



ANNUAL ACTIVITY PLAN 2003

**FINAL VERSION SUBMITTED TO THE COMMONWEALTH GOVERNMENT
8TH JANUARY 2003**

**THIS VERSION HAS *NOT* BEEN APPROVED BY THE MEMBERS OF NICTA
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| | |
|---|-----------|
| EXECUTIVE SUMMARY | 1 |
| OBJECTIVES AND MISSION | 1 |
| STRUCTURE | 2 |
| GOVERNANCE | 2 |
| <i>NICTA Board</i> | 2 |
| <i>Committees</i> | 2 |
| PROGRESS TOWARDS OBJECTIVES | 3 |
| RESEARCH | 3 |
| COMMERCIALISATION | 3 |
| RESEARCH TRAINING | 3 |
| NETWORKS AND LINKAGES | 3 |
| RECRUITMENT OF STAFF | 4 |
| DEED MILESTONES FOR 2003 | 4 |
| PERFORMANCE INDICATORS | 4 |
| RESEARCH | 5 |
| ACTIVITIES | 5 |
| <i>Processes for Initiation of New Programs</i> | 5 |
| <i>International Scientific Advisory Group</i> | 6 |
| <i>Processes for Monitoring and Review of Programs</i> | 6 |
| <i>Processes for Initiating, Monitoring and Reviewing Projects</i> | 7 |
| <i>Overall Expected Outcomes for 2003</i> | 7 |
| <i>Research Programs</i> | 7 |
| 1. <i>Embedded, Real Time and Operating Systems</i> | 9 |
| 2. <i>Wireless Signal Processing</i> | 10 |
| 3. <i>Networks and Pervasive Computing</i> | 11 |
| 4. <i>Formal Methods</i> | 12 |
| 5. <i>Empirical Software Engineering</i> | 13 |
| 6. <i>Symbolic Machine Learning and Knowledge Acquisition</i> | 14 |
| 7. <i>Statistical Machine Learning and Sensor Signal Processing</i> | 15 |
| 8. <i>Knowledge Representation and Reasoning</i> | 16 |
| 9. <i>Autonomous Systems and Sensor Technologies</i> | 17 |
| 10. <i>Logic and Computation</i> | 18 |
| 11. <i>Systems Engineering and Complex Systems</i> | 19 |
| STRATEGIC OUTLOOK FOR 2004-2005 | 20 |
| RESEARCH TRAINING | 21 |
| STRATEGIES | 21 |
| 2003 WORK PROGRAM | 22 |
| <i>Establishing Enhanced PhD</i> | 22 |
| <i>Student Recruitment</i> | 23 |
| <i>Scholarship Arrangements</i> | 24 |
| <i>Student Placements</i> | 24 |
| <i>Education Staffing</i> | 25 |
| EXPECTED OUTCOMES | 25 |
| <i>Main program (NICTA-enhanced PhD)</i> | 25 |
| <i>Subprograms</i> | 25 |
| STRATEGIC OUTLOOK FOR 2004-2005 | 26 |
| COMMERCIALISATION | 27 |
| STRATEGIES | 27 |
| 2003 WORK PROGRAM | 27 |
| <i>Activities</i> | 27 |
| <i>Staff Appointment</i> | 27 |
| <i>International Business Advisory Group</i> | 27 |
| <i>Education and Scanning</i> | 27 |
| <i>Intellectual Property Policy</i> | 28 |
| <i>Advisory Panel</i> | 28 |
| <i>First Look Rights</i> | 28 |
| <i>Intellectual Property Register</i> | 29 |
| STRATEGIC OUTLOOK FOR 2004-2005 | 29 |

