Research and Research Training Management Plan

16 June 2000

University Vision

The University of Wollongong will achieve distinction as a research university with an international reputation for the high quality of its student-centred undergraduate and graduate education.

University Mission

The University of Wollongong aims to explore, develop and apply human and technological capacity for the benefit of its region, the nation and the international community.

Executive Summary

The University of Wollongong is a medium-sized, research-intensive, non-metropolitan university, established in 1951.

In 1999 we had over 13 000 enrolled students (10 359 EFTSU), an academic staff of 562 FTE, a government operating grant of $94.6 million, and a total income of $159.4 million. As a research university, on a range of performance indicators such as those used by DETYA [1], our performance over the past three years has been considerably ahead of our size, as will be seen in Section g) below.

Our aim over the next 5 years is to become firmly entrenched in the top tier of research-intensive universities.

We will assess our performance relative to our size, location and activities. In keeping with our Mission Statement, we will formulate and implement our research plans relative to a regional research strategy, a national research strategy, and an international research strategy. The University of Wollongong prides itself on its productive partnerships in research and development, and we will continue to develop and nurture our relationships with business, industry and government agencies. We were one of the first universities to develop a strategic focus on areas of strength, and we aim to keep our research enterprise well-disciplined, while retaining sufficient flexibility to react to new developments and serendipitous opportunities.

a) Operating Environment

The University has operated according to a research management plan since the early 1990s; the last revision (before this one) was in 1995. Since mid-1999 we have been carrying out an extensive consultative process of revising the research
management plan. We have already redefined and reconstituted our University Research Committee (URC) and its constituent structures; we are in the process of revising and creating research strategies, policies and procedures, and we are currently reshaping our research units according to strategic themes for the triennium 2001-2003. This process will be completed before the budget cycle for 2001 begins.

We take a systemic view of research at the university. Research units are not faculty-bound, but are encouraged to build partnerships across disciplinary boundaries. At present, our research units consist of two CRCs, three ARC Key Centres, and about 30 further URC-defined units. The CRCs and Key Centres are:

- The CRC for Intelligent Manufacturing Systems
- The CRC for Welded Structures
- The Key Centre for Smart Foods
- The Key Centre for Asia-Pacific Social Transformation Studies (joint with the University of Newcastle)
- The Key Centre for Bulk Solids and Particulate Technologies (joint with the University of Newcastle).

The URC-defined research units have, since 1995, been grouped into three categories in terms of size and importance. Category 1 units, called Research Institutes, annually receive both a block grant and performance-based feedback funding from the URC. At present they are:

- The Institute for Superconducting and Electronic Materials
- The Institute for Steel Processes and Products
- The Institute for Intelligent Polymers
- The Telecommunications and Information Technology Research Institute
- The Institute for Social Change and Critical Inquiry
- The International Business Research Institute

Category 2 and 3 research units (called Research Centres and Groups, respectively) receive no block grant, only performance-based feedback funding. The difference between categories 2 and 3 has in the past been related mainly to size; in future it will relate to excellence, strategic directions and levels of funding (see Section b) below). All research units report, through the URC, to the Pro Vice-Chancellor (Research) on strategic matters, and to faculty structures on operational matters. This is one manifestation of an inherent and pervasive two-dimensionality in our research enterprise: a disciplinary or “vertical” axis, and a cross-disciplinary or “horizontal” axis. We conceptualise our faculties as vertical structures, and our research units as horizontal functional entities, with a systemic responsibility.

Research management at UoW functions as a matrix management system.

The URC is the central body for strategic planning of research at the university. It has the responsibility of developing policies and procedures regarding research and research training, and overseeing their implementation. In addition, each faculty has a Faculty Research Committee (FRC), with a similar brief for that faculty. The membership of the URC consists of the Pro Vice-Chancellor (Research) as Chair, the nine FRC chairs, three representatives from amongst the Directors of research units, the chairs of the five operational committees (see below), and the Director of the Research Office. Each member of the URC is assigned certain portfolios and responsibilities. These include standing responsibilities, such as membership of one of the operational committees, or particular tasks, such as developing a strand of
policy or procedures. The URC budget consists of the Research Quantum available to the university for that year.

The implementation of the URC’s policies and procedures is carried out by a number of operational committees.

