Senate Report
Research Activities in 2004

Executive Summary

Murdoch University has continued its commitment to high quality and interdisciplinary research in its Strategic Plan 2003-07, by seeking to build on its record of research excellence in fulfilment of its major research goal:

To contribute to the knowledge, wellbeing and sustainability of contemporary society by conducting high quality multidisciplinary research and development.

The key strategies to achieve the goal are:

- To focus research into areas of recognised and growing strength
- To strengthen postgraduate research
- To extend existing research relationships, and foster new ones, with external partners.
- To exploit Murdoch University’s existing and potential intellectual property, technology transfer, and commercialisation.

This report highlights the successes of Murdoch’s research over the past year measured against these key strategies. Significant points to emerge may be summarised as follows:

- Murdoch has again increased its share of the Research Block Grants. These are allocated by formulae based on research grant income, research completions, research load and publications.
- Data presented show that key performance indicators for the strategies are highly positive and demonstrate Murdoch’s continuing improved research performance.
- Murdoch’s research training and support for higher degree students is rated highly nationally.
- The potential for commercialisation of intellectual property generated by research at Murdoch University has been greatly enhanced through the performance Murdoch Westscheme Enterprise Partnership and MurdochLink Pty Ltd.
- Murdoch University was a new entry in 2004 for a listing of the world’s top 500 research institutions released by Shanghai Jiao Tong University.
- A new Research Quality Framework Process will replace the existing Research Block Grant Scheme in 2007. Murdoch University is positioning itself to optimise its Block Grant in the new framework.
STRUCTURE OF RESEARCH REPORT

1. Strategic Plan 2003-2007: Research goal and key strategies
2. Key environmental factors
3. Key strategies
4. Key performance indicators
5. Outlook for the future

1. STRATEGIC PLAN 2003-2007: RESEARCH

To contribute to the knowledge, wellbeing and sustainability of society by conducting high quality multidisciplinary research and development.

Many aspects of the Australian natural and social environment are unique and therefore require unique solutions. Murdoch University will conduct research in areas that are aligned with national, State and community priorities. The University will continue to build on its record of research excellence through focused, innovative and enterprising approaches.

Maintenance of a productive research culture requires a pool of talented postgraduate research students. Murdoch University will ensure they have quality supervision, clearly defined projects, sufficient resources and opportunities for developing generic skills.

Long-term and enduring partnerships will be built between Murdoch University researchers and other complementary national and international government agencies, universities, industrial and commercial partners and venture capital companies. Murdoch University will support researchers to generate intellectual property that has potential commercial value and, where appropriate, to assist in successful technology transfer and commercialisation.

Key Strategies
- To focus research into areas of recognised and growing research strength
- To strengthen postgraduate research
- To extend existing research relationships, and foster new ones, with external partners
- To exploit Murdoch University’s existing and potential intellectual property, technology transfer, and commercialisation

2. KEY ENVIRONMENTAL FACTORS

2.1 The research block grant funding system

In December 1999 the Government issued a White Paper on research and research training, Knowledge and Innovation. The White Paper, having established the broad framework for research and research training in higher education, was followed by the release of a major Innovation Action Plan, Backing Australia’s Ability (BAA1). This increased funding for research and development generally by $2.9 billion over five years and in the higher education sector specifically by $1.47 billion. It included funding for a doubling of ARC competitive grants, increased project-specific and systemic infrastructure grants. BAA1 funding was due to finish in 2005-06.

In response to a series of reviews conducted in 2003 on Australia’s research needs, the Government followed up with Backing Australia’s Ability – Building Our Future through Science and Innovation (BAA2), which was launched on 6 May 2004. The new package totalling $5.3 billion will run for seven years from 2004-05 to 2010-11. Both of these
packages provide research funding via the universities’ block operating grants through a performance driven competitive system of research funding that rewards performance against four major indices: research income, higher degrees research completions, research publications and higher degree research student load. These indices form the basis of the three primary block grant operating schemes: (1) the Research Training Scheme (RTS); (2) the Institutional Grants Scheme (IGS); and (3) the Research Infrastructure Block Grant (RIBG). It is in the universities’ interests to maximise their research income by improving their performance relative to these drivers. Therefore our key performance indicators are designed to measure these indices. The most significant indices contributing to the allocations are those arising from research income and higher degree completions.