| | |
|---|-----------|
| NETWORKS AND LINKAGES..... | 30 |
| STRATEGIES..... | 30 |
| 2003 WORK PROGRAM..... | 31 |
| <i>International research institutions</i> | 32 |
| <i>Australian Public Sector ICT Research Organisations</i> | 32 |
| <i>Australian Universities</i> | 32 |
| <i>Cooperative Research Centres</i> | 32 |
| <i>Sophisticated Users of ICT (Government and Commercial)</i> | 32 |
| <i>Multinational ICT Companies</i> | 32 |
| <i>SMEs</i> | 33 |
| STRATEGIC OUTLOOK FOR 2004-2005..... | 33 |
| HUMAN RESOURCES..... | 34 |
| STRATEGIES..... | 34 |
| <i>Remuneration Strategy</i> | 35 |
| <i>Priorities for Appointment</i> | 35 |
| <i>Immigration Approach</i> | 35 |
| <i>Policy and HR administration</i> | 35 |
| <i>Staffing</i> | 35 |
| 2002 TASKS COMPLETED..... | 36 |
| 2003 WORK PROGRAM..... | 37 |
| AGGREGATE STAFFING NUMBERS..... | 38 |
| STRATEGIC OUTLOOK FOR 2004-2005..... | 38 |
| ACCOMMODATION..... | 39 |
| STRATEGIES..... | 39 |
| 2003 WORK PROGRAM..... | 39 |
| FINANCIAL PLAN..... | 43 |
| ACTIVITIES..... | 43 |
| COMMENTS..... | 45 |
| STRATEGIC OUTLOOK FOR 2004 – 2005..... | 46 |
| NICTA MILESTONES FOR 2003..... | 47 |
| RESEARCH..... | 47 |
| <i>Quarter 1</i> | 47 |
| <i>Quarter 2</i> | 47 |
| <i>Quarter 3</i> | 47 |
| <i>Quarter 4</i> | 47 |
| RESEARCH TRAINING..... | 47 |
| <i>Quarter 1</i> | 47 |
| <i>Quarter 3</i> | 47 |
| <i>Quarter 4</i> | 47 |
| COMMERCIALISATION..... | 48 |
| <i>Quarter 1</i> | 48 |
| <i>Quarter 2</i> | 48 |
| <i>Quarter 3</i> | 48 |
| <i>Quarter 4</i> | 48 |
| NETWORKS AND LINKAGES..... | 48 |
| <i>Quarter 1</i> | 48 |
| <i>Quarter 2</i> | 48 |
| <i>Quarter 3</i> | 48 |
| HUMAN RESOURCES..... | 48 |
| <i>Quarter 1</i> | 48 |
| <i>Quarter 2</i> | 49 |
| ACCOMMODATION..... | 49 |
| FINANCE..... | 50 |
| PERFORMANCE INDICATORS..... | 51 |
| APPENDIX – CONFIDENTIAL INFORMATION..... | 53 |

EXECUTIVE SUMMARY

National ICT Australia (NICTA) was established in 2002 as the National Information and Communications Technology Centre of Excellence.

NICTA has been funded for the primary purpose of establishing and operating an ICT Centre of Excellence in research including research training and commercialisation. The funding deed between the company and the Commonwealth imposes a range of obligations on the company in the way it operates the centre including a number of milestones and performance indicators.

This document is the Annual Activity Plan for NICTA as required under the funding deed and constitution of the company. It outlines the plans for 2003 with a strategic outlook for 2004-2005. In broad terms the key aims for 2003 are to

- Build up the research programs by recruiting and seconding staff;
- Build the research training program by transfer and recruitment of PhD students;
- Build initial linkages with strategically important organizations both within Australia and overseas;
- Set in place process to commercialise research within NICTA, by developing a range of Projects that have good prospects for commercial outcomes and by developing suitable processes and internal expertise.

Objectives and Mission

NICTA'S aims are clearly spelled out in its own constitution and the funding deed that it has entered into with the Commonwealth. The aims are to:

- develop within Australia ICT research capabilities in existing and emerging fields;
- increase the availability within Australia of ICT research skills by providing postgraduate training and attracting ICT researchers from overseas;
- exploit for the benefit of Australia the commercial potential of research outputs;
- become a catalyst for the development of networks and clusters of ICT industry activity.

NICTA has four overlapping, mutually supportive missions:

- **Research** at the highest international standard and scale to position Australia definitively on the world map in ICT research. The Centre will have focused research themes based around an overall research vision of Universal ICT which are shaped in collaboration with industry and users. The five themes are:
 - Infrastructure technologies;
 - Software engineering;
 - Intelligent systems;
 - Human machine interaction, and
 - Foundations.
- **Commercialisation** of the results of the Centre's research to act as a catalyst for peripheral growth in ICT industry, with an ultimate impact on Australia's GDP. The Centre will provide a fertile ground for nurturing a number of innovative and cutting edge technologies. It will foster a research culture of innovation and strategic commercialisation to produce a quantum leap in the nation's ICT

capability. It will spawn start up companies, as well as utilising other methods for the commercial exploitation of developed intellectual property.

- **Research Training** of R&D professionals in the ICT area scaled to meet the demands of industry and government research organisations and universities. Enhancement will be achieved principally through a new breed of broad based PhD program with particular emphasis on entrepreneurship and international experience. The Centre will address scale requirements by aggressively increasing the number of ICT PhDs in the country.