- The *Research Training Management Committee* (RTMC) has the responsibility of formulating and implementing our full Research Training Management Plan, of which Section e) below forms the basis.
- The *Audit and Resource Allocation Committee* (ARAC) has overall responsibility for performance-based research funding allocations from the URC budget (see Section b.1)).
- The *Ethics Committee* is an advisory body to the URC on ethical matters in research, and oversees the work of our three statutory committees on human research ethics, animal research ethics, and biosafety.
- The *Innovation Committee* is charged with implementing our Contracts and Consultancies Policy and Intellectual Property Policy, fostering innovation, and coordinating the activities of the URC and the research units with the commercialisation activities of the University’s private arm, the Illawarra Technology Corporation (ITC) (see Section e)).
- The *Infrastructure and Information Management Committee* (IMIC) is charged with recording, tracking and planning our infrastructure needs, on the basis of an integrated management information system.

These are not sub-committees of the URC: they are “overlap committees”, with some members coming from the URC but most nominated directly by the faculties through their FRCs. Each operational committee reports, through its Chair, to the URC and the PVC(R). Issues of planning, policy or precedent are referred to the URC (possibly with a recommendation), but within their terms of reference operational committees have decision-making powers on matters of implementation. Further details on the URC and its operational committees can be found at [http://www.uow.edu.au/research/urc/urc.html](http://www.uow.edu.au/research/urc/urc.html).

All administrative functions are carried out by the Office of Research. This consists of a Director, a Grants Manager, a Research Student Manager, a Contracts Manager and other staff providing services such as financial and IT. Only 2.5 positions (out of a staffing complement of 12 FTE) are paid for directly by the University; for the rest the Office of Research is self-funding.

b) Proposed Future Directions

b.1) 

Research at the University will be focused into *four broad thematic areas of strength*:

- MATERIALS AND MANUFACTURING
- COMMUNICATION AND THE INFORMATION SOCIETY
- POLICY AND SOCIAL IMPACT
- ENVIRONMENT AND QUALITY OF LIFE

Each theme runs across all nine faculties, and our research units are clustered by theme. During 2000 we are reconstituting our current research units so as to bring them in line with these strategic priorities. A process of application and selection is currently under way according to which proposed research units are evaluated in
terms of quality, synergy, strategic fit, and capacity for growth. Each research unit has to submit a research plan, stating its objectives, the projects/programs to be undertaken, the entrepreneurial activities planned (including interaction with business, industry and/or government agencies), arrangements for research student training, strategies for growth, projected outcomes and envisaged impact. Performance is measured annually against these research plans, in terms of specified qualitative and quantitative criteria. Feedback funding is linked to performance.

b.2) We plan to develop a holistic and student-centred research training environment. (See section c) below.)

b.3) We plan to support and develop research activities that will enhance our reputation as a University of innovation. Strategies towards inculcating a culture of innovation include:

- The creation of the Innovation Committee
- The creation of UoW Innovation Fellowships
- The availability to all PhD students of free access to a graduate program in business skills
- The creation of a position of Director of Research and Innovation
- Commercialisation activities through the Illawarra Technology Corporation
- Feedback funding mechanisms to reward research units for entrepreneurial activities
- Linkages into Wollongong’s “City of Innovation” image campaign

(See also sections d) and e) below.)

b.4) In keeping with our mission statement, we are developing a regional research strategy, a national research strategy, and an international research strategy. These are internal documents, but key features are as follows.

At regional level, our basic principle is that the university should act as an engine of socio-economic growth for the Illawarra and NSW South Coast. Our research units, and their various projects/programs, should offer a mix of interactions at regional level with local government, business and industries, within our four thematic areas of strength. Current examples would be: our Steel Institute interacting with BHP; our Institute for Telecommunications and IT interacting with Nortel (which have set up their research headquarters on campus); our Centre for Maritime Policy interacting with the naval training base HMAS Creswell at Jervis Bay; our environmental scientists engaging with regional problems such as acid sulphate soils, and our botanists working with the City Council on a cooperative development plan for the city’s Botanic Gardens. The University has a campus at Nowra (joint with TAFE) and a teaching presence as far south as Bega; this South Coast presence will be enhanced by a research presence, for which we are targeting environmental research. We will engage not only with large corporations and government agencies, but also with SMEs, as for example in a recent SME Workshop on campus. Our local interactions will include active participation in the arts and cultural events.

At national level, our basic principle is to develop niche areas within our four thematic areas of research, and to take on a leadership role within these niche areas. For example, we aim to be an IT-intensive University, and to boost the region as a ‘new economy’ player. We put a strong emphasis on collaboration with other universities, and aim to enhance our participation in CRCs, ARC Centres of Excellence, and other collaborative ventures such as RIEF grants. An example would be our two Key Centres shared with the University of Newcastle. Likewise, we will
continue to work hard at forming partnerships with business and industry. A number of examples of current interactions appear in Section d).

