major disciplines apart from medicine and dentistry. An overview of these schemes is provided at Chart 6.1.

6.58 While all institutions are able to compete for funding under the ARC schemes, in practice the more established universities win most of the support under most programs. For example, each of the Go8 universities has a Special Research Centre (with four having two centres) while only 6 of the 'others' have such centres. In 2000, the Go8 also won over 60 per cent ($64.5 million) of the funds allocated under the Large Grants Scheme. The Australian Maritime College won $123,462 in funding under this scheme while at the other end of the scale, the University of Sydney won $13,104,773. This pattern is generally repeated for the other schemes.

6.59 The Committee heard a range of criticisms of the ARC grants schemes. However only some of these relate to the specific arrangements and current policy settings for the schemes: others relate to features inherent in competitive project-based funding. While there were many suggestions for improvements to the ARC schemes and for a better balance between grant-based funds and support for the general research activities, few submissions recommended that the competitive grants schemes be abolished or radically reformed. Most also welcomed the recent decision to double the funding for these schemes over the next five years, although most also thought that increases needed to flow far more quickly.

6.60 Criticisms of the ARC funding schemes, particularly the large grants schemes, include the fact that they are based on an 'experimental science view of the world where objectives are specified in advance'[68] and are biased against the humanities. This is not readily apparent: the success rate for humanities' grant proposals is slightly higher than average (22.9 per cent against an average of 22 per cent) while that of the social sciences is only marginally below average. However there are more categories applying to the physical and natural sciences, with the result that 70 per cent of all grants were awarded to the sciences in 2000. The average size of grants awarded to the sciences was also much higher.[69] In summary, the real problem is that Discovery grants are a shrinking proportion of total funding while industry-related grants are growing fast. While this may reflect the different cost structures for the sciences, it does disadvantage the capacity of the humanities and social sciences to attract funds under the Research Quantum.

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68 H Clarke, *Prioritising University Research: A critique of the Kemp reforms*, Agenda, Vol 8, No 1, 2001, pp.56-58

69 Australian Research Council, *Annual Report 1999-2000*, Table 6.3, p.61

CHART 6.1: OVERVIEW OF ARC FUNDING SCHEMES

Scheme	Purpose	Features	Allocations in 2001
Discovery – Projects (amalgam of the Large Research Grants and Research Fellowships Schemes)	Grants: To support research likely to lead to significant conceptual advance in understanding and knowledge of a subject, important discoveries or innovations or practical outcomes of social and economic value; Fellowships: To pursue internationally competitive independent research and to provide career development for promising researchers	Support research by teams and individuals; Primary criterion is excellence Researchers can customise their combinations of research and research fellowships Applicants for grants can seek up to 5 years funding and between $20,000 and $500,000 funding	Total: $107.6 million allocated for Large Grants in 2001 (new and ongoing) and average grant size (for new grants) is $60,073; Total of $27.4 million for fellowships (new and ongoing) in 2001 (100 new fellowships awarded in 2001)
Discovery-Indigenous Researchers Development	To encourage participation in research by Indigenous Australians	Support to enable researchers to be competitive in applying for mainstream ARC grants	Total $224,752 in 2001; including $179,159 for 7 new grants
Special Research Centres	To support excellent basic research and research training with strong international links	19 SRCs currently funded; Funding for 9 years with reviews in 3rd and 6th years	Total for all SRCs: $15.2 million
Federation Fellowships (new program announced in *Backing Australia's Ability*)	To attract and retain outstanding Australian researchers in key positions	125 new fellowships over the next five years; each fellowship is worth $225,000 a year for five years	First fellowships to be funded in 2002
Linkage- Projects (replaces SPIRT program)	To support collaborative research and research training between universities and industry	Incorporates support for grants, postgraduate awards and postdoctoral fellowships; research projects and research training can be combined; Industry contribution in cash or kind required Applicants can seek up to 5 years funding and grants of $20,000 to $500,000	$57.9 million for new and ongoing projects was allocated in 2001 (matched by industry contribution totalling $79.8 million)
Linkage-Infrastructure (Previously Research Infrastructure- Equipment and Facilities)	To encourage universities to develop collaborative arrangements amongst themselves or with organisations outside the sector to develop research infrastructure	Applications to involve two or more institutions; Minimum grant $100,000; funding for one year	Total: $24.7 million for 75 new projects in 2001
Linkage-International (previously International Researcher Exchange (IREX)	To support movement of researchers between Australian institutions and international centres of research excellence	Includes fellowships (under agreements for reciprocal exchange) and awards	Total: $2.9 million (for fellowships and new and ongoing awards)
Key Centres of Teaching and Research	To support applied, industry-related research and promote postgraduate training in areas of national priority	Funding for 6 years with review in 3rd year	$3.9 million to support 12 Key Centres
Special Research Initiatives	To support activities encouraging greater collaboration among Australian researchers	Development of international research linkages or cooperative development of high quality capacity in innovative areas	No new SRI projects funded in 2001 (as at 31 July 2001)
Learned Academies Special Projects	To support special projects carried out by these bodies	Grants are provided on a competitive basis	Total $439,757 for 3 grants

6.61 The ARC model is also said to lack the flexibility needed to support research in new and emerging disciplines[70] and early career researchers and has not supported the establishment of a centre for mathematical sciences along the lines of the Max Planck institute.[71]

6.62 The work associated with grant applications is also a significant and unwelcome burden at a time when staff are under pressure from increasing workloads;[72] this is exacerbated by the requirement, under the 'partnership' schemes such as SPIRT and the CRC programs, to obtain financial contributions from industry 'partners':

> The time taken to solicit contributions from industry is immense (and not judged as workload). Australian industry is notorious for not contributing to research, unlike its counterparts in other countries. Yet industry money is increasingly required before a grant can be considered. While I have been reasonably successful with SPIRT grants because my current area of research (e-healthcare) is attractive to industry I have also had the disappointment of being involved in a major e-healthcare CRC application that failed, largely because we could not get enough industry support…[73]

Focus on industry funding

6.63 With 'linkage' programs, that are designed to link university-based research with the users of research (mainly industry), now accounting for 40 per cent of ARC grants funds[74] the workload associated with soliciting industry funds can be extremely high. The inclusion of income from industry in the formula for the IGS block funding from 2002 and in the new RTS funding formula (discussed in more detail in a subsequent section), will intensify the pressure on universities to chase industry funds for research.[75] Apart from the adverse effect that this weighting has on workloads and on the proportion of funds available for basic research (or 'discovery'), there are very real questions about whether Australian industry will have the resources and commitment to invest at the level envisaged under current research funding formulae.

6.64 Information on research funding trends over the last 6 years shows that 'industry and other' funding of research increased from $219.6 million in 1996 to $287.9 million in 1999 (representing 32.5 per cent of all research funding in 1999). At the same time, there is evidence that there are some real constraints on universities' capacity to attract industry funds. Notwithstanding the strong incentives, under current

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70 Professor Janice Reid (University of Western Sydney), *Hansard*, Sydney, 17 July 2001, p.1018

71 Submission 231, The Australian Mathematical Society, p.2.

72 Submission 60, The Australia Institute, Part 2, page x

73 Submission 108, Dr Ken Harvey, p.5

74 Professor Vicki Sara (Australian Research Council), *Hansard*, Canberra, 13 August 2001, p.1320

75 M Gallagher, *The Emergence of Entrepreneurial Public Universities in Australia*, Occasional Paper series 2000E, September 2000, p 19 (Mr Gallagher refers to this as 'greater incentives' for universities to attract funding from industry)

funding formulae, for universities to 'grow' their research income from industry, industry investment in research had fallen in a number of universities over the past few years and eight universities obtained less than 20 per cent of their research income from industry.[76] In this context, the Committee notes that the Government's recent commitment, under *Backing Australia's Ability,* to double the level of funding for ARC grants over the next five years, could be taken as an indication of the failure of its *Knowledge and Innovation* strategy to deliver an internationally-competitive level of research investment.[77]

6.65 An over-reliance on industry funding carries with it a range of limitations, including reduced institutional discretion in the use of funds, and a distortion of research effort towards those disciplines with most relevance to industry, and away from both the humanities and the basic 'or enabling' sciences, particularly mathematics and, to a lesser extent, physics.[78] In the longer term, this is likely to lead to an erosion of the research capacity in areas that underpin research capacity in the more applied sciences such as engineering as well as in the humanities. It is also likely to lead to increased, and frequently unproductive, competition for available funds.

6.66 The Committee wishes to make it clear that it is not opposed to the development of university partnerships with the private sector. It believes that such partnerships can make a major contribution to improving innovation in industry and the transfer of skills and knowledge to the broader community. However it does not believe that the current policy and funding framework, with its heavy weighting towards industry investment in research, is the best - or only - way to promote these outcomes. Current policy and funding arrangements are also likely to further disadvantage those universities, including regional and remote universities, with limited scope for attracting industry income and, as discussed, will also shift funding away from the humanities and enabling sciences. By rewarding the generation of research income and activity, they shift the focus further away from the quality and intrinsic value of research. Other issues associated with industry funding of research are discussed is in the later section on capturing the benefits of research.

