AUSTRALIAN RESEARCH COUNCIL

Comments on Discipline Research Strategies

Information Technology: Sink or Swim?

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Introduction

The Australian Research Council (ARC), recognising that the active involvement of the research community is essential to the formulation of research policy, is encouraging peak bodies to develop research and research training strategies for their disciplines.

The information technology discipline strategy was developed by the Australian Academy of Technological Sciences and Engineering (ATSE). The review activities were overseen by a Working Party chaired by Professor Peter C Poole, FTSE, and having members drawn from industry, government and universities. The Working Party was assisted in its task by a Steering Committee whose members are eminent in many areas of information technology.

In preparing its report the Working Party consulted widely with academics, government and industry. Six open forums were held in major cities, and interviews and meetings were conducted during the investigation. Submissions were also received at various stages.

Since December 1997 the final report of the strategy, Information Technology: Sink or Swim?, has been available to the public on the World Wide Web from the ATSE web site. The strategy has since been published in hard copy by the National Board of Employment, Education and Training. It was formally launched by Mr Tim Besley, FTSE, President of the Academy, on 18 September 1998 in Melbourne.

The Australian Research Council sought the views of its own members in developing its response. Following publication of the response the Council will also write to all organisations referred to in the recommendations inviting their response direct to the Academy.

General Comments

The terms of reference for the strategic review of information technology encompassed scientific, social and economic, and education and training considerations. The review aimed to

- determine the degree to which a strong fundamental research base is required in all fields of information technology research in Australia;
- identify the strengths and weaknesses of IT research in an international context;
- assess the contribution of basic and applied IT research to the Australian information industries;
• evaluate the benefits of Australian IT research for Australian industry and for the wellbeing of Australian society; and

• characterise the current education and training of people engaged in IT research in the public and private sectors.

Based on this information, the Working Party undertook to make recommendations for policy or funding changes and to identify methods for implementing its recommendations.

The report concludes that Australia currently lacks the strength of IT research that it views as necessary to underpin the growth in information industries. The Working Party agreed that Australia is at a crossroads in deciding which direction it will take in the future. On the one hand, the country could develop its own information technology industry through research, innovation and development. On the other, it might continue to rely on primary industry exports and importing high technology products. Hence, the report is entitled, *Sink or Swim?*
Council’s Response to Specific Recommendations

The strategy contains seventeen recommendations ranging across a number of issues and addressed to a variety of organisations. In the following response, the Council concentrates on the six recommendations addressed to it. A summary of all recommendations from the report is in the Appendix to this document.

Australian Government Funded Research

Recommendation 1 (pp. 94-95)

- In order to provide coordinated and focussed research programmes aimed at disciplines that are most important for Australia’s future prosperity, the Federal Government must establish a national priority setting process for Australian research. Government research programmes must also rationalise their funding mechanisms for research to avoid duplication. To this end the Federal Government must ensure that:
  a. all government funding bodies and research agencies have a priority setting process, similar to that introduced by CSIRO; and
  b. all government funding bodies and research agencies should ensure that mechanisms for research are rationalised.

[ARC, DEETYA, DIST]

a. The ARC agrees that the Federal Government must establish a national priority setting process for Australian research. Through the Prime Minister’s Science, Engineering and Innovation Council, the ARC is participating with other Commonwealth agencies in the development of broad structural priorities for research. The ARC mission encompasses a special responsibility for supporting basic research and research within higher education institutions. As a result, the priority setting mechanisms most appropriate to Council will be different from those of other organisations with different missions, such as the CSIRO. The Council is currently reviewing the application of priorities across the range of its research funding programmes.

b. The ARC also agrees that funding mechanisms for research should be rationalised to avoid duplication. The ARC actively pursues
opportunities to fund research jointly with other Commonwealth agencies in cases where there is a commonality of objectives. As one example of such interaction, the ARC is currently liaising with Research and Development Corporations about a joint workshop on new gene technology, which will help identify areas of common interest and concern.

**Recommendation 2 (pp. 95-96)**

- In view of the economic significance of IT and the size of the IT research sector, the ARC should clearly identify this category in its assessment panel structure and make the following changes:
  
  a. the names of the A4 sub-panel should be changed from Engineering 1 to Information Technology and the A8 sub-panel from Engineering 2 to Engineering;
  
  b. the new Information Technology sub-panel should assess all applications in the IT discipline including Computer Science, Computer Engineering, Software Engineering, Digital Communications and Information Systems;
  
  c. the new Information Technology sub-panel should be augmented with the appropriate research expertise in the Information Systems area.