At international level our basic aim is to be an Australian-based University with a substantial overseas presence and profile. The University already has a large number of overseas collaborations and interactions of various levels of intensity. We plan to concentrate our activities in a few geographical and thematic areas, rather than try and sustain a large number of individual activities all around the world. We therefore aim to strengthen our alliances with a small number of institutions abroad, concentrating on key areas of overlap with our own research themes.

b.5) For flexibility, we will retain the option of mounting special research initiatives from time to time, making use of the strengths available in research units and academic units, without at the outset being bound to current structures. A current example is the Digital Media Initiative, set up to develop UoW’s presence in the fast-changing world of convergence between the Internet and TV broadcasting. It includes representatives from our research centres in telecommunications, in multimedia, and in creative arts, and is developing R&D partnerships with TV and IT companies. Other possibilities currently under investigation include a Mathematical and Computer Modelling Initiative, and an Oceans Initiative.

b.6) Our (newly-formed) Infrastructure and Management Information Committee (IMIC) will formulate and implement a system of recording, tracking and planning for our infrastructure needs. IMIC will represent academic as well as non-academic infrastructure suppliers (e.g. the library, information technology, finance, buildings and grounds) and will make an input into infrastructural grant applications such as RIEFP grants. In addition, IMIC will work with the University Planning Unit to streamline our management information systems relating to research (for example, data such as presented in this Research and Research Training Management Plan).

b.7) We will formulate a Conceptual Framework setting out the underlying concepts, values and principles on which our research management is based. This document will serve as a reference point for our strategies and plans, and a conceptual aid to decision-making.

c) Arrangements for Ensuring a Quality Research Training Experience

| We aim to produce graduates who are not only trained researchers in their own right, but are also well-equipped for employment or self-employment. |

The University offers the full spectrum of higher degrees: research Masters, PhD, professional doctorates and doctorate by publications. Research training management is the responsibility of the Research Training Management Committee (RTMC), which was formed expressly for this purpose as part of the URC restructuring during 1999-2000. The RTMC reports to the URC and the PVC(R). Each faculty research committee is represented on the RTMC, to ensure coordination. The RTMC is supported by the Thesis Committee, which is entirely devoted to the examination process. The University aims to provide a holistic and student-centred research training experience, with an integrated suite of policies and procedures covering all aspects of recruitment, enrolment, induction, supervision, support, examination, exit and follow-up. Here are a few examples:
• **Information:** We have developed and implemented a user-friendly on-line “Research Student Guide”, where prospective and current students can drill down to any level of specificity, accessing all information, policies and procedures relevant to research students. (See [http://www.uow.edu.au/research/new/](http://www.uow.edu.au/research/new/).)

• **Supervision:** Our Code of Practice Supervision has been fully revised, in response to a 1997 survey of research students. It provides a comprehensive description of the envisaged relationship between research student and supervisor, and includes mechanisms such as early review of a thesis proposal, annual two-way reporting, and clear grievance procedures. We also have policy in place to support offshore PhD students.

• **Support:** We have a Research Student Maintenance Fund, which makes research funds available for student infrastructural support. A separate Research Student Conference Fund supports student travel. All research students have free access to our Statistical Consulting Service, and can attend training sessions in statistical methods. Extensive support is provided by the Library and the Learning Development Centre, including thesis-writing workshops and information technology services and courses. For those students interested in an academic career we make available a course “Introduction to Tertiary Teaching”, which can also be used for credit towards postgraduate qualifications in Education.

• **Student Life:** Our Wollongong University Postgraduate Association (WUPA) provides a collegial environment for research students. WUPA is represented on the RTMC and the URC. An annual Research Student Open Day is a showcase for our student projects, and brings students in contact with business and industry.

We are fully committed to measuring student satisfaction and acting upon the feedback received. It must be said that we share the disquiet that has been expressed in the HE sector about the Postgraduate Research Experience Questionnaire (PREQ) proposed by DETYA as an instrument, especially if it is to be used for cross-sector comparisons. However, we trialed the PREQ amongst recently-graduated research students in December 1999, and benchmarked it against current research students. The trial had a sample space and a response rate too low to yield significant information. For the benchmark, 855 PREQ surveys were sent to current research students; of these 286 were returned (254 PhD and 32 research Masters), a response rate of 33.5%. The results were as follows:

<table>
<thead>
<tr>
<th>CURRENT STUDENTS (%)</th>
<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PhD</td>
<td>Mast.</td>
<td>Total</td>
</tr>
<tr>
<td>Supervision</td>
<td>12.2</td>
<td>15.6</td>
<td>12.6</td>
</tr>
<tr>
<td>Skill Development</td>
<td>5.8</td>
<td>7.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Climate</td>
<td>21.7</td>
<td>25.0</td>
<td>22.1</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>18.7</td>
<td>17.5</td>
<td>18.5</td>
</tr>
<tr>
<td>Thesis Examination</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Clarity of Expectations</td>
<td>7.5</td>
<td>15.6</td>
<td>8.4</td>
</tr>
<tr>
<td>Overall Satisfaction</td>
<td>15.4</td>
<td>15.6</td>
<td>15.4</td>
</tr>
</tbody>
</table>

We also carried out an independent survey in 2000 as part of the re-enrolment process on the Web, with students given the option of answering a few questions
once they had completed their enrolment. This survey had a 38% response rate overall.