Disappointingly Backing Australia’s Ability – Building Our Future through Science and Innovation fails to provide any additional funding for the RTS or the IGS. An AVCC paper analysing BAA2 concludes that the funding for research will be inadequate compared to the OECD commitments for substantial increase in research funding over the same period. The analysis may be found at http://www.avcc.edu.au/news/public_statements/publications/AVCC-Response-to-BAA2.pdf

2.2 Research Quality Framework

Attention should also be drawn to an announcement by the Prime Minister in May 2004 that the Australian Government would establish Quality and Accessibility Frameworks for Publicly Funded Research as part of the Backing Australia’s Ability – Building our Future through Science and Innovation. The aim of the Research Quality Framework (RQF) initiative is to develop the basis for an improved assessment of the quality and impact of publicly funded research and an effective process to achieve this. Subsequently the intention is to use these measures to develop a new research block fund to replace the existing IGS and RTS schemes. The new measures will be developed by the end of 2005 in consultation with the universities. At present it is anticipated that a national RQF scheme will be adopted in 2007.

2.3 Priority Areas for Research

BAA2 represents a commitment to pursue excellence in research, science and technology, through three key themes:
- the generation of new ideas (research and development);
- the commercial application of ideas; and
- developing and retaining skills.

The National Research Priorities, developed as part of BAA1, will continue to focus the research effort on these challenges. The four priorities are:
- An Environmentally Sustainable Australia;
- Promoting and Maintaining Good Health;
- Frontier Technologies for Building and Transforming Australian Industries; and
- Safeguarding Australia.

As preference is given in the competitive grants funding for projects that fall within these areas, Murdoch’s research strategy is to ensure that there is considerable overlap between our Areas of Research Strength and the National Research Priorities.

The concentration on science and technology as priority areas, while understandable, has lead to considerable disquiet in the Humanities, Arts and Social Sciences sector of the Australian universities. These areas have been traditionally major areas of research and scholarship
throughout the system and continue to be at Murdoch University. At Murdoch these disciplines are responsible for a majority of our higher-degree research completions and therefore contribute significantly to our RTS block grant income. Lobbying by these disciplines across the sector, lead in June 2004 to the announcement by the Government that it would provide funding of $1 million for a Council of Humanities Arts and Social Sciences (CHASS). The Council will help strengthen the role of the humanities, arts and social sciences in Australia, and provide a forum within which academics, students and the broader community can develop more effective ways of engaging constructively with policy-makers.

2.4 Succession Planning

A comprehensive study of the Murdoch research community was carried out by Professor Val Alder, Executive Research Strategist, in the first half of 2003 and reported to the Senate last year. It revealed two particularly significant features, firstly that most of the income generated for our 2003 research block grants RTS and IGS are due to a small subset of the Murdoch research community. The second important observation was that this performance is due to an increasingly aging cohort of research leaders. To mitigate the potential loss of research income a succession planning process was implemented in 2003 and is designed to run for a further four years.

2.5 Agricultural Research

In 2004 a business plan was submitted by the Department of Agriculture WA to the state government for relocation of the department’s headquarters and the formation of an integrated research alliance with Curtin University, Murdoch University and the University of Western Australia. The proposed Institute¹ is designed to perform the research required by the State Department of Agriculture. It will bring together the major agricultural researchers in the State and will comprise a series of centres of excellence and will be staffed by researchers from the universities and Department of Agriculture. The partners will provide a range of facilities, both new and existing. A Steering Committee evaluated the relevant research strengths at each university and the overlaps with the researchers from the Department. Because of Murdoch’s considerable research concentration in veterinary and plant agriculture and biotechnology, it will benefit in a significant way. The ensuing formation of the new centres following from a successful conclusion to the planning process should provide enormous long-term benefits to the research capability of Murdoch University. It will provide critical-mass research teams working at Murdoch that will lead to enhanced opportunities for agricultural research. Relocation of several hundred researchers from the Department of Agriculture to Murdoch is proposed. The proposed relocations and integration will take at least five years as new research facilities will need to be built using state government funding. Increased funding streams from the Federal Government agencies, enhanced opportunities for research training of higher-degree research students and formation of national international collaborations will follow. Overall the formation of ARWA will lead to the largest Integrated Agricultural Research Facility in the Southern hemisphere and one of the five largest centres of its type in the world.