6.67 The Committee believes that the current emphasis on industry funding in grants schemes, as well as in the IGS and RTS, together with greater emphasis on matching grants reflect an ideological bias towards industry funded research both as a means of promoting the relevance of research and of reducing universities' reliance on government funding. A preferable approach would be to replace rigid (and possibly arbitrary) allocations and weightings for industry linked research with a policy of support for the highest quality research across the spectrum.

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76 ibid., p.19

77 Submission 283, NTEU, p.17

78 Note that other disciplines such as law (and statistics and accountancy) can also be considered to be enabling disciplines that are necessary to support the development and exploitation of knowledge in other fields

Other issues related to grant based funding

6.68 The fixed life of grants also creates problems, particularly in a tight funding environment. Even highly able researchers may find it difficult to sustain a career in research on funding which is repeatedly contestable. Low overall success rates mean that even the best researchers are likely to miss out at some point and may then, depending on their circumstances, need to find alternative employment, resulting in the loss of much valuable research expertise.[79] Project grants also skew research into more manageable, predictable areas where precise objectives can be formulated in advance.[80] This also restricts universities' capacity for strategic management at the institutional level and complicates the management task.[81]

6.69 While the need for some mechanisms to support and promote quality and excellence in research is apparent, the dilemma is how to frame criteria that will achieve this. One submission noted that:

> While some measurement of 'research productivity' is meaningful, it is almost impossible to judge the significance of particular work in the short to medium term. It is this difficulty which makes research, in this sense of the term, so difficult to manage. I would not argue that research should be free of any planning or assessment. There is clearly a need to choose between grant applications and some value in counting up books and articles as one kind of output, but we should not fool ourselves that we can do any of this very well. The really significant outputs are very likely to be quite unpredictable — and perhaps not from universities at all![82]

6.70 Notwithstanding the problems associated with the ARC grants schemes, they have performed a valuable role in supporting high quality research and providing intensive research opportunities for capable individual researchers or teams, irrespective of institution. However the current defects in the schemes need to be addressed, in particular the need to ensure adequate support for both basic and applied research and for the humanities and social sciences. The ARC also needs to ensure that its criteria and arrangements are able to provide support for emerging disciplines and early career researchers.

6.71 Many of the criticisms of the ARC grants schemes arise because, for many individuals, they provide the only opportunity for them to pursue an active research program. Increased funding of core operating grants, and the block funding of research, would enable many more academic staff to undertake ongoing research, particularly in the humanities where the main requirement is, as one academic noted, for time and access to a library. In addition, a move to disciplinary-based funding in place of the current Research Quantum/IGS, would also remove some of the pressure

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79 Submission 88, Professor Charles MacKnight, p.12

80 M Considine and S Marginson, *The Enterprise University,* Cambridge University Press, 2000, p.141

81 Emeritus Professor Mairead Browne, *Hansard,* Sydney, 18 July 2001, p.1023

82 Submission 88, Professor Charles Macknight, p.5

for academics to chase grant funding. Finally, a better balance between grants based funding and block funding would overcome many of the problems associated with an over-reliance on grants based funding.

Recommendation Twenty

The Committee recommends that Australian Research Council grants schemes be reviewed to ensure they reflect:

- **adequate support for both basic and applied research and for the humanities and social sciences;**
- **support for emerging disciplines and early career researchers; and**
- **implementation of a range of strategies to assist new universities to develop their research and training capacity.**

Recommendation Twenty-One

The Committee recommends that the Government double the number of research fellowships available to Australian researchers. Such fellowships should assist both early and mid career researchers, as well as providing a new range of assistance to outstanding researchers through a new program of elite fellowships designed to retain our brightest minds in Australian universities.

Research Infrastructure Block Grants (RIBG)

6.72 The RIBG provides another mechanism for funding research infrastructure in universities. Its stated purpose is to 'meet the project related infrastructure costs associated with competitive grants, ensure that areas of recognised research potential can develop, provide support for areas of research strength and remedy deficiencies in research infrastructure.'[83] It is intended to cover the 'overhead' resources essential for delivering research and training projects or programs, such as libraries, computing centres, animal houses; equipment purchase or hire, installation and maintenance, telecommunications and salaries and services for support staff. In practice, however, it provides funds to cover the infrastructure costs associated with competitive research grants. Under the RIBG, universities receive 19-20c for every $1 that they receive in competitive grants.

6.73 Once again, institutions' share of the funds varied significantly from $10.738 million for the University of Melbourne to $481 for the University of the Sunshine Coast. Total funds were $82 million in 2001 or just over one third of the amount allocated under the Research Quantum. While funding under the RIBG will double over the next five years, this will simply maintain the current funding ratio of 20 cents

83 DETYA, *Higher Education Report for the Triennium 2001-2003,* March 2001, p.159

for each dollar of competitive grants funding in the context of a doubling of that funding under *Backing Australia's Ability.*

6.74 This main criticism of the RIBG is that the ratio of infrastructure to grant support of 19-20or each $1 is grossly inadequate.[84] It compares unfavourably with the ratio used in the United Kingdom, where 45 per cent of staff costs are covered under infrastructure funding, and the United States, where infrastructure costs are funded at more than 50 per cent of the value of the grant.[85] As a result, those institutions that are most successful in attracting competitive research grants are likely to experience further pressure on their research infrastructure. On the other hand, those that are unsuccessful in securing competitive grants under the Competitive Grants Scheme have no access to this source of funding, and no capacity to develop the infrastructure that might assist them to become more competitive. While the changes to the grant funding arrangements under *Backing Australia's Ability*, including the payment of full salary costs of research staff awarded grants will overcome the pressure on research infrastructure previously built into the competitive grants, they do not address this problem.

6.75 The clear evidence of rundown in infrastructure under the prevailing funding arrangements indicates that there is a need to increase the level of support provided under the RIBG.

Recommendation Twenty-Two

The Committee recommends an increase in the level of support provided under the Research Infrastructure Block Grants scheme (RIBG). To limit the immediate budgetary impact, this could be done on a phased basis, until the ratio reaches the level of 45c expenditure on infrastructure for every dollar of competitive grant income.

Research Training Scheme (RTS)

6.76 Under the *Knowledge and Innovation* policy changes, funding for research training will be removed from operating grants and placed in a contestable pool. Universities' allocations will be based on 'performance' against a 'broad quality verification framework' and a formula weighted towards those institutions with a strong research profile. (Weightings will be 40 per cent for research income, 50 per cent for research training completions and 10 per cent for publications). The number of higher degree research places will be reduced from 25,000 to 21,500;[86] funding will be limited to a maximum duration of four years for a PhD or two years for a Masters

84 Review of Higher Education Financing and Policy, Final Report, *Learning for Life*, April 1998, p.161

85 Submission 351, Australian Research Council, p.5

86 DETYA: Education: Research: Changes to Higher Education Funding (at http://www.DETYA.gov.au/highered/research/index.htm)

degree. The objective is to build critical mass and excellence in *existing* areas of strength.' [87]

6.77 The RTS changes are intended to address perceived problems in the management of research and research training including unacceptably low and delayed completion rates for research higher degree students as well as graduate dissatisfaction and criticisms from employers about the employability of some research graduates.[88] These problems are seen to be largely attributable to the poor supervision and support provided to many postgraduate research students.

6.78 Submissions from some universities and student associations raised serious concerns with the new RTS arrangements. The problem of low completion is said to be imagined, because the data used fail to account for part-time students and those with interrupted studies, and, in any case the RTS addresses the symptoms rather than the causes of any problem. Poor supervision is said to be at least partly the result of workload pressures on staff. [89] The poor income support structure for many research students also restricts their capacity to devote themselves full-time to their studies.[90] One submission noted that the lack of a good understanding of the elements of effective research training hampered the development of effective training arrangements.[91]

6.79 Interestingly, one of the main assumptions underlying the RTS arrangements, that is, that shorter periods of research training will provide better outcomes, is at odds with the arguments that the Department of Defence raised in favour of longer PhD programs as a better preparation for a research career.[92]

6.80 Submissions also claimed that there would be a number of adverse consequences flowing from the RTS. Universities' selection of research students would be influenced by their likelihood of completing in the required timeframes, which may disadvantage women, and members of other equity groups who have (or are perceived to have) longer completion times. Speculative or 'risky' research projects and disciplines requiring long periods collecting data will also be discouraged. Better-resourced universities are likely to poach students from less well funded institutions who are near completion.[93] Emerging or new research disciplines do not fit neatly into the criteria for identifying areas of disciplinary excellence and

87 Submission 281, RMIT, p 23

88 Knowledge and Innovation: A policy statement on research and research training (at http://www.DETYA.gov.au/archive/highered/whitepaper/1.htm)