**Response to the claim: "Overall I am satisfied with the quality of my course".**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postgraduate Research</td>
<td>2.3</td>
<td>4.2</td>
<td>15.5</td>
<td>51.9</td>
<td>25.4</td>
<td>262</td>
</tr>
</tbody>
</table>

Our first conclusion is that we should become more professional in surveying student satisfaction. Accordingly, IMIC and the Strategic Planning Unit will, over the next year, (a) devise effective instruments for measuring student satisfaction, and (b) find ways of improving the response rate. Secondly, we note that the areas of lowest satisfaction amongst our students are “climate” and “infrastructure”, and the RTMC will work towards addressing these issues. A number of initiatives are already under way.

- UoW has joined a national consortium for supervisor training.
- The university, through its faculties and research units, will develop suitable induction programs for new students, statements of minimum standards and resources available, and 3-year rolling plans on research training management.
- The development of transferable skills for research students, and the formulation of a suitable set of “Attributes of a UoW research graduate”.

For example, as from 2001 UoW will make available to all PhD students, on a voluntary basis and with costs covered, a suite of modules aimed at inculcating business and innovation skills. Successful completion of a certain number and selection of these, over the 4-year period of PhD study, will result in the award of a Postgraduate Certificate in Business. This will give our PhD graduates a further competitive advantage in the job market, or in setting up in business on their own. The Certificate in Business can also be used as an entry route to MBA studies or to a special-purpose Master’s degree in Business and Innovation.

Finally: we regard the level of engagement of our academic staff with research students as a measure of our research intensity, and we regard the rate of completion of our research students as a measure of research training efficiency. Figures appearing in Section **g** lead us to adopt the following goals:

- We aim for a ratio of research students over academic staff higher than 1 to 1.
- We aim for a conversion rate of research students (completions over commencements) higher than 2 out of 3.

**d) Collaboration with Other Institutions, Industry and Other Bodies**

Collaboration and cross-disciplinarity are concepts integral to research management at UoW. In 1999 we won the *Good Universities Guides* award as Australia’s University of the Year for Productive Partnerships in Research and Development.

A quick and simple illustration of why the University is deserving of such an accolade is our record in SPIRT grants (“Strategic Partnerships with Industry in Research and Training”). The following table gives our ranking against all other Australian universities:
Another good measure of our interaction with business and industry is the concept of *industry-earned research dollars*. This is the percentage of our total research income that does *not* come from government grants (i.e. it comes from industry), and which has been *earned* (i.e. we discount philanthropic contributions). On this measure UoW’s performance sector-wide is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>UoW: Percentage of industry-earned research income</th>
<th>Sector Average</th>
<th>UoW rank sector-wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>35.0%</td>
<td>22.5%</td>
<td>4</td>
</tr>
<tr>
<td>1997</td>
<td>72.6%</td>
<td>24.9%</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>54.1%</td>
<td>24.6%</td>
<td>2</td>
</tr>
</tbody>
</table>

The figures for 1997 and 1998 were enhanced by a particular high-income commercialisation venture; nonetheless it shows up our significant profile of industry interaction.

Our aim is that at least 40% of our total research income should be earned through interaction with business and industry.

Besides making the case in terms of numbers, there are many actual examples that can be given of our collaborations and interactions with business, industry and the region.

- Nortel has located their research laboratory at the UoW campus, and a significant level of interaction is taking place both in terms of R&D and in terms of state of the art training.
- Our CRCs and Key Centres all interact strongly with industry, as per their charters, and have Boards with membership drawn from industry and the community.
- Our 6 internal Research Institutes all relate strongly to industry:
  - The Institute for Steel Processes and Products has had funding for three Chairs from BHP for the past 5 years at $500K per year, plus further support over this period of $1.88 million.
  - The Institute for Superconductors and Electronic Materials collaborates with companies such as Metal Manufacturers Ltd in the area of high-temperature superconductivity, as well as with 10 Australian Universities and more than 30 institutions around the world. The Institute’s SPIRT grants for 1999-2001 have a total value of $840 000.
  - The Institute for Telecommunications and Information Technology has undertaken extensive R&D collaboration with the major IT&T companies, including Telstra, Motorola, Nortel, Vodafone, Optus, HP, Ericsson, Alcatel,
Anritsu, MCI Worldcom, Xylan, DSTO, CSIRO, SIA, Switchview, Canon. Total funding over the past 10 years would be of the order of $15 million. Telstra alone has contributed about $6.5 million in cash towards research in broadband switched networks, including future Internet technologies.