3. KEY STRATEGIES

An overview of the key strategies guiding Murdoch’s research effort follows. A detailed analysis of the strategies and the major research groupings into areas of research strength and quantitative information about them is contained in the Murdoch University Research and Research Training Management Plan 2005.

¹ The name of the institute was confirmed as Agriculture Research Western Australia (ARWA) in 2005
3.1 Focusing research into areas of recognised and growing strength

Examples of successful research at Murdoch span a continuum from individual or small group projects to large focussed groups working in Research Centres. Murdoch has more than 30 specialist Research Centres representing a diverse range of research expertise. However, it was recognised that its limited strategic resources cannot be spread evenly. This was encapsulated in the 1999 University Senate resolution “That the University should focus its research effort into areas where it can achieve leadership and a sufficient concentration of resources, including staff, to support a long term research program containing areas of national and international significance”. This resolution was enacted in 2000 with the development of designated Areas of Research Strength (“ARS”) and has continued to guide the management of research and research training at Murdoch. The process has been further refined with the launch in March 2004 of the Academy for Advanced Studies for internationally recognised researchers and small research groups who do not ‘fit’ into the ARS, and the introduction of mechanisms to direct more support to designated areas of research strength. Further work is being done to articulate the role of the Academy and to widen its membership to include representation from the ARS.

The ARS are largely multidisciplinary and fit the focus areas of sustainability of contemporary society enunciated in the primary research goal of the University. Today Murdoch supports six Areas of Research Strength and two areas of emerging research strength.

The Areas of Research Strength are:
- Agricultural and Veterinary Biotechnology and Bioinformatics
- Contemporary Asia
- Ecosystem Management and Restoration
- Hydrometallurgy
- Social Change and Social Equity
- Technologies and Policies for Sustainable Development

Emerging Areas of Research Strength are:
- Interactive Media
- Learning, Leadership and Policy

They provide a focal point for Murdoch’s research and research training activities and incorporate researchers who are also prominent in most of the research centres in the University. Together they are responsible for attracting 60% of the University's reportable research income.

In recognition of the potentially looming problem of retirement of research leaders, a succession planning process was introduced in 2003. Management of the risk of loss of key researchers in the next five years has been tackled by identifying which key researchers need to be replaced immediately or in the medium term. A funding scheme, to meet the costs associated with maintaining our key research leadership was approved as a strategic allocation in the R&D budget and was made possible through the projected growth of the Murdoch research allocations of RTS, IGS and RIBG from the positive trend of the key performance indicators for research.

Three key elements of the fund are that provisions be made for (1) replacement of strategic senior appointments at the professorial level to ensure continuity of leadership in Areas of Research Strength; (2) encouragement of young postdoctoral researchers with research leadership potential from within the University and attracting talented researchers from other
institutions; (3) provision of short term gap funding for highly capable researchers who have narrowly missed out on grants awarded in competitive funding rounds. The SRF can also be used strategically to match offers from other institutions to our younger research leaders.

An initial $500,000 allocation was made to the scheme in 2004. Six key appointments have been made in the first two categories as follows:

(1) Professor Richard Oliver, Professor Neil Loneragan
(2) Dr Treena Burgess, Dr Dmitry Fursa, Dr David Morgan, and Dr Steven Bellman

Risk management of our key researchers is an ongoing issue for the future. Monitoring of our research leaders and their future plans for category (1) is a continuing process in 2005. A new round of applications for research leadership fellowships, category (2) was called for in November 2004 for appointment in 2005. To fund the commitments through 2005 an allocation of $750,000 was provided for in the R&D budget.

3.2 Strengthening Postgraduate Research

The administration of research training and research student completions is managed through the Graduate Centre, under the direction of the Dean of Graduate Studies.

The multi-disciplinary nature of Murdoch’s undergraduate and postgraduate programs has made Murdoch particularly attractive to mature aged students, many of whom have considerable experience in the workforce. Demand for places from well-qualified applicants continues to be high. The ability of the students to accept entry into a program of study is limited by the availability of scholarships. Recognising this the University has strategies to assist students to obtain financial support, which include providing additional, partial or fully funded scholarships from internal and external sources.