Linkages and interaction with Australia's public sector research and higher education and training sector to energise and transform its ICT innovation capability. This will support the growing skill requirements of industry. Clustered industry development will be promoted to support existing SME growth. Networks and linkages domestically and overseas will be established to support all Centre programs.

Structure

NICTA is a limited liability company whose members are:

The Australian National University

- The University of New South Wales
- The NSW Government
- The ACT Government.

NICTA is structured with two nodes, one node located in Sydney, NSW and the other node in Canberra, ACT. The Sydney node has two facilities: the National Headquarters located at the Australian Technology Park (ATP), Eveleigh, where there will also be a research facility and the other, a major research facility located on The University of New South Wales (UNSW) campus at Kensington. The Canberra node is located in or adjacent to the Australian National University (ANU) Campus.

Governance

NICTA Board

As a limited liability company, NICTA is governed by a Board of Directors.

Committees

The board is assisted by three sub-committees drawn from its own ranks, but supplemented by others as required:

- Governance and remuneration
- Audit and finance
- Evaluation.

In addition it will be forming two external advisory groups with senior international membership:

- International Scientific Advisory Group (ISAG) (details in Research section of this report)
- International Business Advisory Group (IBAG) (details in Commercialisation section)

NICTA has entered into a funding deed with the Commonwealth managed by a Project Executive, consisting of representatives from the ARC and the Department of Communications, Information Technology and the Arts (DOCITA) and a Project Manager (DOCITA).

The role of the Project Executive is set out in the deed as administering the requirements of the ARC Act as those requirements relate to the ARC's funds and NICTA's related performance.

Progress towards Objectives

Research

Consistent with its charter and obligations the company has already put in place 11 initial Programs and announced the leaders of each of the Programs. Each of the Programs will be expected to deliver results across in the four areas of research, research training, commercialization and linkages. It is intended into the future to start new programs which are not outgrowths of activities of the two main partner universities. These will be based, to a large extent, at the ATP site, which is intended to be a world class research establishment, separated and independent from the partner universities.

Commercialisation

NICTA recognizes that a successful commercialisation program requires a strong infrastructure and it will pursue strategies aimed at facilitating the transfer of research outcomes from existing programs to both users and producers of the technologies involved.

Research Training

NICTA aims to generate expansion in ICT education across Australia as a whole and not to simply redistribute or centralise talented students. It will build the national pool of talented students in two main ways:

Increase the number of talented students that are choosing ICT as a career path. Here the dual focus on research and commercialisation is important as it means that students will have a balanced exposure to both research necessity and economic reality.

NICTA will attract talented students from around the world into its PhD program. As a world-class research institute, NICTA will need to draw upon a population base much larger than that of Australia. Australian immigration policy currently allows that upon completion of their PhD studies, such graduates can stay in Australia, thereby increasing the ICT talent pool in the country.

Networks and Linkages

NICTA will undertake a program of network building and linkage creation in an open and collaborative manner to support and nurture national excellence in research. 'Open' here means open to excellent researchers anywhere in Australia, and the world, and from any sector, whether Government, Industry or Education. 'Collaborative' means that the intention is to work together with partners in common areas of interest, rather than competing with existing research facilities, or supporting any particular institution in competition to the exclusion of other players in the field.

Recruitment of Staff

NICTA's recruitment strategies, remuneration structures and personnel policies must have as their goal the achievement of outcomes of excellence in all facets of the NICTA Mission. In such an entrepreneurial culture, where both individual and team performance reward is to be an essential component, it is important that from the outset, NICTA clearly enunciates the value it places on its staff and that all staff are informed of and understand the impact of NICTA HR policy and processes and of how remuneration will apply across the organisation.

NICTA is committed to attracting exceptional research and support personnel to carry out its Mission. Four key motivators will be emphasised in this search:

The stimulus of a prestige intellectual environment

- Excellent resources and facilities for all staff
- Internationally- and market-competitive remuneration levels
- An excellent quality of life in Australia - Canberra and Sydney.

Deed Milestones for 2003

The schedule to the funding deed (signed 10 October 2002) with the Commonwealth sets out a number of conditions or milestones that must be met, two initial sets timed at 90 days after date of the funding deed (i.e. 8 January 2003), and 31 December 2002 respectively. These are all met or very close to being met and will be reported on in documents separate to this Annual Activity Plan. The deed also sets milestones for 31 March 2003 and these are on track.