- The Institute for Intelligent Polymers receives funding from Australian companies such as BHP ($80K for coatings technologies), Visy Industries ($100K for sensors), and Quantum Technologies ($125K for an electronic Braille system). International funding comes from companies and agencies such as Mitsubishi Rayon in Japan ($100K for polymer processing) and DARPA in the USA ($200K for carbon nanotubes).
- The International Business Research Institute has won World Bank funding of $2.1 million to improve the management of science and technology policy in Indonesia, as well as funding from UNESCO, the OECD and APEC.
- The Institute for Social Change and Critical Inquiry receives funding of more than $0.75 million cash from Rio Tinto for its work in Social Impact Planning in South East Arnhem Land. (It also receives significant in-kind support: vehicles, maintenance, accommodation, etc.)

- At a regional level, a good example of interaction is our e-Business Centre, set up to interact with SMEs. This was recently opened by the NSW Minister for Information Technology and Management.
- At an international level, we have existing and well-functioning interactions with over 70 universities in Asia, Europe and the Americas, as well as projects funded by governments and international agencies. Increasingly, we will cluster these to fit with our areas of strength. A significant recent development is the visit we received from HRH Princess Chulabhorn Mahidol from Thailand, and the Memorandum of Understanding with the international Chulabhorn Research Institute she leads. This will enable us to concentrate on specific areas of research, and simultaneously improve coordination of our interactions with other Thai universities.

e) The Management of Commercialisation, Intellectual Property and Contractual Arrangements

Like most universities, UoW has experimented with a range of models for innovation and the commercialisation of research. The university’s private arm, the Illawarra Technology Corporation (ITC), has been through the phase of acting as an incubator, trying to nurture and spin off small companies. That did not work well for us, and the current model is one whereby ITC concentrates on the commercialisation of in-house research. ITC sets aside funds into a Technology Development Fund (TDF) in lieu of paying rent for its headquarters located on campus, and this fund is used by a Technology Advisory Committee to aid the development of technologies on campus, and take these technologies to market. Since 1996 a total of $2.3 million has been applied from this fund to a wide range of projects, falling into two main areas: Communication Technologies, and Advanced Manufacturing Technologies. One achievement under the first heading was the establishment of a cost-saving and market-enhancing call centre for the university. Under the second heading, ITC marketed a university-designed microwave oven to heat treat wool bales in just six minutes, rather than the several days it takes in hot rooms. These have been exported to Italy and the Czech Republic.

The University has a well-developed policy on Contracts and Consultancies, which are handled by the Research Office through the Research Contracts Manager.
All research contracts are based on the principle of full cost recovery plus profit. The Research Office charges a 10% fee for managing research contracts, consultancies and commercialization activities. (Some faculties and/or departments also exact an internal levy, but the URC has now constituted a working group to evaluate these practices, and ensure equity and uniformity.) To encourage entrepreneurship and self-resourcing, staff are able to keep all of the remaining profit within their own research accounts, for their own use. The value of our research contracts rose from $12.671 million in 1996 to $17.875 million in 1998.

The University also has an Intellectual Property Policy, which essentially operates on a 50/50 basis: 50% of benefits for the individual researcher, and 50% for the University; the latter again being split in equal proportions between the University and the relevant faculty or academic unit. This is a simple and clear-cut arrangement, with significant potential benefits for entrepreneurial staff. An Intellectual Property Committee, chaired by the PVC(R), is responsible for the implementation of the Intellectual Property Policy.

The University has over the recent past moved increasingly towards a higher profile in innovation and entrepreneurship. For example, in 1999 an Engineering Innovation Centre was launched off campus in collaboration with a number of industries. This thrust will be continued in an increasingly systemic and structured manner. Leading this initiative will be the responsibility of the (newly-formed) Innovation Committee. It will in the short term coordinate the work of the Technology Advisory Committee, the Intellectual Property Committee, the contracts and consultancy part of the Research Office, and other innovation activities; in the longer term it will phase out some committees and take direct control of the corresponding activities.

Our aim is to construct a clear pathway for research units to move towards financial self-sustainability.

f) Quality Assurance Mechanisms for Self-Assessment

There are three basic quality assurance questions that should be answered by any university:
1. What concept(s) of quality do you adopt?
2. For these concepts, what quality assurance mechanisms do you have?
3. How do you know that these mechanisms work?