Improved processes for monitoring progress of students implemented in 2003 were further refined in 2004. The commitment to, and success in, improving the quality of higher degree research training and research infrastructure for postgraduate students is monitored by surveys and more recently by benchmarking studies. Benchmarking of research degree policies and processes against other universities was introduced in 2004. A recent study found that at the doctoral level, Murdoch’s research degree processes met all, or all but one of the benchmarks in 7 out of 8 categories. Murdoch was one of only 4 universities of 24 to achieve the highest ranking (the others were the University of Melbourne, Monash University and James Cook University).

As part of its strategy to promote new international research collaborations including those offered by research training, the R&D Board acted on a report commissioned by the R&D Division to investigate the cost/benefit of increasing our international postgraduate student load. The report confirmed a significant net benefit from training international students. The recommendations of the final report are being implemented in 2005 and will provide partial financial support for training an additional twenty international students in 2005.

3.3 Extending existing research relationships, and fostering new ones, with external partners

Federal and State Government funding initiatives have enhanced Murdoch University’s commitment to partnerships with other institutions and industry, in particular Cooperative Research Centres, WA State Government Centres of Excellence and the Australian Research

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2The following candidates were successful in being awarded research leadership fellowships for 2005:
Dr Eric Konigsberger, Dr Kanishka Jayasuriya and Dr David Nolan.
Council Linkage Program. Murdoch’s success in increasing its participation in Round 9 of the Cooperative Research Centres (CRC) Program involved core partnership in three new CRC’s, refunding of one CRC and supplementary funding for two other CRC’s. By the end of 2005 Murdoch will be a core partner in eight CRC’s and a supporting partner in a further four.

**Round 9 CRC successful outcomes for Murdoch University**

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<th>New CRC:</th>
<th>CRC for an Internationally Competitive Pork Industry</th>
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<td>CRC for National Plant Biosecurity</td>
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<td>CRC for Sustainable Forest Landscapes (being developed from an existing CRC in which Murdoch was previously not involved).</td>
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<td>Developing from existing CRC:</td>
<td>AJ Parker CRC for Integrated Hydrometallurgy Solutions</td>
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<td>Supplementary funding for existing CRC:</td>
<td>Australasian CRC for interaction design</td>
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<td>CRC for molecular plant breeding</td>
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The Research and Development Board allocates leveraged funding in a strategic manner for these ventures. The details of funding programs in BAA2 indicate that further development of collaborations and enhanced use of national facilities will be a priority to access new funds.

### 3.4 Intellectual property, technology transfer, and commercialisation

Murdoch University through its R&D Division now has an improved systematic and focussed approach to the identification, management, protection and commercialisation of the intellectual property of its researchers. Its Industry Liaison office (ILO) has been successful in forming linkages with industry and venture capital partners.

With the creation of Legal and Governance, Murdoch Link and the joint venture investment fund, the Murdoch Westscheme Enterprise Partnership (MWEP), ILO has the opportunity to fulfil a more focussed role in meeting its core objectives, which are to:

- a. Identify, managing and protect the University’s IP
- b. Implement/develop educational policies and processes
- c. Foster a more entrepreneurial, innovative and commercial focus amongst researchers.
- d. Foster and facilitate effective research and development partnerships with industry and investors.

MWEP and MurdochLink target specialised areas; MWEP is constrained in pursuing only those projects that meet strict criteria relating to potential market size and commercial returns, and MurdochLink targets consultancies. ILO interfaces with these bodies and provides commercial and administrative support to them. It continues to represent the university in its day-to-day interaction with various external parties and provides support to researchers in identifying, protecting and commercialising emerging IP. In addition it pursues commercialisation opportunities either not taken up by MWEP or not offered to MWEP.

In 2004 MWEP financed a number of exciting and innovative research projects, originating from Murdoch. These include projects that involve the identification of biocidal compounds and Giardia diagnostic tests. Ongoing projects include a novel plant breeding process that will deliver a natural alternative to the world’s largest crop fungal pathogens as well as a multidisciplinary project involving the development of a new herbicide based extracts from an exotic plant leaf and a native seed.
The University’s commercial consulting company MurdochLink Pty Ltd was established in January 2004 to manage the University’s consulting and contract research activities. This will help limit the University’s exposure to risk, regulate consultancy activity and enable University staff to build on their strengths and expertise. This also enhances the reputation of the University and its staff and provides them with a source of additional income. A General Manager, Mr Tim Morrison, was appointed in January 2004. In 2004 forty projects were awarded to Murdoch Link. A total amount of $1,035,406 in grant and contract funding has been generated by the Company in its first year of operation exceeding the budget forecast. For 2005 our most recent projection is for the company to exceed 3 million dollars in projects.