90 Day Milestones

The milestones to be reached within 90 days of signing the funding deed are very much related to the fundamental structure of NICTA, viz.;

- the appointment of most of the board of Directors of the company;
- agreements between company and the shareholders;
- opening the company's headquarters at its long term home – Australian Technology Park;
- agreement on specific policy issues with the Project Executive;
- initiation of action to appoint a permanent CEO

31 December

The funding deed sets out three milestones to be satisfied;

- centre's premises opened at UNSW and ANU;
- progress on search for CEO so an appointment can be made by 31 March 2003;
- finalisation of Annual Activity Plan including milestones and performance indicators.

Performance Indicators

Performance will be measured by the following outcomes:

- quality of researchers;
- quantity and quality of research;
- successes in commercialisation;
- extent of networks and linkages;
- number and quality of graduates;

A detailed list of these indicators can be found on page 51.

RESEARCH

Activities

The programs outlined in the work program below are central to the mission of NICTA. Any inadequacies in the research program will adversely affect NICTA's success.

The overall research vision of NICTA focuses on *Universal Information and Communication Technology*. NICTA aims to conduct research that will make information and communications technologies universal ubiquitous, usable, reliable and affordable.

The research falls within five **Themes**:

- Infrastructure Technologies;
- Intelligent Systems
- Software Engineering
- Human-Machine Interaction;
- Foundations.

Research within NICTA is organized using two structures: Programs and Projects. Programs are discipline specific groupings and are the "home" of all researchers. Programs have responsibility for delivering into the four key missions of NICTA (Research, Research Training, Commercialisation and Linkages).

Programs are essentially the departmental structure of the research arm of NICTA. They are expected to perform long term research (essentially "in-house") as well as more targeted research via Projects.

Projects are the tasks that the programs will perform. They are also the vehicles for research collaboration that may span the boundaries of one or more programs. Typically a project will have a leader (who will come from one of the programs, or potentially from some external organisation), goals, deliverables, a timeline and a client. Another program could also be the client for a project. Projects may be funded by programs; by NICTA centrally; and/or by external organizations.

There is a logical dependency between Programs and Projects. The first priority is to staff the Programs. Once the staffing mix has been determined (and some of the staff have started) Projects can be commenced. Some initial planning on Projects has already been done (and that is reflected below in this section); much of the work on developing and selecting Projects will occur during 2003.

Processes for Initiation of New Programs

In the longer term Programs will be started only after a detailed analysis, including input from the International Scientific Advisory Board and the Evaluation Committee.

It is recognised that not all of the machinery we intend to have in place in steady state will be available early in 2003. NICTA does intend to start some new Programs in 2003, and these will be evaluated by the Research Committee¹ and formally proposed to the NICTA Board.

¹ The research committee comprises the CEO, two node directors and others as needed.

Programs will be initiated and assessed based on scientific excellence, benefit to Australia, issues of balance, and how the programs address the vision of the Centre. In assessing scientific excellence, account will be taken of:

- Existence of significant scientific challenges;
- Capability of the program to contribute to global body of knowledge;
- Availability of staff, especially leaders.

In assessing the benefit to Australia account will be taken of:

- Potential for successful commercialization and ultimately the creation in Australia of new industrial activity of global scope;
- Prospects of coupling to Australian end users and enhancing and assisting the existing industry sectors in Australia;
- Attractiveness to students;
- The need for research training in the area;
- The national interest in having the particular technology;
- The opportunity to influence and shape international standards.

International Scientific Advisory Group

The International Scientific Advisory Group (ISAG) will be fully constituted during 2003. It will comprise 6-10 very senior individuals with a broad appreciation of ICT research directions. It will meet infrequently and provide high-level strategic advice to the NICTA board. A key function of the group will be to participate in an Annual Outlook Forum to be held in Q3/4 2003. The purpose of this forum will be to consider the broad future directions of ICT research. Informed by this process, the ISAG will also be asked to comment on proposals for future NICTA Programs.

Processes for Monitoring and Review of Programs

A fundamental requirement for the continuation of a Program is that it delivers at a level that is commensurate with the best international research laboratories, and the Centre's ongoing operation will use a variety of review mechanisms, which will also ensure a turnover of Programs.

Ongoing internal performance monitoring will occur annually. Particular attention will be paid at the end of 2003 to consider how the initial Programs are progressing. The Research Committee will evaluate all initial programs for their progress against the four components of the NICTA mission.