[ARC]

a. The Council recognises the economic importance of information technology. It is willing to consider a change of name for the A4 discipline sub-panel. However, the name, ‘Information Technology’, would appear to exclude the panel’s involvement in other areas, including Engineering, Photonics, Signal Processing, Control Systems and Electronics. It may be inappropriate to relocate these forms of engineering to the A8 sub-panel, as they differ in terms of research methodology and philosophy.

The Council is prepared to consider alternative names for the A4 sub-panel to reflect more accurately what the panel does. The Chair of the Research Grants Committee (RGC) will refer the issue to the panel for comment, as part of the ARC’s current review of the nomenclature and discipline coverage of its panels.

b. The present A4 sub-panel does assess all applications in the IT discipline.

c. In view of the large number of IT applications received each year, the Council considers that the number of IT panel members may need to be supplemented. It is common in all panels, however, for applications in certain fields to be assessed by members of panels whose main expertise is outside the specific area.
Recommendation 3 (p. 98)

- In recognition of the nature of IT research, the ARC should consider the following changes to the implementation of their Large Grants Programme:
  a. evaluation of research proposals in IT should take into account other research contributions besides published papers;
  b. assessors of grant applications should indicate on the assessment form their confidence level for assessing the application;
  c. the ARC should implement the recommendations of the Bazeley Report to address the problems faced by young researchers in obtaining funding support for their work; and
  d. because IT is an experimental discipline, the ARC should establish mechanisms to fund experimental IT research programmes based upon recognised scientific principles and these programmes should be extensible for a period of up to 5 years.

[ARC]

a. Under the Council’s Large Research Grants Scheme, there is scope for applicants to indicate their track record other than by referring to published papers. With regard to the development of computer software, researchers can clearly indicate, for example, how particular software packages have been patented or made available to others, statistics of their uptake and access, and the number of copies sold to individuals and companies.

b. The Council is confident that assessors are capable of making appropriate judgements about their competence to assess applications.

c. This recommendation refers to the Bazeley Report, Waiting in the Wings: a Study of Early Career Researchers in Australia, ARC Commissioned Report, No 50. In line with the recommendations of the report, the ARC has introduced a special category in the Large Grants Research Scheme for researchers to indicate whether they wish to be considered as early career researchers, and this is further clarified in the 1999 Large Grant guidelines. The early career researchers category applies to all disciplines.

d. The Council considers that Information Technology is not unique as a discipline in having an experimental focus, and that opportunities exist for achievements in the discipline to be recognised, for example, through patents and original software.

The Council’s Research Grants Committee is considering the potential benefits of introducing Programme grants to complement projects
funded by Large Grants. Programme grants may be appropriate for exceptional researchers and could be funded for up to five years.

Recommendation 4 (p. 100)

IT research needs to be conducted in a global context, and this together with Australia’s geographical position means that the focus on the importance of international research collaboration in IT must be increased. Government bodies should foster international collaboration in the following ways:

a. DIST and DEETYA should establish an integrated funding mechanism to increase the collaboration between Australian researchers and international research groups;

b. ARC should fund specific grants to allow Australian postgraduate students to spend a short time in an internationally recognised IT research facility; and

c. IT professional associations in conjunction with DIST and DEETYA should establish a ‘Distinguished Visitor’ programme in the IT discipline.

[ARC, ACS, DEETYA, DIST, IEAust]

a. The Council’s Committee on International and National Cooperation is currently exploring ways in which ARC, DEETYA and DIST funding mechanisms can be integrated in supporting collaboration on a national and international scale. To this end, the Council is seeking to facilitate the appointment of a DIST nominee to the Committee.

b. The Council acknowledges that support for postgraduate students to undertake a portion of their training at research facilities overseas could fill a gap in present training arrangements. It is considering a proposal to enable postgraduate students to spend up to six months overseas with full support. Such an opportunity would provide for international knowledge and technology transfer and establish international collaboration at an early stage in the career of a PhD candidate.

c. The Council understands that visitor programs already exist in universities and other areas. However, the Academy may wish to support a distinguished visitor program in the IT discipline.