89 H Clarke, Prioritising University Research: A critique of the Kemp reforms, Agenda, Vol 8, No 1, 2001, p.51

90 Submission 54, Dr Linda Hort, p.4

91 Submission 102, Centre for the Study of Research Training and Impact, p.3

92 Submission 109, Department of Defence, p.2

93 Submission 236, CAPA, p.14

are less likely to gain support. RMIT asked for more recognition by funding agencies of the value of some of the emerging research disciplines:

> This research work is of high value, not in terms of the income attracted, but in terms of the contribution to the innovation cycle of enterprises. It is often undertaken by part-time students already employed in industry and working at the forefront of discovery. A hallmark of these emerging disciplines is that they do not have a track record or established research tradition. While the existing incentives strengthen and enhance the drive to excellence and critical mass needed to underpin Australia's research performance, it impedes the evolution of research in the new and emerging disciplines.[94]

6.81 The removal of funding for 'gap' places (that is postgraduate research places filled on a HECS-liable basis because they are above the DETYA-agreed load of HECS-exempt places) as part of the phasing in of the RTS, is also a source of concern, particularly for newer universities. Institutions that have traditionally catered to low socioeconomic status students and regional students and have used the opportunity for providing HECS-liable research training places to expand opportunities, will be particularly disadvantaged by the removal of the so-called gap places:

> Thus, regional institutions are faced with cuts of 800 Higher Degree Research (HDR) places while the whole Group of Eight, with a substantially larger base of research places, is cut by only 663 HDR places. Three universities most associated with extending access – the University of Western Sydney, Deakin and RMIT – will suffer the highest individual loses with combined cuts of 1023 HDR places from a 2000 base of just 2005 HDR – a cut of more than 50%.[95]

6.82 The Vice-Chancellor of the UWS explained further that:

> While the phasing in of the impact of [the white] paper was very welcome to us, it is having a devastating impact on our research profile and we will continue in a downward spiral unless there is some mode of arresting that impact. In the year 2000 we admitted – and remember we have a 35,000 student base- 190 new research students within operating grant. This year, in 2001, we will only be able to take on about 60 students. Over the four years in which this well be phased in we will lose half the 635 places we had in 1999.[96]
>
> We recognise the rationale behind the White Paper but the fact is that for some universities, and us in particular, it has pulled the rug out from under the university at a time when it was beginning to build a research profile. This is undoubtedly valuable for the region. It is interlinked with the needs

94 Submission 281, RMIT, p 23

95 Submission 236, CAPA, p.15

96 Professor Janice Reid (University of Western Sydney), *Hansard*, Sydney, 17 July 2001, p.1009

> of industry and particularly interlinked with the social and economic needs of Greater Western Sydney.. and will not [enable them to] build that research profile [that the community had expected when they were established].[97]

Professor Reid suggested that the Government consider some developmental funding to allow universities such as hers to be able to develop the profile it needed to compete on a less disadvantaged basis.

6.83 The Northern Territory University also argued that the new arrangements would limit their capacity to undertake research '*in* the Territory on issues of special significance *to* the Territory'.[98] James Cook University, based in northern Queensland, had similar concerns.

6.84 The Committee considers that the concerns of regional and 'emerging' universities are well-founded. The RTS accounts for the single largest source of research funds from the DETYA portfolio (Table 6.1 refers). Funds for research training provide for a significant proportion of the intensive research undertaken in universities. They also help universities to develop the next cohort of academic research staff. The loss of these places will therefore have a significant effect on universities' capacity to undertake research, much of which, for regional universities, is on issues of concern to the local economy. It will also erode these universities' capacity to develop the research capacity that is an essential component of quality teaching.

6.85 The University of Western Australia presented the view from the other side of the university divide, being supportive of the principle of moving funding of research training onto the more competitive arrangements under the RTS. However it argued that the across-the-board formulae would *not result in enough* redistribution of research places to those better equipped to provide research training:

> The concern reflects the inadequacy of DETYA control over higher degree by research places over several years during which places have grown most dramatically in universities with very modest research facilities, cultures and performance.[99]

6.86 The need to concentrate research training places was also argued forcefully by Emeritus Professor Karmel:

> It would raise research quality generally and enhance students' training experiences. It would certainly be in the interests of the research students. It would also correct the tendency to enrol excessive numbers of research students in some institutions for reasons of funding or prestige. Evidence of

97 ibid.

98 Submission 124, Northern Territory University, p.4

99 Submission 134, University of Western Australia, p.5

> this tendency is that over the years 1989 to 1999 research student numbers have risen from 14,500 to 37,000; of the latter 8,500 are at institutions which were not universities ten years ago.[100]

6.87 However he believes that the new arrangements would once again emphasise quantity over quality and lead universities to compete aggressively with each other by enrolling as many research students as possible, to maintain their relative share of a fixed quantum of funding.[101] He recommended an alternative approach, with funding directed to students on the basis of a national ranking system, in part to facilitate students moving to different institutions and broadening their experience.[102] The Academy of Sciences also supported the granting of support to research students, based in merit, rather than to institutions.[103]

6.88 A final criticism of the RTS is that the reduction in the number of places runs counter to the need to bolster our research capacity, particularly when more than 60 per cent of research and 35 per cent of publications in Australian universities are the work of research students.[104] RMIT noted that:

> This reduction in the number of researchers in training comes at a time when Scandinavian and [other] European countries that have embraced the knowledge economy are experiencing there is an emerging shortage of researchers.[105]

Comment

6.89 Research training is costly and there is a need to ensure that funds allocated for this purpose are used wisely and that research students receive the best possible support and supervision. The Committee recognises, in this context, that there is a need to ensure that research training is only undertaken in those departments within universities that can provide the necessary support and supervision. However it does not believe that the RTS arrangements are the best way of ensuring that this occurs. The RTS formula entrenches many of the problems with the Research Quantum/IGS: it is biased towards some disciplines and it provides no guarantee that funds will flow to the departments or disciplines within institutions that provide the necessary support and supervision. Further, it is important to note that the RTS adopts a ratio of 1:2.35 when funding non-laboratory and laboratory disciplines respectively. Consequently, the amount for the humanities and social sciences is quite inadequate.

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100 Submission 8, Professor Peter Karmel, p.1

101 ibid., p.12

102 Ibid, p.15

103 Submission 335, Australian Academy of Science, p.4

104 Submission 237, University of Melbourne Postgraduate Association, p.4

105 Submission 281, RMIT, p.23

6.90 There is a need to ensure that RTS places can remain available to those departments that can provide the highest quality research training experience, irrespective of the overall performance of their institution. This could also help to ensure that some of the new universities can retain the capacity to build their research profile and compete for future research funding on the basis of a slightly more even playing field. DETYA should also consider reviewing the RTS criteria so that research in emerging disciplines can be supported as these are areas where major contributions to innovation can be made.

6.91 The completion criteria should also be reviewed to better reflect the average range of completion times for different disciplines. There is merit in undertaking research on the circumstances that promote effective research training so that future policies are soundly based. Finally proposals for a RTS should be reviewed within the context of a broader policy framework for the development of a vibrant research capacity over the longer term.

Recommendation Twenty-Three

The Committee recommends that DETYA review the Research Training Scheme (RTS) criteria so that research in emerging disciplines can be supported as areas where major contributions to innovation can be made.

Key principles

6.92 Submissions and witnesses to the inquiry raised a number of issues with the broader policy and funding framework for university-based research. As indicated, these include the balance between applied and basic research, the concentration of funding on disciplines and among institutions and the commercialisation of research.

Concentration

6.93 Some of the issues related to concentration of research have been discussed in the previous sections of this chapter on funding formulae. This section summarises the issues relating to concentration of research activity and suggests directions for the future.

6.94 Concentration and selectivity have been 'the driving principles' of research policy in Australia since the introduction of the UNS and competitive funding mechanisms have been the instruments of implementation.[106] This has been largely dictated by concerns about the escalating costs of infrastructure, including laboratory equipment and library holdings, and a belief in the concept of the importance of a critical mass of researchers to produce quality research.[107] Although many consider

106 *M Considine and S Marginson, The Enterprise University, Cambridge University Press, 2000,* p.142 quoting senior DETYA official

107 Senate Standing Committee on Employment, Education and Training, *The Organisation and Funding of Research in Higher Education,* March 1994, p. 69

that these factors are more relevant to the SET disciplines where equipment costs are important and where a team approach to research is often the preferred model, and are less applicable to the humanities,[108] the principle has been enforced across the board. The recent changes to research training under the RTS will have the effect of further concentrating research activity.