The Program review mechanisms will include a formal review cycle (every 4–5 years) involving the highest-level international experts. The reviews will use performance measures including degree of contribution to Projects and thereby commercialisation outcomes, patents, international publications, citations, and international visibility and influence. It is expected that most Programs will change significantly (a possibility which includes closing of the Program or absorbing it into another Program) after the second such review.

Processes for Initiating, Monitoring and Reviewing Projects

Projects will require a formal proposal which will be evaluated by the Research Committee. It is expected that Program leaders will play a major role in developing initial projects. Criteria that will be used in the evaluation of Projects will include:

- Fit of the Project to the NICTA research vision and Programs;
- Contribution from client organisations;
- The fit to potential research students;
- Extent to which the Project could lead to commercial outcomes;
- Extent to which it promotes long-term research rather than short-term gains;
- National benefit (especially relevant for projects involving foreign owned multinational corporations);
- Capacity for the Project to act as a demonstrator for NICTA Intellectual Property;
- Degree to which the Project requires integration of contributions from different Programs;
- Appropriateness of the Project for NICTA versus an ICT CRC.

The ongoing management of Projects is part of the plan that will be put forward when developing the project. The process will be tailored to suit each Project but will always include an assessment of the extent to which milestones are being met and the client is happy, and the scientific excellence of the work.

Overall Expected Outcomes for 2003

The expected outcomes of the research Programs are that they contribute to the four components of the NICTA mission. Within the research component, the specific outcomes expected are research advances within the general area of each Program.

Targeted research will occur within Projects. Projects that will commence in 2003 are still being developed and it is premature to specify their expected outcomes. All Projects will need to have a written list of expected outcomes approved by the Research Committee of NICTA before commencing.

Research Programs

NICTA will commence eleven programs in early 2003 (see the table on the next page). Each Program has a leader designated and the first aim is to get them formally appointed and working.

All of the Programs are ramping up their operations already with new appointments expected early in the New Year. A number of staff are expected to be seconded from the core partner universities. On average around 4 staff will be seconded per Program. The secondment arrangements are tied up with the partner agreements. Once the agreements are in place, the process of securing the secondments will be quick (requiring only negotiating with each potential secondee regarding remuneration and duties within NICTA).

Table 1 the 11 Programs to be commenced in 2003

| Theme | # | Program | Designated Leader | Location |
|-----------------------------|----------|---|--------------------------------------|-------------------------------|
| Infrastructure Technologies | 1 | Embedded, Real-time and Operating Systems | Gernot Heiser | Kensington |
| | 2 | Wireless Signal Processing | Rodney Kennedy | Canberra (+Kensington) |
| | 3 | Networks and Pervasive Computing | Aruna Seneviratne | Kensington & ATP ² |
| Software Engineering | 4 | Formal Methods | Ron van der Meyden and Carrol Morgan | Kensington |
| | 5 | Empirical Software Engineering | Ross Jeffery | ATP |
| Intelligent Systems | 6 | Symbolic Machine Learning and Knowledge Acquisition | Arun Sharma | Kensington |
| | 7 | Statistical Machine Learning and Sensor Signal Processing | Robert Williamson | Canberra |
| | 8 | Knowledge Representation and Reasoning | Norman Foo | Kensington & ATP (+Canberra) |
| | 9 | Autonomous Systems and Sensor Technologies | Richard Hartley | Canberra |
| Foundations | 10 | Logic and Computation | John Slaney | Canberra |
| | 11 | Systems Engineering and Complex Systems | John Moore | Canberra (+Kensington) |

Note that there are no initial Programs in the Theme of Human-Machine Interaction; development of a new Program within this theme is a priority. See the Appendix for some possibilities that are being pursued.

The subsections below briefly summarize these initial Programs and their plans for the coming year. The descriptions briefly cover the staffing of the Programs. Researchers in NICTA have one of four possible ranks. From junior to senior they are

- Researcher, similar to level B (lecturer) in a university;
- Senior Researcher, similar to level C (senior lecturer) in a university;
- Principal Researcher, similar to level D (associate professor) in a university;
- Senior Principal Researcher, similar to level E (professor) in a university.

² Subject to UNSW's approval, the Networks and Pervasive Computing Program and the Knowledge Representation and Reasoning Program will also move to the ATP during 2003. The aim of this move is to allow a faster ramp up of activities at the ATP to better utilize the surplus space that NICTA may have to rent in 2003 at the ATP.