4. KEY PERFORMANCE INDICATORS

The University’s research performance is assessed by a set of nationally accepted key performance indicators. It is of particular interest to present comparisons with the group of six Innovative Research Universities (the IRU group) who have agreed to cooperate in research collaborations and research benchmarking. The group comprises Flinders University, Griffith University, La Trobe University, Macquarie University, Murdoch University and the University of Newcastle.

4.1 Research income

Murdoch’s research income has risen steadily in the past 5 years. In 2004 Murdoch University had Operating Revenues of $109.07 million and Consolidated Revenues from all sources of $188.58 million. In the competitive research funding system introduced in 2002 that links research funding directly to research performance, Murdoch has consolidated the strong position as one of Australia’s top performing research universities on a per capita basis. Research income increased by 23% from $29.18m to $35.97m between 2003 and 2004 and has more than doubled in the five years since 2000 (See Figure 1). This will have a strong positive effect on the research block grant in 2006 to 2007. The target of $40 million by 2007 in the Strategic Plan 2003-2007 is achievable based on the present trend.

![Graph showing Murdoch DEST Reportable Research Income 2000-2004](image)

**Figure 1. Research Grants and Income 2000-2004**
Murdoch’s performance in ARC linkage grants which is a measure of its engagement of research relevant to the needs of industry partners has demonstrated an excellent growth trend as indicated in Figure 2. The exceptional performance of 2003 was not sustained in 2004 but the trend line is positive.

![Graph showing ARC Linkage Grants to Murdoch: 2000 – 2004](image)

Research income performance with other universities may be assessed with the advent of the new government research funding system in 2002. The RTS, IGS and RIBG form a readily identifiable block grant for research ($RG = $RTS+$IGS+$RIBG) that may be compared to the operating grant. The higher the percentage the more “research oriented” the university is. Murdoch is a research-intensive university and therefore this is a useful measure for comparison with other universities. In 2003 Murdoch’s RG/OG amounted to 21.60% which placed Murdoch 12th nationally out of 40 institutions, which represents a one place improvement in the national rankings over the previous year.

Murdoch ranked 12th nationally on its research block grant as a percentage of its operating grant and second amongst the IRU with our block grant being worth 22.67% of our operating grant. This is an increase of 1 place nationally and amongst the IRU. Murdoch’s performance in relation to the Innovative Research Universities group is shown in Figure 3.
Another key performance indicator, total research income per ten full-time-equivalent researchers, is given in Figure 4. Murdoch is ranked first amongst the IRU group. Murdoch achieved a 17% increase in research income over the previous year and ranked 6th Nationally for Research Income per 10 research staff.

4.2 Research Training

In 2004 Murdoch University had 835 higher degree research students (578 EFTSU), which is 6.4% of total student enrolments compared to 6.1% in 2003. A measure of the research focus of our staff is that Murdoch University ranks 4th nationally (unweighted load) in the number of research students supervised per 10 staff FTE. Figure 2 provides a comparison of this indicator with the numbers of the IRU group of universities.
Murdoch’s postgraduate student completion rate per 10 FTE staff (Figure 6) ranks 11th nationally (up two places from last year) - Murdoch remains at the top of the IRU group.

As research scholarships are funded for three years and the RTS places for no more than 4 years, it is important to reduce Murdoch’s completion time shown in Figure 7. The year 2004 saw the average Doctorate Completion time dip down to a highly satisfactory 43.33 months after a high in 2002 and 2003, due mainly to a number of long-term PhD students finally completing and skewing the data. In 2004 the Murdoch Graduate Centre undertook its biannual survey of Postgraduate Research Student Opinion. Responses from the survey were very positive, as in surveys from previous years. Murdoch scores consistently high, in 2004 scoring between 75%-91%, in the survey categories: School/Division Environment, Support
for Research Activities, Professional Development and Intellectual Freedom. The Graduate Careers Council of Australia ranked Murdoch’s research students are the most satisfied in Australia in a benchmarking study with Murdoch ranked by it research students as
- first for overall satisfaction
- first for thesis examination
- first for goals and expectations being met
- second for skill development
- third for supervision.