6.95 Past reviews have questioned the merits moving further down the path of concentration. An ARC study found that there was 'no clear conclusion' that concentration led to better outcomes: the 'calibre of staff, availability of funds and amount of time available for research' were likely to be equally important.[109] A report of the predecessor to this Committee concluded, in a 1995 report, that concentration should not be at the expense of allowing each university to 'sustain a research environment across all its disciplines so that sites of excellence can mature to a level where they will be in a position to benefit from prospective funding mechanisms'.[110]

6.96 The submission from Griffith University echoed these concerns:

> There is also evidence that as well as exhibiting a shortfall in vision for higher education, policy thinking is bogged down in now outmoded concepts. The Federal Government's *Knowledge and Innovation* policy statement on research and research training, for example, while producing a much needed boost in funding, reaffirmed competition, efficiency and critical mass as the guiding principles for the allocation of resources. Yet, the Higher Education Funding Council for England recently cast doubt on the value of "critical mass" as the basis for the allocation of research funding, noting that it "chokes off essential seed corn funds for developing research groups, developing research areas, and collaborative research endeavours. [111]

6.97 The submission from Griffith University pointed out that, taken to extremes, concentration would also inevitably lead to a divorce between teaching and research, with a significant loss to innovation potential:

> The focus of the Government's Innovation Statement, 'Backing Australia's Ability', is discovery and the extension of the knowledge base, rather than the dissemination of that base through teaching. Many of its programs reflect a strong commitment to the 'selectivity and concentration' theme which has been a persistent feature of most research policy documents of the last twenty years. It points in the direction of greater specialisation and concentration of research funding in the hope of achieving more world class centres of excellence. The implication of such policies is that teaching will

108 ibid., p. 73

109 ibid., p.74

110 Senate Standing Committee on Employment, Education and Training, *The Organisation and Funding of Research in Higher Education*, March 1994, p.95

111 Submission 63, Griffith University, p.3

> be a broadly based activity across institutions, while research will increasingly be focussed, for each theme or topic, in a smaller number of institutions.[112]
>
> The resulting greater bifurcation of academic work between teaching and research seems to be accepted in some universities and by some policy makers as inevitable and even desirable. In fact, however, some version of the teaching-research nexus is essential if universities are to maintain and enhance their contribution to the knowledge-based economy. Research and discovery feed two distinct but interconnected processes. One leads, in many cases, through various stages of development and application, to commercial outcomes, to innovation, skilled jobs and exports. This is the focus of the Innovation Statement.[113]

6.98 RMIT also argued strongly, as did a number of other universities, for an approach that ensures that all academics have the opportunity to undertake research:

> We use the Boyer model of scholarship to integrate our teaching and research activities [EL Boyer, 1990, *Scholarship reconsidered*, Carnegie Foundation]. Boyer's model proposes four forms of scholarship: discovery - creating new knowledge; integration - knowledge put into a social and intellectual context; application - applying knowledge in useful ways for individuals, industry and institutions; teaching - facilitating student learning and developing scholars in all areas.
>
> This understanding of scholarship as a continuum of practices departs from the traditional conception of research and teaching as separate activities, brought together only when teaching staff pass on the fruits of their own research to students. RMIT also believes that this wider view of scholarship links us better with the needs of industry for knowledge and skills in all of the four scholarships. It is essential to the quality and relevance of our programs that staff engage across the range of scholarships, and the format for academic and teaching workplans has been rewritten to reflect this.[114]

6.99 Policies supporting the concentration of research increased the importance that institutions accorded to research performance. Research is the only area where universities have some capacity to influence the amount of Commonwealth funding that they received, by increasing their performance – or some might say 'playing the formula.'[115] Recruitment and promotion practice accordingly place a great importance on the individual's research performance. James Cook University, for example, stated that:

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112 Submission 63, Griffith University, p.7

113 ibid, p. 7

114 Submission 281, RMIT, p.14. See also Submission 310, University of South Australia, p.4; And Submission 202, Professor Barbara Van Ernst, Vice-Chancellor, Lilydale campus, Swinburne University of Technology, p.6

115 Submission 8, Professor Peter Karmel, p.12

> research is no longer discretionary. Along with teaching and administration, Research is one of the performance criteria against which we gauge our staff in terms of their suitability for promotion and in terms of their competence. It is no longer an option for them to choose whether or not they do research.[116]

Another submission made a similar point:

> It is not only that maintenance of research and scholarly reading is a crucial part of professional self-respect, but also that research results and the obtaining of research grants are now *the* dominant factor in performance assessment and promotion (some would say that this is an undue dominance, with adverse effects on the value placed on teaching). One reason for this emphasis on research outcomes is that research, rather than teaching, is an area where individual effort can achieve extra departmental and Faculty funding through the distribution of the Research quantum and through the research funds dispersed by the ARC and NHMRC.[117]

Several recent surveys had confirmed that research was of higher priority for many academics than teaching, both because of its intrinsic rewards and because of the importance of a good track record in research for career prospects.

6.100 There are valid concerns that research policy in recent years has gone too far down the path of increased concentration. However, in cases of limited funding, there are also benefits in ensuring that resources are not spread too thinly. The Committee acknowledges that in some disciplines, particularly in the SET area, there may be a need to support larger groups and teams for optimum results. However the current arrangements do not appear to provide sufficient opportunity for new research areas to develop and for new institutions to develop a research capacity. The Government could consider a range of strategies or programs to assist new universities to develop their research and research training capacity. The ARC could also consider better ways of incorporating the needs of both the humanities and social sciences and emerging disciplines into the criteria for their schemes. A better balance between block funding of research (particularly one that, like the UK RAE approach, is directed to individual departments, rather than institutions), would also provide an important avenue for talented researchers, including early career researchers, to develop a research career.

Focus on national priorities

6.101 In 1990, the then Dr David Kemp, the current Minister for Education, Training and Youth Affairs, put the case against an excessive reliance on national priorities in research:

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116 Professor Bernard Moulden (James Cook University), *Hansard*, Townsville, 12 July 2001, p.906

117 Submission 178, Australian Federation of University Women, p.4

> When the research effort is tightly constrained by centrally determined 'national priorities', when the research environment is subject to constant uncertainty and disruption, when governments increasingly seek to determine how research will be managed, creativity can be stultified and innovation harmed.
>
> These risks are currently being incurred in Australia and I simply note the recent comment of the Australian Vice-Chancellors Committee that the research infrastructure of higher education in this country is being damaged by unwise government intervention — intervention which is justified as micro-economic reform, but is in reality forced restructuring according to government ideological whim.[118]

6.102 However the policy changes that he subsequently introduced under the *Knowledge and Innovation* policy statement reflect a clear focus on research as a means of achieving broader government policy objectives. This approach is in marked contrast to the Government's approach to undergraduate teaching, where the market has been left to determine the balance of teaching between various disciplines and specialisations.

6.103 The Australia Institute noted that an undue influence on steering research towards national priorities can have adverse implications for academic freedom:

> Placing limits on the capacity of universities to set their own priorities for teaching or research can, in turn, place subtle or overt downward pressures on the autonomy of individual academics.[119]

6.104 It can also add to the complexity of the management task in universities, as a result of the need to respond to shifting policy priorities.

6.105 When national priorities play an undue role in shaping research investments and activity, this can also have adverse effects on the maintenance of long-term research capacity across a broad range of disciplines. This is particularly the case when national priorities are focussed on responding to immediate pressures or on economic development, or perhaps more narrowly, industry development.

6.106 While it is legitimate and sensible for government to develop national priorities and for these to inform allocation of funds for research, national priorities should not drive or dominate resource allocation. The Committee believes that there is a need to ensure the primacy of curiosity-driven research in universities.

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118 Submission 143, Northern Territory Postgraduate Students' Association, p.5, Quoting Dr David Kemp (now the Hon. Dr David Kemp) in 1990

119 Submission 60. The Australia Institute, Paper 2, p.4

Disciplinary balance

6.107 The emphasis on harnessing the economic benefits of research, has gone hand with an emphasis on the disciplines of science, engineering and technology (SET) and medical and related sciences. This mirrors the experience of other OECD countries: the recent significant increases in investment in university-based research in countries such as the United Kingdom, Canada, the United States and Finland, have been focused on science and technology.

6.108 The social sciences and humanities are therefore sometimes considered mainly in terms of their role in supporting economic goals and the innovation agenda.[120] For example, the report of the National Innovation Summit Group argued the need for Australia to nurture its research capabilities in the social sciences and humanities because they can enhance the organisational, management, legal and marketing knowledge that it critical to successful innovation.[121]

6.109 While a recognition of the contribution that these disciplines can make to economic development and innovation is welcome, it is too narrow a view of their significance. In particular it ignores the important contribution that university-based research can make to social and cultural development.