As regards the first question: from amongst the many concepts of quality for higher education, we regard the following as appropriate for UoW, and specifically for research at UoW:
- Quality as fitness of purpose. The University’s goals and objectives are evaluated against national policies, regional requirements and societal expectations.
- Quality as fitness for purpose. The University’s performance is evaluated against its own mission, goals and objectives. (This concept of quality embraces the traditional concept of quality as “maintenance of standards”.)
- Quality as a transformative concept. What value do we add?
- Quality in terms of customer satisfaction with a product (ISO 9000).
- Quality in terms of value for money. Is the University spending taxpayers’ money to good effect?

As regards the second question, UoW has a number of policies and practices in place to assure the quality of our research and research training activities in terms of
each of these concepts of quality. (In addition, we plan to do more work specifically on the so-called “learning” benchmarks, in the terminology of DETYA Report [2].) Here are some examples.

- We hold a University-wide Planning Conference once a year, where the overall purpose of the university is examined and re-affirmed. The fitness of our purpose is evaluated through participation in the Planning Conference of invited guests from government, political parties, industry, community organizations or the media. In addition, the University Audit Officer regularly reviews our policies and procedures against state and federal government requirements.

- The fitness for purpose of our entire research enterprise comes under review once every three years. All research units are subjected to scrutiny within the context of the University’s overall strategic plan. Some units may fall away, and new ones may be formed. (This process is currently under way for the triennium 2001-2003.) In addition, all research units report back to the URC annually, and their performance against qualitative and quantitative performance indicators determines the level of feedback funding they receive. As regards research training, we measure up to traditional notions of “maintenance of standards” through measures such as rigorous external examination of theses.

- We add value at regional level through driving socio-economic development; we add value to business, industry and society through our research collaborations, and we add value to our research students, over and above research training, through inculcating skills and attributes preparing them for employment or self-employment.

- Our client-focused activities are quality-assured in the sense of customer satisfaction through scrutiny by suitably representative bodies. The larger research units have Advisory Boards with strong representation from business and industry; our research training management structures have representation from WUPA (the Wollongong University Postgraduate Association), and our regional research policy is appraised by interaction with bodies such as the Illawarra Business Chamber, the Illawarra Area Health Service, and the Department of State and Regional Development. We intend making more systematic use of such representative bodies to establish benchmarks and assess our research impact at regional and national levels.

- The concept of quality in terms of value for money comes down to output related to cost. (See Section g.)

As regards the third question above, we check whether our quality assurance mechanisms work by applying suitable performance indicators. These too are discussed in Section g) below.

We will use a basket of leading, lagging and learning indicators to check how we perform in terms of our chosen quality concepts.

g) A Review of Recent Past Research Performance

In this section we use a number of standard key performance indicators (KPIs), and data available from public sources, to quantify our research performance over the past three years, and to indicate our ranking relative to other Australian Universities.

A first and simple measure of research performance is research publications per staff FTE. A related measure is success in obtaining ARC grants, and in the table below we use the performance indicator of newly-awarded competitive ARC grants
as a percentage of total operating budget (i.e. relative to size). For a deeper analysis, research income should also be used as a parameter. The so-called “Brennan indicator”, for example, takes the ratio of Research Quantum to total government operating grant; this measures research returns against government financing. A more explicit “value for money” indicator would be the ratio of research income against salary costs; this quantifies the rate of return on taxpayers’ money. (A similar measure is used by the Higher Education Funding Council of England (HEFCE) in the UK Research Assessment Exercise.) On these indicators, our recent past performance has been as follows.

<table>
<thead>
<tr>
<th>KPI</th>
<th>Research publ’s per academic staff FTE</th>
<th>Newly awarded ARC grants as a % of total operating grant</th>
<th>Brennan indicator</th>
<th>Total Research income over salary costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Rank</td>
<td>%</td>
<td>Rank</td>
</tr>
<tr>
<td>1996</td>
<td>0.61</td>
<td>8th</td>
<td>1.27</td>
<td>8th</td>
</tr>
<tr>
<td>1997</td>
<td>0.98</td>
<td>4th</td>
<td>1.61</td>
<td>10th</td>
</tr>
<tr>
<td>1998</td>
<td>1.05</td>
<td>5th</td>
<td>1.98</td>
<td>5th</td>
</tr>
<tr>
<td>1999</td>
<td>na</td>
<td>na</td>
<td>2.72</td>
<td>1st</td>
</tr>
<tr>
<td>2000</td>
<td>na</td>
<td>na</td>
<td>1.92</td>
<td>5th</td>
</tr>
</tbody>
</table>

A number of proportional performance indicators used by DETYA [1] use total research income as the denominator. On these indicators our recent past research performance can be ranked as follows.