![Figure 7: Average time to completion for Murdoch Postgraduate Research Students](image)

Murdoch’s performance in terms of weighted publications research output, including books, book chapters, refereed journal articles, and refereed proceedings, per 10 staff FTE is rated at 16th out of 42 nationally. Murdoch improved its ranking from the previous year by 1 place to be 2\textsuperscript{nd} out of 6 in the IRU group.

4.3 Publications

![Figure 8: 2003 Weighted Publications per 10 Research Staff FTE for IRU group](image)
It should be pointed out that research publications are weighted at a marginal level and have very little influence on the block grant under the present block grants scheme. However they are a useful measure to indicate that quality research outputs are being delivered. They will play a much more important role in the emerging Research Quality Framework and our present strategies for maximising the research block grant will need to be reset as the details of the changes emerge.

4.4 Intellectual property, technology transfer, and commercialisation

The Division of R&D is in the process of developing formal key performance indicators for assessing the performance of the following commercial activities of Murdoch University: License income royalties, equity value, contracts for research and number of spin out companies.

5. OUTLOOK FOR THE FUTURE

The research environment is becoming increasingly competitive. Many of our competitor universities are also improving their research performance and we only stand to improve our position relative to them if our research grant income, research completions and publications increase at a greater rate than theirs. We must also face the disappointing fact that the block grants for RTS and IGS are fixed and have no inbuilt indexation for the future. In this climate, nurturing of research and growing it across our considerable range of quality research areas continues to be challenging.

In this competitive environment it is very pleasing to be able to report that Murdoch University has been listed for the first time in 2004 in the highly regarded Shanghai Jiao Tong University Index which places Murdoch University in the top 500 research universities in the world. Altogether 14 Australian universities were listed - the Group of Eight universities, five of the six IRU Australia members and the University of Tasmania. Media coverage of the listing’s release acknowledged that there are two "research intensive" groupings of Australian universities. The complete list is available at: http://ed.sjtu.edu.cn/ra/2004/2004Main.htm. In the 2005 listing Murdoch has improved it’s ranking by 14 places.

Over the next few years Murdoch is well placed to strengthen its research in the areas of agricultural science with the relocation of the Department of Agriculture and the integration of a considerable number of its researchers to the Murdoch campus. These research activities fit well with Murdoch’s research mission as well as with state and federal research priorities.

Medical research also continues its strong growth in research income. Of particular note is the considerable success of Professor Simon Mallal and Professor Ian James in securing a 12.6 million dollar funding from the Bill and Melinda Gates Foundation for their Centre for Clinical Immunology and Biomedical Statistics. Accompanying such rapid growth in research is the necessity for planning of new physical research infrastructure. One of the challenges for the University will be to find ways of allocating research block grant returns from this funding in order to provide infrastructure to our best researchers.

A further challenge that will confront Murdoch is the Research Quality Framework and the impact it will have. There is considerable speculation in the sector that the new framework as developing will have the effect of moving research block funding away from the new-generation universities, including Murdoch to the sandstones. As loosely proposed, the funding will go to research clusters within each university that can demonstrate international recognition for their research at a very high level. Murdoch University has already pointed out in its submissions to DEST that our mission is to engage with research that fits in with
national priorities as evidenced for example, by our strong performance in CRCs and ARC linkage grants. Thus far there is considerable lack of clarity how these priorities can sit comfortably with the requirement of globally recognised research. In order to be able to plan effectively for the advent of the RQF framework to be introduced in 2007-8, Murdoch R&D Division and the R&D Board will be carrying out detailed modelling and will participate in trial assessments throughout 2005. The information derived from these assessments will be used to form our strategies for maximising our block grant income under the new framework.

The history of the similar research assessment exercise in the United Kingdom suggests that there will considerable incentives placed in the path of outstanding researchers to change institution. Murdoch already has recognised the need for maintaining continuity and capability in its leading research areas by implementing a succession plan for the next few years. With the additional pressures and increased risk for retaining its key researchers this plan will need to be widened and enhanced to meet the new scenario.