6.110 The humanities play a unique role in the creation of knowledge and the development of understanding of our culture and society. They 'deal with the critical analysis of value and meaning and what some have called the critical transformation of existing knowledge that resolve uncertainty and doubt.' [122] The main goal of the humanities is to:

> make sure that debate is kept open on issues that profoundly affect Australians, individually, culturally and spiritually. The Humanities debate is ultimately about universal, ethical questions.[123]

6.111 The Australasian Association of Philosophy described the contribution that their discipline can make to the broader society:

> the interdisciplinary character of philosophy means that it has an important role to play in many areas of research in both the natural and social sciences, in the elaboration and exploration of the methodological and theoretical underpinnings of almost all human activities, in the exploration of basic

120 For example, the National Innovation Summit Group report argued that Australia must also nurture its research capabilities in the social sciences and humanities because they can enhance the organisational, management, legal and marketing knowledge that it critical to successful innovation. *Innovation: Unlocking the Future*, Final report of the Innovation Summit Implementation Group, August 2000, p.15

121 I*nnovation: Unlocking the Future*, Final report of the Innovation Summit Implementation Group, August 2000, p 15

122 Submission 30, Australian Catholic University, p.1

123 ibid., p.2

> issues concerning the nature and significance of human life and reality, and in the exploration of questions of ethics and morality.[124]

6.112 Professor John Quiggin also pointed out that disciplines such as philosophy, 'commonly seen as totally irrelevant to 'real life'', had developed the tools that have been fundamental to the design of computer hardware and software.[125] A strong capacity for research in the humanities and social sciences is also important to ensure that Australia could address social, economic and cultural problems that are unique to Australia, such as the problems of fiscal federalism and relations between indigenous and non-indigenous people in Australia.[126]

6.113 The submission from the Australian Catholic University expressed concern that the concentration of research funding on science and technology reflected a 'functional, utilitarian ethic' that underestimates and undervalues the contribution that the humanities and social sciences can make to the nation:

> Knowledge for its own sake has no meaning for Australian culture unless it serves practical and serviceable ends. This view of knowledge, reflected by Innovation funding, is risky and dangerously selective.[127]

6.114 The submission recommended that the concept of innovation should be broadened to include the contributions of the social sciences and humanities in knowledge innovation and that funding formula be reviewed to remove biases against the humanities and social sciences.[128]

6.115 Research in the humanities and social sciences is essential if we are to understand our own culture and society and respond effectively to the many economic and social challenges of the future. Universities are the only places in Australia that undertake research in the humanities and social sciences on any measurable scale. Their support of research in the humanities and social sciences is therefore essential.

6.116 The humanities and social sciences must not be neglected in the race to ensure that we can maximise the economic benefits of research. Universities' civic responsibilities and role as the critic and conscience of society must also be supported. This entails ensuring that adequate support flows to the social sciences and humanities and that there are sufficient funds for basic research. Above all it requires that universities are sufficiently funded to allow all staff the opportunity to pursue some research activity to promote a diversity of viewpoints.

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124 Submission 18, Australasian Association of Philosophy, p.2

125 Submission 49, Professor John Quiggin, p.22

126 Ibid, p 24

127 Submission 30, Australian Catholic University, p. 4

128 ibid., p.5

6.117 The Committee considers that the argument of the Professor Malcolm Gillies, President of the Australian Academy of the Humanities, in favour of a broadening of the role of the Prime Minister's Science, Engineering and Innovation Council to include the humanities and social sciences, would do much to redress the lack of focus on the value and contribution of the humanities and social sciences in current policy and funding arrangements for university-based research. Professor Gillies argued that a broad approach to innovation, embracing the humanities and social sciences, is essential and would be supported by such an arrangement:

> In other words, there are not scientific and technological questions that exist in isolation; the people of Australia matter and the knowledge of those people, which is reflected in the humanities and social sciences, is vital if we are going to have proper uptake of an innovative Australia.[129]

Recommendation Twenty-Four

The Committee recommends that the Government upgrade the Science, Engineering and Innovation Council into a Council with responsibility of providing expert advice across the widest range of disciplines, including sciences, engineering, the humanities and social sciences.

Balance between basic and applied research

6.118 The emphasis in *Knowledge and Innovation* on increasing industry capture of the benefits of research is claimed to lead to an increasing emphasis on applied research or research with an immediate practical application in mind. The NTEU claims that an increasing emphasis on applied research could in turn undermine the unique contribution that university research can make to innovation:

> universities are the sites that combine basic, applied and strategic research within the same department and sometimes within the same research teams; therefore allowing valuable synergies to develop.[130]

6.119 Submissions also noted that the available evidence indicates that innovation is strongly linked to patenting activity, which in turn relies heavily on publicly funded basic research.[131] The Council of Deans of Science argued that there is:

> irrefutable evidence internationally that says most of a nation’s wealth generation is from blue skies research, discovery research. .The laser … was the outcome of a brilliant piece of theoretical work.. 73 per cent of papers

129 Professor Malcolm Gillies (Australian Academy of the Humanities), *Hansard*, Adelaide, 4 July 2001, p.745

130 Submission 283, NTEU, p.16

131 Submission 283, NTEU, p.16; See also the Australian Research Council Annual Report 1999-2000, p.16 reporting the results of a study on the link between basic research, patenting and innovation: emerging high technology areas have been found to be heavily dependent on basic research

> cited in American patents applications come from publicly funded research, and it is over 90 per cent in Australian patents applications.[132]

6.120 Ironically, in that context, a focus on industry-funded, or industry-relevant research, could undermine the capacity of research to contribute to innovation. On the other hand, a focus on pure, curiosity-driven or blue skies research did not undermine the potential for the application of that research: applications of research often arise 'naturally' as an outcome of basic research.[133] This viewpoint was put by the chief executives of leading US high technology corporations in 1985, when they noted that:

> History has shown that it is federally sponsored research that provides the truly "patient' capital needed to carry out basic research and create an environment for the inspired risk-taking that is essential to technological discovery. Often these advances have no particular use but open "technology windows" that can be pursued until viable options emerge.[134]

6.121 An opposing view was presented in a recent report for the Government. The authors of a study on international trends in public sector funding of research conducted for DETYA in 1999 argued that the linkages and integration within the national innovation system were the key drivers for innovation:

> An alternative argument is that within a national innovation system, performance in the knowledge economy is determined less by knowledge creation than the 'distribution power' of the system, to ensure timely access by innovators to relevant stocks of knowledge…
>
> The traditional perspective [seeing investment in application as at the expense of research] we would claim is based on an outmoded view of both the knowledge production and knowledge application processes, and their interaction. Analysis of theoretical issues, international policies and actual patterns of investment indicate the emergence of a new model in which discovery and application are effectively fused, and linkages in both areas are of national importance…. Integrative capacity both within national science and innovation systems, and between different national systems (ie linkages) is likely to be a major determining factor in the future wealth of nations. There is evidence that policy priorities overseas are now focusing upon 'balanced' investments in discovery and linkages'.[135]

6.122 The Chief Executive Officer of the Australian Research Council (ARC), Professor Vicki Sara, also put the (personal) view that the current research paradigm

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132 Professor Charles MacGillivray, (Australian Council of Deans of Science), *Hansard*, Townsville, 12 July 2001, p. 853

133 Submission 283, NTEU, p.17

134 Quoted in Our Universities: Our Future, AVCC Discussion Paper, Support Paper E, Submission 315, AVCC

135 Matthews M and Johnston R, I*nternational Trends in Public Sector Support for Research and Experimental Design,* Evaluations and Investigation Programme DETYA EIP 99/8, Executive Summary at http://www.DETYA.gov.au/archive/highered/eippubs/eip99-8/default.htm

does not distinguish between applied and basic research, because of the speed of research and interaction between researchers.[136] The boundaries between basic and applied research are clearly not as rigid and impermeable as the categories might suggest and applied research can also inform and support basic research. Nevertheless, it remains useful to distinguish, as the ARC continues to do, between 'discovery', which 'is about ideas with long-term or no outcomes' and research with a focus on solving a specific problem.[137]

6.123 Government policy statements constantly affirm its commitment to continued support for basic research,[138]at the same time as encouraging more application-oriented research. The key is to achieve an appropriate balance, although this is not necessarily a simple matter:

> The Government believes that basic research serves as the foundation and catalyst to much commercial research and is a fundamental driver to innovation. The Government also recognises that our universities are the principal sites for basic research and that support for fundamental research must be sustained. At the same time, Governments have responsibilities to address social needs in cost-effective ways. It is a legitimate expectation that public investment in research will pay social dividends through contributions to problem-solving as well as providing commercial opportunities.
>
> Clearly there are tensions in the establishment of priorities for research. These are more acute in a time of budgetary restraint.[139]

6.124 The submission from CAPA argued that, notwithstanding this stated commitment, the changes to the ARC and research funding mechanisms will result in a shift in the balance away from basic to applied research.[140] In essence their argument is that the incentive structure in the research funding formulae is heavily weighted in favour of industry-funded research activity, which by definition, is applied research.

6.125 Basic research or 'discovery' is the wellspring of innovation and therefore vital to our future as a prosperous community. The Committee believes that government benefits from having access to sources of independent, expert advice on the characteristics and requirements of research, to ensure that policy is not overly influenced by prevailing Government policy concerns or orthodoxies. Enhancing the role of the Chief Scientist will go some way towards achieving this goal.