<table>
<thead>
<tr>
<th>KPI</th>
<th>Total Research Income over Total Income</th>
<th>Total Research Income per Staff FTE</th>
<th>Total Research Income per Domestic Res Stud EFTSU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>Rank</td>
<td>%</td>
</tr>
<tr>
<td>1996</td>
<td>8.7%</td>
<td>13th</td>
<td>15.1%</td>
</tr>
<tr>
<td>1997</td>
<td>19.9%</td>
<td>1st</td>
<td>41.6%</td>
</tr>
<tr>
<td>1998</td>
<td>11.2%</td>
<td>10th</td>
<td>20.9%</td>
</tr>
</tbody>
</table>

These rankings are sector-wide, on total aggregated data. We note, however, that not all universities engage in the same activities. At UoW, for example, we have to take account of the fact that we do not have a medical school, since this is a strong causal factor in accessing NHMRC grants. (AV-CC data for 1998 [3] show that NHMRC grants amounted to almost 40% of the total national competitive research grant funding - $159.6 million out of $405.9 million). A second important qualifier is the notion of research-earned research income. Many historically advantaged universities can, as a result of age, a metropolitan basis, or large landholdings, accrue significant income for research through non-research activities such as bequests and donations, as well as real estate transactions. UoW is evidently not in a position to put a high reliance on income from the NHMRC, or from donations and bequests. Also, the pool of ARC funding is unlikely to grow in the near future. These are reasons why in Section d) we target, as our most attainable areas of growth, innovation, entrepreneurship, and interaction with industry.

With regard to research students, our profile since 1996 is given below (in headcount numbers, including international students).
Over this period the University has maintained, on average, a ratio of research students to academic staff of about 1.46. On this performance indicator, UoW has ranked within the top 7 Australian universities since 1996.

Beyond the actual numbers of research students, what is of equal importance is the completion rate. We use the new DETYA guidelines for completion times: 2 years for research Masters, and 4 years for PhD. I.e., in the table below research Masters’ completions at the end of one year are compared to commencements at the beginning of the previous year, and PhD completions at the end of one year are compared to commencements at the beginning of the year three years earlier.

<table>
<thead>
<tr>
<th>Year</th>
<th>Masters Completions</th>
<th>Doctoral Completions</th>
<th>Total Completions</th>
<th>Masters Conversion Rate</th>
<th>Doctoral Conversion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>39</td>
<td>103</td>
<td>142</td>
<td>35.7%</td>
<td>61.6%</td>
</tr>
<tr>
<td>1997</td>
<td>44</td>
<td>103</td>
<td>147</td>
<td>74.5%</td>
<td>59.8%</td>
</tr>
<tr>
<td>1998</td>
<td>28</td>
<td>90</td>
<td>118</td>
<td>56.0%</td>
<td>45.6%</td>
</tr>
<tr>
<td>1999</td>
<td>25</td>
<td>56</td>
<td>81</td>
<td>51.0%</td>
<td>27.5%</td>
</tr>
</tbody>
</table>

The average completion rate over the period 1996-99 for Masters students is 60.2%, and for Doctoral students is 50.3%. We note that the completion rate is not high, but this appears to be a sector-wide phenomenon. A reasonable performance indicator of efficiency in this context is a university’s share of total PhD completions over its share of total academic salary costs. (This is used by HEFCE in the UK; it is another example of a “value for money” quality indicator.)

<table>
<thead>
<tr>
<th>Year</th>
<th>UoW share of PhD completions</th>
<th>UoW share of total salary costs</th>
<th>UoW rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>2.86%</td>
<td>1.95%</td>
<td>4th</td>
</tr>
<tr>
<td>1997</td>
<td>2.87%</td>
<td>2.07%</td>
<td>4th</td>
</tr>
<tr>
<td>1998</td>
<td>1.56%</td>
<td>2.01%</td>
<td>19th</td>
</tr>
</tbody>
</table>

(The 1998 result illustrates the volatility of performance indicators based on small numbers, in this case research student completions. We also note the sensitivity of completion rates to the ratio between part-time and full-time students.) We conclude that even though our performance relative to the sector is good we need to be more efficient in terms of completion rates and completion times, and our Research Training Management Plan based on Section c) will aim to achieve these goals.