Recommendation 5 (pp. 101-102)

IT research is an engineering activity and requires significant levels of infrastructure support. In addition, a number of international IT research consortia are setting standards for information services, electronic commerce, and advanced manufacturing well into the next century.
It is essential that Australian research organisations and industry participate in these consortia to allow our industry to build competitive products and services on this infrastructure. The Federal Government must invest in IT infrastructure and fund participation in these consortia. Areas of particular importance are:

- International broadband communication networks and next generation Internets;
- Geographical and Spatial Databases;
- Intelligent Manufacturing Systems; and
- High Performance Computing and Communications.

[ARC, CSIRO, DEETYA, DIST, DCA]

The ARC currently provides funding for a Key Centre of Teaching and Research for the Social Applications of Geographical Information Systems based at the University of Adelaide. The Centre's objectives include provision of a major focus and vehicle for researchers and planners to collaborate in the analysis and use of population and social data through the incorporation of existing data using advanced geographical information systems technology. Research activities are centred around three main clusters, which are population dynamics, community planning and new technologies for Spatial Information Systems.

The ARC is a strong supporter of the High Performance Computing and Communications Centres of Expertise Programme through its Research Infrastructure (Equipment and Facilities) Programme. Initial funding in 1993 for the Programme was provided from ARC unallocated funds. In addition, in the 1998–99 budget the ARC has funded fifty additional Australian Postgraduate Awards (Industry) in the field of information technology.

**Australian Industrial IT R&D**

**Recommendation 10** (p. 108)

- To improve the flow of information about the strengths in Australian IT research to industry, both government and individual research groups must establish easily accessible mechanisms to allow industry to access information about the capabilities and achievements of Australian IT research groups in an ongoing way. This should include:
  a. a distributed World Wide Web-based registry of current research capabilities and activities; and
b. structured industry forums and workshops.

[ARC, DIST]

a. Most government research organisations and individual research groups in universities have web sites indicating their capabilities and achievements. Software systems exist which allow the consolidating of information about web sites and tracking of relevant information about a particular topic.

b. The ARC's Special Research Initiatives Programme supports specific activities which encourage greater collaboration between researchers, such as networking activities, workshops and seminars. In addition, the Council is aware that structured industry forums and workshops occur in an ad hoc manner. There are many occasional forums or industrial workshops which brief industry on the latest advances in cutting-edge technology to bring industry and the higher education sectors closer together.
Appendix

Recommendations

Australian Government Funded Research

Recommendation 1

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  a. all Government funding bodies and research agencies have a priority setting process, similar to that introduced by CSIRO;
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[ARC]

Recommendation 4

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  a. DIST and DEETYA should establish an integrated funding mechanism to increase the collaboration between Australian researchers and international research groups;
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  c. IT professional associations in conjunction with DIST and DEETYA should establish a ‘Distinguished Visitor’ programme in the IT discipline.

[ARC, ACS, DEETYA, DIST, IEAust]

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consortia are setting standards for information services, electronic commerce, and advanced manufacturing well into the next century.

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- International broadband communication networks and next generation Internets;
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[ARC, CSIRO, DEETYA, DIST, DCA]

**Australian Industrial IT R&D**

**Recommendation 6**

- In recognition of the importance of IT research for all industry sectors and the structure of the IT industry in Australia with very few large locally owned companies, for the next round of CRC funding, the Minister for Industry, Science and Tourism should ensure that:
  
  a. IT is a priority area consistent with national priorities and that 25 per cent of the funding for all CRCs should be based on the IT discipline;

  b. mechanisms are examined to increase the flexibility of CRCs to strengthen their applicability to IT.

[CRC Committee, DIST]

**Recommendation 7**

- In order to make small-to-medium business enterprises (SMEs) more competitive in the fast moving and highly innovative IT marketplace, the following initiatives should be taken:

  a. DEETYA, DIST and DCA should investigate and establish additional mechanisms for facilitating research interaction between universities, research organisations and the IT industry;

  b. mechanisms should be established to provide sponsorship and coordination of testing and conformance facilities for SMEs.

[DEETYA, DIST, DCA]
Recommendation 8

- To increase the profile and strength of industrial R&D in Australia, and to provide significant new employment and investment opportunities:
  a. the Federal and State Governments should strengthen investment and facilitation mechanisms for multinational companies to conduct IT R&D in Australia.