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136 Professor Vicki Sara (Australian Research Council), *Hansard*, Canberra, 13 August 2001, p.1320

137 ibid.

138 Knowledge and Innovation: A policy statement on research and research training (at http://www.DETYA.gov.au/archive/highered/whitepaper/1.htm), para 2.1.

139 ibid., para 2.6

140 Submission 236, Council of Australian Postgraduate Associations (CAPA), p.26

Recommendation Twenty-Five

The Committee recommends that the Office of the Chief Scientist be made a full time position.

Capturing the benefits of research

6.126 The commercialisation of research embraces a range of activities or policies including the orientation of research towards commercial needs, private sector investment in or sponsorship of research and the commercialisation of intellectual property. Commercialisation of research is promoted for two reasons in Australia: to increase the level of innovation in the private sector and to provide an additional revenue stream for universities.

6.127 The report *The Chance to Change* by the Chief Scientist put the 'innovation' argument:

> In view of Australia's considerable investment in public sector R&D, a near term return from this investment depends on industry capturing and exploiting public sector research outputs – ideas, skilled people for example.
>
> We must support initiatives that encourage the take-up of researchers and research by industry. Companies that wish to succeed in the new economy must be prepared to invest in new skills and technologies and align themselves with research institutions that perform basic research. Without this access and alignment, the downstream benefits to our society of basic research will be greatly reduced.[141]

6.128 The Australian National University submission highlighted the importance of this objective but suggested that income generation is also important:

> Commercialisation [of research] is important to universities for four reasons:
>
> 1. It offers a means for supplementing other sources of revenue to support teaching and research. This is especially important in the current environment of reduced operating grants.
>
> 2. It will assist in maximising infrastructure and other research support funding from the government via the forthcoming Institutional Grants Scheme and the Research Training Scheme. These respectively have weightings of 60% and 40% based on external research income, including income from industry and commercial sources.
>
> 3. It is an appropriate response to calls for universities to contribute to national innovation.

141 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.81

> 4. It allows universities to create a reward system for staff not otherwise possible from normal sources of revenue on which the conventional salary structures are based.[142]

Industry sponsored research

6.129 As discussed, federal research funding policies, as set out in the *Knowledge and Innovation* policy statement, provide strong financial incentives for universities to increase their reliance upon industry partnerships as a component of their overall research efforts. The AVCC Submission described the role of industry-related research and its place in the broader spectrum of university-research:

> Universities have actively engaged with industry to extend the range and extent of university research into areas of direct interest of Australian and international industry. This allows the wealth of talent employed by universities to increase its contribution to Australia's short and medium term research and development needs.[143]

6.130 In 1996 the proportion of university-performed research and development funded by industry was 5.2 per cent, up from 3.9 per cent in 1994;[144] the proportion remained 5.2 per cent in 1998.[145] This aggregate figure disguises significant differences between institutions: industry/private funding of research at the University of New South Wales was over 35 per cent in 1998.[146] It is interesting to compare this figure with the report that Stanford University, the successful US private university around which Silicon Valley grew, still receives 90 per cent of its research funding from government.[147]

6.131 Industry-related research usually involves some degree of industry investment in, or sponsorship of, that research and in framing research objectives. This may be accompanied by a requirement for industry to have exclusive access, at least initially, to the results of that research. As the AVCC noted, this can create tensions between the free academic exchange that has been the hallmark of university research and the requirements of industry:

> universities realise that there can be tensions between open access to research results and the preferences of those that fund the research; this applies whether the funding comes from industry or from a government department. Similarly, those funding the research may wish to put pressure

142 Submission 317, Australian National University, p.5

143 Submission 315, AVCC, p.5

144 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.9

145 Submission 81, Professor Simon Marginson, p.5

146 Submission 222, UNSW Postgraduate Association, p.5, Figure 2.

147 G Brown, *The Rising Costs of Aiming High* article in The Australian Higher Education Supplement 18 April 2001, p.33

> on researchers to reach only a conclusion that suits the purposes of the supporter of the research…
>
> In anticipation of these possible pressures, universities have policies and protocols to ensure that they preserve their reputation as a source of independent inquiry and advice – one of the most important of the tradeable currencies that universities have. These policies and protocols ensure that research results can be published in the open literature wherever possible, whilst still preserving appropriate confidentiality. [148]

6.132 Despite the steps universities have taken to develop effective approaches to the management of industry sponsored research, problems with current practices and arrangements clearly remain. As the level of industry investment in research increases, these problems will intensify unless satisfactorily resolved.

6.133 A problem identified in the submission from the University of New South Wales (UNSW) Postgraduate Students' Association was the development of a two-tiered system in universities:

> This is easily seen at UNSW where over the period 1996 to 1998 there were particularly large increases in industry funding in the areas of Commerce and Economics, Engineering and Science. In Engineering alone the industry funding grew from $2.05 million to $3.38 million. While this trend is encouraging for these disciplines, no such reciprocation was seen in the arts, humanities and social sciences.[149]

6.134 Industry investment in research is also having a major effect on the research undertaken by postgraduate students at UNSW:

> There has been an increasing reliance on industry funding with 25.2% of research postgraduates at UNSW in 2000 funded by industry. Additionally, 29% of these students are expected to work on problems dictated by industry, 22% expected to produce a patent before the end of their course and 15.6% a product or software.
>
> Within this more commercialised structure, problems with student ownership of their intellectual property are not uncommon. There have been examples of students unable to publish results due to contractual arrangements with private companies, students whose work was taken by the company that they worked under, and students that were forced into signing an intellectual property contract at the very beginning of their projects. (Refusal to sign would preclude the student from working on this project). These occurrences all show a lack of recognition of the

148 Submission 315, AVCC, p.6

149 Submission 222, Postgraduate Board of University of New South Wales, p.5

> postgraduate students in the research process and the difficulties surrounding the involvement of industry in public education institutions.[150]

6.135 The submission of the University of Melbourne Postgraduate Association (UMPA) observed that participation in industry-related or sponsored research projects can often be of great benefit to individual students 'as long as academic standards are upheld'. Benefits included superior study resources, more generous scholarship conditions, and better prospects of employment after graduation. Management of the intellectual property (IP) of students in such arrangements can, however, present problems. The UMPA recommended that universities' IP policies should protect students' IP rights and future career options.[151] They also recommended a sector-wide approach to student IP rights and university IP policies.

6.136 Other submissions from student associations also cite instances where privately funded equipment and facilities in a university engineering department were restricted to use on specific areas of research. For one student, this meant the need to choose between having access to the equipment and undertaking research on a preferred topic. The student chose to re-develop his PhD program to one that more directly suited the industry sponsor's objectives, even though the original topic was one that would have had significant technological benefits and potential industry spin-offs.[152]

6.137 Industry-funded research has a valuable role to play in promoting innovation in the private sector and can provide useful supplementary sources of funds for universities. Collaboration can also provide the opportunity for universities to develop valuable insights and skills in dealing with a wider range of problems. However industry investment in research needs to occur in an environment which protects the broader public interest. This includes provision for the publication and dissemination of research results with a significant public good component. It also includes arrangements which protect the integrity of research and the interests of staff and research students. An environment where universities accept industry investment to compensate for inadequate levels of public funding is unlikely to be one that meets these requirements.

6.138 The AVCC has developed guidelines to assist universities in developing their own frameworks for industry-related research and most if not all universities have protocols to help them manage this issue. Nevertheless the evidence suggests some significant problems remain, indicating the need for additional leadership from the Commonwealth. This could take the form of a statement of the basic principles that should govern universities' involvement in industry-sponsored research including the rights of research students to publish the results of that research.

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150 ibid., pp.10-11

151 Submission 237, University of Melbourne Postgraduate Association, p. 43-45

152 Submission 229, Melbourne University Student Union, p.2

Co-operative Research Centres

6.139 The Co-operative Research Centres (CRC) program was introduced as a Commonwealth Government initiative in 1990, as a way of supporting collaborative research links between universities, government research agencies and industry. Financial support is provided for periods of up to 7 years, on the basis of success in a competitive application process. By 1996, 61 CRCs had been established with funding totalling $690 million from Government, $350 million from industry, $400 million from CSIRO and $590 million from universities. [153]

6.140 The Committee was struck by the almost universal support and praise for the CRC program. The Chief Scientist noted that the program ' by all measures had been shown to be remarkably successful. All major reviews of the program have endorsed the success of the CRC program.'[154]

6.141 CRCs promote both basic research and the application of that research to industry, benefiting both industry partners and the broader society.