**h) Graduate Outcomes in Terms of Attributes and Employment**

In the University’s Strategic Plan we set out the Attributes of a Wollongong Graduate, and these cover research students as well. In addition, however, the RTMC is formulating during 2000 further attributes specifically desired of a
Wollongong research graduate, and will describe the means whereby such attributes are to be instilled. A number of mechanisms are already in place or on the drawing board, such as the Postgraduate Certificate in Business (see Section b)). Our research training has resulted in many honours and prizes for our students. For example:

- Recent PhD graduate Kirsten Benkendorff was named Young Australian of the Year for Science and Technology, for her innovative work in isolating from marine slugs a natural antibiotic more powerful than penicillin.
- Amongst our Honours graduates, Gaurav Raina won the Ramanujan Studentship for Mathematics to Trinity College Cambridge, and Mark Tito (currently doing a DPhil at Oxford) won the Student of the Year Award from the Royal Institution of Great Britain.
- In the performing arts, singer Goknur Ray won the Queen's Trust Award, and was one of only 13 students to win admission to the Royal College of Music in London in 1999.

As regards graduate destinations, the most recent (1999) figures are as follows:

<table>
<thead>
<tr>
<th></th>
<th>National</th>
<th>Wollongong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total FT employment</td>
<td>75.9%</td>
<td>72.2%</td>
</tr>
<tr>
<td>Total seek FT emp.</td>
<td>10.0%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Total not seek FT emp.</td>
<td>6.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Median Salary</td>
<td>$49 600</td>
<td>$53 000</td>
</tr>
</tbody>
</table>

Our sample space (again) was quite small, but the indications are that most of our PhD graduates are employed in the education sector (indeed, some of them are staff members of this or another university). The median salary of our PhD graduates is well above the national median.

i) Research-Active Members of Staff and their Research Outputs and Achievements

UoW has a high proportion of well-qualified staff: 76.9% of academics hold a PhD (1999 data). We also have a high proportion of research-active staff, where by “research-active” we mean “meeting at least one of the following criteria in any given year”:

- Holding or part-holding a national competitive grant, other public sector grant, or industry grant
- Having authored at least one DETYA-defined research publication, singly or jointly
- Supervising or co-supervising a research student.

Our performance under these headings over the past three years is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Grants received</th>
<th>Grant-holders</th>
<th>Authors</th>
<th>Supervisors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Masters</td>
</tr>
<tr>
<td>1997</td>
<td>170 (29.2%)</td>
<td>170 (29.2%)</td>
<td>333 (57.2%)</td>
<td>155 (27%)</td>
</tr>
<tr>
<td>1998</td>
<td>207 (35.7%)</td>
<td>222 (38.3%)</td>
<td>330 (56.9%)</td>
<td>122 (20%)</td>
</tr>
<tr>
<td>1999</td>
<td>183 (32.5%)</td>
<td>211 (37.5%)</td>
<td>n.a</td>
<td>111 (20%)</td>
</tr>
</tbody>
</table>
A natural follow-on question would be to ask how many staff members satisfy at least one, at least two, or all three of these criteria simultaneously. Our data sets do not allow a straightforward answer. However, on a minimalist approach (satisfying at least one of the criteria, as a contributor) our analysis shows that over 70% of our staff can be classified as research-active, whereas on the strictest approach (satisfying all three criteria) 20-25% of our staff may be considered highly research-active. Another measure would be to look at the proportion of research-only staff: our last report to DETYA listed 80 such staff members (14.2%).

We aim to increase our proportion of research-only staff to at least 25% within the next five years.

The research activities of our staff can also be formulated and analysed in the context of our research units. A full breakdown of the membership, aims, activities and funding profile of each of our current research units appears in the University’s Research Fact File. The University has considerable strengths in the traditional disciplinary sense, but our main research strength, as has been demonstrated throughout this document, is in collaboration, partnerships and cross-disciplinarity. Outputs and achievements include the following examples.

- UoW won the 1999-2000 Good Universities Guides award as “University of the Year for Productive Partnerships in Research and Development”.
- Our Multimedia research unit has won numerous awards, including a BAFTA award for an interactive CD on theatre and stage management. (One of the runners-up was the Microsoft corporation.)
- Techniques originally developed for atmospheric sensing were applied to breath-detection of Heliobacter Pylori, the ulcer-causing organism, resulting in a commercialisation activity worth $20 million (now at prototype stage).
- UoW has been declared a centre of excellence in Information Technology by the NSW Government.

References

Glossary of UoW-specific Terms and Abbreviations
ARAC: Audit and Resource Allocation Committee
FRC: Faculty Research Committee
IMIC: Infrastructure and Management Information Committee
ITC: Illawarra Technology Corporation
TAC: Technology Assessment Committee (of the ITC)
RTMC: Research Training Management Committee
UoW: University of Wollongong
URC: University Research Committee
WUPA: Wollongong University Postgraduate Association.