[DEETYA, DIST]

Recommendation 9

- In order to strengthen ties between the tertiary sector and industry, and to encourage a closer interaction, the process of staff exchanges between industry and the tertiary sector should be actively encouraged by the following initiatives:
  a. Australian universities should allow academics from IT departments to spend time working in industry and such activities should be taken into consideration when criteria for promotion are being evaluated; and
  b. the Federal Government should establish a scheme to facilitate industry personnel placement in an appropriately organised university department for a period of up to one year duration.

[AIIA, DIST]

Recommendation 10

- To improve the flow of information about the strengths in Australian IT research to industry, both Government and individual research groups must establish easily accessible mechanisms to allow industry to access information about the capabilities and achievements of Australian IT research groups in an ongoing way. This should include:
  a. a distributed World Wide Web-based registry of current research capabilities and activities;
  b. structured industry forums and workshops.

[ARC, DIST]

Recommendation 11

- The Minister responsible for government IT programmes should ensure that the Australian IT research community is represented on Government advisory committees for the information industries to
provide an Australian research perspective to their deliberations. Such representatives should be nominated by that community.

[DEETYA, DIST, DCA]

Australian IT Research Education

Recommendation 12

Better academically qualified students must be attracted into the IT discipline at the tertiary level if more high calibre researchers are to be trained. This process must be started in primary and secondary education. To achieve this:

a. DEETYA and the relevant State Government Departments in conjunction with universities must establish procedures and incentives which encourage more high achieving school leavers to enter IT courses at the tertiary level.

b. State Governments should examine the quality of IT education at the primary and secondary level with a view to implementing world best practice in terms of the IT curriculum and teacher competence.

[AVCC, DEETYA, State Education Departments]

Recommendation 13

In order to reflect the increasing consolidation of the IT discipline, Australian universities should take steps to establish an appropriate organisational structure at departmental level which reflects the convergence of the components of the IT discipline.

[AVCC]

Recommendation 14

To increase the cohesion of the IT discipline, the Australian Computer Society and the Institution of Engineers, Australia should develop a close working relationship at the national level, particularly in the areas of IT course accreditation, membership rights and promotion of the IT discipline.

[ACS, IEAust]

Recommendation 15

The laboratory, equipment, software and technical infrastructure needs of IT have not been recognised because the discipline has been
misclassified. Government and higher education institutions should reclassify the IT discipline to reflect funding levels that are at least equivalent to those applicable to the laboratory-based physical sciences and electronic engineering.

[AVCC, DEETYA]

National Focus on Information Technology

Recommendation 16

- The development of strong local information industries to provide ongoing employment opportunities for the benefit of all Australians is vital. This can only be achieved through the development by the Federal Government of a broad, coherent strategy covering all industry, commerce, education and research sectors. In recognition of this, Federal Government portfolio responsibilities for the information industries covering telecommunications, information processing and the media should be brought under one minister.

[ASTEC, PM&C]

Recommendation 17

- Initiatives should be taken to raise awareness of emerging IT issues and directions in industry, commerce, government and the general public in an ongoing fashion. Professional and industry organisations including Australian Computer Society, Australian Information Industry Association, Australian Interactive Multimedia Industry Association and the Institution of Engineers, Australia should regularly coordinate and conduct presentations on key IT issues including current research to the public and government bodies. In addition, centres such as the National Science and Technology Centre and the Powerhouse Museum should increase their coverage of IT-related subjects.

[ACS, AIIA, AIMIA, CRC Association, IEAust, NSTC, Powerhouse Museum]
Acronyms used in the document

ACS  Australian Computer Society
AIIA  Australian Information Industry Association
AIMIA  Australasian Interactive Multimedia Industry Association
ARC  Australian Research Council
ATSE  [Australian] Academy of Technological Sciences and Engineering (also called ‘the Academy’)
AVCC  Australian Vice-Chancellors Committee
CRC  Cooperative Research Centre
CSIRO  Commonwealth Scientific and Industrial Research Organisation
DCA  Department of Communications and the Arts
DEETYA  Department of Employment, Education, Training and Youth Affairs (Now DETYA, Department of Education, Training and Youth Affairs)
DIST  Department of Industry, Science and Tourism (now DISR, Department of Industry, Science and Resources)
FTSE  Fellow of the Academy of Technological Sciences and Engineering
IEAust  Institution of Engineers, Australia
IT  Information Technology
NSTC  National Science and Technology Council
R&D  Research and Development
RGC  Research Grants Committee
SME  Small to Medium Business Enterprise