6.142 Features which have made the CRC program particularly successful include strong research management through corporate-style boards for each centre to set research directions and strategy. Positive outcomes include innovative education programs, the formation of a number of spin-off companies and a host of valuable public and commercial outcomes. A major advantage of the CRC arrangements, in the view of the Chief Scientist, is the emphasis on collaboration rather than competition. The Chief Scientist recommended a range of policy and legislative initiatives for the support and extension of the CRC program and for additional funding to significantly expand the program.[155]

6.143 Submissions to this inquiry were also very positive about the CRC program. The NTEU noted that a number of university-based CRCs were aligned to the development priorities of their regions and had particular relevance and benefits for local economies.[156] The Australian Catholic University noted, however, that the exclusion of the humanities and social sciences from the CRC programs closed off an important avenue by which CRCs could contribute further to knowledge and Australian society and failed to recognise the important contribution that they could make to innovation.[157]

6.144 The Committee supports the role and contribution of CRCs in promoting research and innovation in Australia and believes that Government support should be

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153 M Gallagher, *The Emergence of Entrepreneurial Public Universities in Australia* (DETYA Occasional Papers Series 2000E, p.35

154 *The Chance to Change* Final Report of the Chief Scientist, November 2000, p.89

155 ibid., p.92

156 Submission 283, NTEU, p.45

157 Submission 30, Australian Catholic University, pp. 4-5

expanded to allow for an increased number of CRCs and the inclusion of the humanities, social sciences and creative arts within the CRC program.

6.145 The committee believes that CRCs based on such previously excluded disciplines will contribute significantly to our intellectual capital and to innovation and economic development while also exploiting the potential of greater numbers of tertiary institutions that currently remain beyond the boundary of Commonwealth-funded specialised or collaborative research programs. One case study is the Victorian College of the Arts (VCA). With antecedents dating back to the (Victorian) national gallery school in 1867, the VCA was established in 1972, becoming affiliated with the University of Melbourne in 1991. It is a specialist arts education and training institution, offering both undergraduate and postgraduate education to emerging artists in all the principal visual and performing arts. Its acknowledged leadership in studio-based experiential learning is complemented by opportunities for cross-disciplinary learning and research due to the wide brief held by its six teaching schools. The VCA has also initiated strong research programs, directed toward both cultural and economic outcomes. In common with many similar institutions, industry links are exemplary and of critical importance to collaborative research. Its emerging Australian Digital Arts Laboratory, focused on creative engagement between art and virtual technologies represents an opportunity to establish alternative directions in the creation of new knowledge and new art.

6.146 As a small specialist tertiary provider the VCA occupies a niche similar to the National School of Dramatic Arts (NIDA) or the Australian Film, Television and Radio School (AFTRS) but with strategic differences. It spans a greater range of disciplines than either of these two institutions, while it does not benefit from the additional resources that they enjoy as a result of their different source of federal funding: the Department of Communications, Information Technology and the Arts in the case of NIDA and the AFTRS as opposed to UNS funding through DETYA for the VCA. Notwithstanding current funding constraints, the VCA ranks high in terms of quality and innovation when compared to international peers. It is typical of many such institutions and disciplines that remain beyond the perimeter of current CRC and similar funding models but whose participation would enrich and extend Australia's research initiatives and economic interests.

Recommendation Twenty-Six

The Committee recommends an expansion of the Cooperative Research Centres Program to ensure the incorporation of the humanities, social sciences and creative arts.

Commercialisation of research

Approaches to commercialisation

6.147 The ARC has described research commercialisation as:

> a key aspect of innovation. In its most obvious form, the commercialisation process involves taking laboratory scale research results and completing the considerable further experimental development, production and marketing that is needed to deliver…[158]

6.148 Professor Ian Chubb, Chair of the AVCC and Vice-Chancellor of the Australian National University pointed out the economic costs to the nation of failing to commercialise the results of research:

> If the Australian public invests in Australian university research, then the Australian public ought to be able to expect a return. I am now one of those who suggests that all we should do.. is just publish it. What [the other submission writer] was really saying but did not say was that 'and then we should buy it back when it's turned into something we need as a nation'. I do not see any real sense in that.[159]

6.149 The Committee agrees with this view and the argument put in the AVCC that the main question relating to commercialisation is not whether it should be promoted, but the best arrangements for doing this:

> University research produces many results that need to be commercialised for the research to bear practical fruit. The Australian public has invested in this research and deserves to see value from its results. The question is therefore not should university research be commercially developed but who should do it and how?[160]

6.150 The Committee also notes evidence that while the commercialisation of research can yield substantial benefits for the broader economy, it is a complex and costly process and that, on average, only one in one hundred prospective research outcomes investigated for research purposes can be successfully commercialised.[161] The ARC noted that:

> the experience in the US is that in the vast majority of research universities the revenues from commercialising research constitutes a small addition to budget – well below 1 per cent. The amount of incremental income might be sufficient to provide useful incentives to the researchers involved, and to pay for some of the costs of managing IP, but it could not be counted on to relieve the financial pressures that universities face. [162]

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158 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.2

159 Professor Ian Chubb (AVCC), *Hansard*, Sydney, 17 July 2001, p.990

160 Submission 315, AVCC, p.7

161 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.3

162 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.18

6.151 The commercialisation of intellectual property in Australian universities has traditionally involved the patenting of that property and licensing to commercial firms in return from income, usually in the form of royalties. One submission explained how this works:

> researchers, having made a discovery in a publicly funded university, which owns the intellectual property rights, can take out with the knowledge and help of the University, a preliminary patent. This allows time to solidify the discovery/invention, allows time to file for a full patent and time to get the backing from pharmaceutical companies or other interested business operators. In most such cases in the past, where an agreement with a commercial partner had been reached, the University and the researcher were rewarded with additional moneys to further the research in question and in the case where a marketable product was eventually developed, royalty agreements did benefit the University and a small reward would also go to the inventor(s) as an additional incentive.[163]

6.152 The submission from the Australian National University (ANU) noted that the university has access to $2m-$4m additional Research and Development funds each year as a result of the licensing or sale of its intellectual property in this way.[164]

6.153 While this form of commercialisation is not without its problems, these can be overcome:

> The downside of such agreements are their linkage to secrecy clauses, which inhibit and stifle free discussion so important in the progress of science and a pillar of the concept what a University is all about. However this can be minimized by negotiating short lag periods between obtaining research results, having them scrutinized by the commercial partner for possible additional patent protection, and allowing publication and or seminar presentation. [165]

6.154 This approach was contrasted with 'investing in, or spinning off, commercial enterprises based on intellectual property generated at the University.' A series of recent reports on research and innovation have encouraged the formation of spin off companies to exploit commercialisation of universities' intellectual property because this is seen to offer far greater potential returns both for the university and the economy.[166] A recent ARC paper argued that, while the short term returns to universities from commercialising intellectual property will favour consultancies, contract research and licensing of IP to companies, in many cases multinationals, spin offs may be a better long term approach:

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163 Submission 117, Dr Arno Mullbacher, p.3

164 Submission 317, Australian National University, p.5

165 Submission 117, Dr Arno Mullbacher, p.3

166 I*nnovation: Unlocking the Future*, Final report of the Innovation Summit Implementation Group, August 2000

> a greater focus on generating new ventures, through which the university's IP is commercialised (start-up or spin-off companies) can, on the evidence from overseas and locally, lead to a higher multiplier on the university's investment from IP in the longer term while increasing risks in the short term. The most appropriate mechanism for commercialising IP needs to be considered on a case by case basis, bearing in mind long term and short-term considerations and associated risks.[167]

6.155 In this context, one submission attached an article in the *Business Review Weekly* that reported on Australian spin-off companies with market capitalisations ranging from $40-$200 million. Universities typically owned around 20 per cent of the equity.[168] The ANU explained the benefits of this joint equity arrangement (where the researcher and the university share in the intellectual property and equity) for the university:

> This provides additional funding to support the educational objectives of the institution but, just as importantly, provides rewards to key staff who would otherwise be attracted out of the Australian tertiary education sector to industry or to overseas agencies. It is also important to recognise that PhD graduates in sectors such as IT can, on graduation, be offered salaries considerably in excess of those who supervised them.
>
> An example at the ANU of such a development is its involvement with Biotron, a company which has recently been listed on the Australian Stock Exchange. In addition to the value of its direct equity holding, the University will benefit from its share of profits and from additional research income which the company will generate and place with the University.[169]

6.156 However these arrangements carry financial risks. Universities often do not have the spare capital required for the long lead times associated with commercialisation:

> [I doubt] whether the universities themselves have the capital for the very long lead time that is necessary in some cases between the first steps and the final commercialisation. To be putting money into something for 10 or 20 years before there is a return is maybe something that most universities do not have the funds to carry through[170]

6.157 Professor Niland, Vice-Chancellor of UNSW supported the need to take a very long-term view when considering the commercialisation of intellectual property.[171] Professor Gavin Brown, Vice-Chancellor of the University of Sydney,

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167 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.vii

168 Submission 128, Dr Ian Ferguson, Attachment 2

169 Submission 317, Australian National University, p.5

170 Professor Paul Adam (ANZAAS), *Hansard*, Sydney, 17 July 2001, p.930

171 Professor John Niland (UNSW), *Hansard*, Sydney, 17 July 2001, p.942

while agreeing that lead times were long, noted that the long run did eventuate: his university was expecting to see significant returns from a number of such projects in the near future.[172]

6.158 A number of submissions and witnesses argued that commercialisation, like other private revenue raising activities, could detract from universities' pursuit of their core mission of teaching and basic research:

> the thrust towards the commercialisation of university activities (especially research), apart from carrying high risks, raises the questions of whether commercialisation is not a distraction from the universities' core business of teaching and research and whether the skills available in universities and the culture that imbues them are generally appropriate for commercial enterprises. Enthusiasm for commercialisation should not lead us to assume that these are settled questions, however desirable commercial operations might be in particular instances. Again, objective analysis is needed. [173]

Commercialisation and the public good

6.159 Witnesses also raised concerns that the commercialisation of research may result in limits on the free dissemination of knowledge, which is the 'whole basis for scientific advancement'.[174] The long-term effects of this would be severely detrimental. The submission from the University of Western Australia (UWA) noted, in this context, that its strategy is to commercialise selected research outputs, including those relating to semi-conductor technology and information technology. At the same time it considers the need to protect the public interest and does not enter into research contracts that preclude the release of research findings that would be of public interest and/or of great benefit to the community.[175] The Australian Geoscience Council recommended that appropriate national guidelines be developed to ensure that the results of privately funded research projects carried out at universities are released into the public domain a reasonable time after the research sponsor has had access to the results. [176]

Conflicts of interest

6.160 The ARC notes that commercialisation of intellectual property also gives rise to a range of potential conflict of interest situations:

> Interactions with industry can create conflict of interest problems for employees who may have legitimate personal financial interests in companies that do not have commercial agreements with their employer,

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172 Professor Gavin Brown (University of Sydney), Sydney, 17 July 2001, p.1031

173 Submission 8a, Professor Peter Karmel, p.14

174 Professor Paul Adam (ANZAAS), *Hansard*, Sydney, 17 July 2001, p.935

175 Submission 134, University of Western Australia, pp.5-6

176 Submission 193, Australian Geoscience Council Inc, p.2

> from which they receive gifts or consultancies, or in which they hold equity or executive or non-executive directorships. Potential conflicts are heightened when the scientists and engineers who invent the technology are offered, or acquire, financial interests as part of their employer's deal with a commercial partner. .. In the US the pattern in universities and research institutes has been set by the rigorous conflict of interest policies of the main federal funding agencies, the National Science Foundation (NSF) and the National Institutes of Health (NIH) as well as by State laws in the case of employees of public universities… All universities in the US have committees that review the materiality of potential conflicts declared in employee's [mandatory] annual returns…
>
> Equity holdings and non-executive appointment can create three way conflicts of interest between the university, the spin-off and the individual, which would need to be disclosed. However recognising the fragility of spin-offs in their first few years, non-executive and advisory positions in spin-offs would generally be approved in US universities… Most Australian universities allow employees to take equity in spin-off companies, without specifying limits..The holding of executive positions in spin-off companies is uncommon in the US, though it is permitted in the UK by the University of Cambridge and some other universities. Such appointments have potential for serious conflicts of interest. Unpaid leave of absence to work with the spin-off company would be an alternative.[177]

It recommended that these be carefully managed through robust policies.

6.161 Several submissions from research staff argued that the conflicts of interest could vary with the arrangements for the commercialisation of research and are greatest where university researchers have an equity position in a spin-off company established to commercialise the results of research currently being undertaken by the university. In the case in question:

> The formation of this company has the potential to significantly enrich a small number of research workers…for minimal effort and must represent one of the most obvious examples of conflict of interest between scientific research and commercial exploitation. ..why should a publicly funded institution (including those researchers working there at present) now be used to promote (and provide infrastructure for) a company with no product yet to sell and whose shareholders include a minority of staff who stand to gain (disproportionately) financially from the success of this company?
>
> Share prices in Biotron will be reflected in the success or failure of the research. Can we expect research workers to be scrupulously honest in reporting facts that will adversely affect share prices. Even research workers in the school not associated with Biotron may be under pressure not to publish or disseminate results that adversely impinge on development of

177 Australian Research Council, *Research in the National Interest: Commercialising University Research in Australia*, July 2000, p.30

> the promised products and profits to Biotron since the ANU is a shareholder. It is unclear what the effect will be on individuals working in the school in similar areas who are not associated with Biotron. Will new researchers entering the school be prevented from working "in competition" with Biotron projects.[178]

6.162 In response, one of the founders of the Biotron company argued that:

> It is very important for scientists to hold significant equity in a company that they form and this equity will normally eventually be in the form of shares. There is no successful biotechnology company in the USA in which scientists do not hold significant equity. If scientists do not retain significant equity, they will lose control of those strategic decisions made by the company that depend on knowledge of the science. If the scientists do sell their shares, they may become rich but they will also lose their equity and control.[179]

6.163 Another founder of Biotron explained also commented:

> Biotron [funds] intermediate and early applied research. Intermediate research is defined as being from the time a potential product developed from basic research shows commercial potential, until it is proven to be commercially viable. Applied research then takes over, adding value to the product. The majority of funds raised through Biotron's Prospectus are to be used for research associated with the development of medical products, with the balance being applied to commercial management of that research, and running a public company…
>
> Biotron is an independent company funding research which is conducted in premises leased from the University and separate from JCSMR. All research is done by people specifically employed to work on Biotron's intermediate and applied research and, as a condition of employment, they agree to delay publication of findings until it is commercially acceptable to Biotron. Basic research continues at JCSMR as before, and researchers publish results. Yes, if any research associated with three JCSMR programs (not *all* JCSMR research – just research conducted by four JCSMR Professors) reaches the intermediate research stage (shows commercial potential), Biotron has the first right to accept the project and fund the commercial research. There is benefit for the researchers, and for the ANU. The researchers can further their work safe in the knowledge that, based on results, funding for intermediate research is assured; reasonable funding for intermediate research has been, to date, virtually impossible to find in this country.

178 Submission 20, Dr Paul Waring, p. 3

179 Submission 183, Dr Peter Gage, p 2

> As for the ANU, it is a shareholder in Biotron. If a product is developed and commercialised, the ANU shares in the dividends – income which should be considerably greater than that received if research is prematurely licensed[180]

6.164 The creation of Biotron has obviously generated some tensions or conflicts within parts of the research community. To a large extent these appear to reflect differing views on the desirability and implications of some approaches to commercialisation. The debate that has surrounded Biotron suggests the need for universities to have clear and comprehensive guidelines for the commercialisation of research. Such guidelines need to deal explicitly with issues of conflicts of interest and publication of research results. Chapter 7 on universities' commercial operations resumes the discussion of some of these issues in the context of a general examination of the principles governing the use of public assets for generating revenue, and makes some general recommendations.

Intellectual property (IP) – and the 'entrepreneurial academic'

6.165 The commercialisation of research also raises a number of issues related to assignment of IP. OECD countries adopt a range of approaches to the assignment of IP developed in the context of publicly-funded research. In the US, the Federal Government allows universities to take the title for any IP developed out of federally-funded research provided they do so in a reasonable period; if they do not, property rights revert to the government. Canada is considering a similar approach to the US, and may also allow universities to assign title to individual researchers. In the UK, universities have the right to exploit publicly funded IP. In some cases, the most notable example being Cambridge University, the university allows individual researchers to take title of their research and exploit it on condition that they return an agreed portion of any profits to the university.

6.166 In Australia, under common law, universities, like other employers, have title to the IP developed by their staff. Many choose to allow individuals to share in this in the context of any commercialisation of research results. The University of Melbourne has adopted the Cambridge University model discussed above. This approach is said to have advantages for the individual, the university and the economy, by facilitating the commercialisation of research at the same time as ensuring a financial return to the university and transferring the risks associated with the management and commercialisation of IP from the university to the individual.[181] A witness to the inquiry argued strongly for this approach to be adopted and that the NHMRC and ARC amend the provisions of their grants to support this. [182] The ARC has suggested that while there are risks associated with this approach, there may be value in encouraging this approach in Australia to stimulate more entrepreneurial behaviour by researchers but still providing for the university to share in any financial benefits.

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180 Submission 288, Mr Peter Scott, p.3

181 Submission 128, Dr Ian Ferguson, p.4

182 ibid.

Conclusion

6.167 Recent policy on research in the higher education sector has grown out of concerns about Australia's declining competitiveness in a global economy dominated by the trade in knowledge-intensive goods and services. The Committee shares the Government's concern to maximise the capacity of Australia's higher education sector to contribute to economic development. However it believes that universities' capacity to contribute to the nation's social and cultural development is an equally important role, if somewhat neglected in recent years. It also shares the concerns of many witnesses that the deterioration in university infrastructure, and academic staffing, have eroded universities' capacity to undertake high quality research in both the immediate and longer term. It considers that the current state of research funding and management reflects an incrementalist approach to policy formulation, with new initiatives being introduced with insufficient thought about their longer term implications.