1. Embedded, Real Time and Operating Systems

Research Focus

Embedded systems are already in widespread use; world-wide more than 90% of all computer systems are embedded. Most people in the industrialized world own several embedded systems (mobile phones, VCRs, CD players, automobiles etc). Embedded systems are one of the main drivers of universal ICT.

Embedded systems must often respond to external events within a certain time and are therefore real-time systems. Furthermore, embedded systems are increasingly networked subject to downloading of data and programs via the network. Hence many classical operating systems issues are becoming important in the embedded systems area.

Despite a significant amount of industrial development in embedded systems, and some active research in the embedded and real-time domains across Australia, there is presently very little “systems” research, i.e. research taking an overall approach to building embedded and real-time systems. This includes a comprehensive approach to such critical issues as reliability, security, energy efficiency and development and maintenance cost.

The program will build on the strengths of the existing Operating Systems and Embedded Systems Research Group at UNSW and its linkages to international university and industrial research labs. It will build links and collaborations with relevant domestic R&D facilities and, in particular, SMEs.

Staffing

The initial staffing is based on secondments from UNSW. It is expected to consist of one Professor (Gernot Heiser – the Program Leader), three Principal Researchers, and three Senior Researchers. In addition there are a number of research staff employed on project funds held by the seconded researchers (two senior and about five junior staff). Over the first two years it is planned to hire one Senior Principal Researcher, 1-2 Principal Researchers, and about six Researchers. Hiring the Senior Principal Researcher is considered the biggest challenge. Discussions are already under way with two candidates as well as a number of fresh PhDs. The Program will also require a senior general staff for project management and client liaison, one admin assistant, and 1-2 programmers.

Receptors and Collaborations

There are numerous possibilities for interactions, collaborations and Projects. Three possible projects that will be examined early in 2003 are:

- Verified Embedded Systems (with links to the formal methods program and Dresden University)
- Gelato (HP and Intel) (carried over from UNSW)
- Embedded systems for satellite applications using Linux (with IBM OzLabs).

2. Wireless Signal Processing

Research Focus

Providing high rate digital data to small mobile terminals at low cost and long battery life is the paradigm application for Wireless Signal Processing. To provide such an application demands the development of new theory and advanced tools directed at physical layer wireless communications. Research will be conducted in:

- Study of fundamental performance limitations of wireless telecommunications systems especially mobile and ones requiring adaptation;
- Information theory related to wireless communication;
- Multiple antenna diversity systems such as related to MIMO systems and smart antennas;
- Multi-user systems and multi-access technologies;
- Adaptive algorithms for equalization, timing recovery and decoding;
- Coding for wireless channels;
- Wireless and mobile channel modelling.
- Confluence of wireless physical layer communications with packet based network layers.

Staffing

The program will start with staff seconded from both the ANU (One senior principal researcher, one senior researcher and one researcher) and two senior researchers from UNSW. Rod Kennedy of the ANU will lead the program initially but does not want to lead it long term. Thus an important medium term goal is to recruit a suitable future leader. The program will also recruit a number of junior researchers (four offers will be made early in 2003).

The Program is inundated with potential PhD students, and a key goal will be to be able adequately supervise them. This is a major driver for finalising the appointments of the junior researchers as quickly as possible as they will be involved in the joint supervision of PhD students under the direction of the more senior researchers.

The Program will need to pay particular attention to ensuring the two groups (Canberra and Kensington) work as an integrated team. The fact that some of the Kensington staff have had long term experience working in Canberra with the Program leader is expected to be of great help in this regard.

Receptors and Collaborations

The program has already identified and ranked the top research groups in the country that would be suitable to collaborate with either via a substantial project or by recruiting NICTA fellows. Negotiations are currently in progress with several of them.

There are several possibilities for projects and longer term commercialisation including:

- Various array processing problems (joint project with WATRI). This project can start very rapidly; detailed negotiations have already been held.
- Wireless signal processing issues arising in ubiquitous information and entertainment systems;
- Information Theory (with researchers from the University of South Australia)

3. Networks and Pervasive Computing

Research Focus

The main challenge to be addressed is the development and deployment of systems that will provide access to services from any-where at any-time.

In the networking area, traditionally Australian researchers have been focusing on transmission technologies, with very strong signal processing and control systems backgrounds. In the applications domain, the focus has been on distributed system projects such as distributed databases. As a result there has been very little support for research in the 'middle-layer' technologies despite it being one of the biggest growth areas in the US and Europe. The goal of this program will be to address this.

The plan is to achieve this goal by initially concentrating on three fundamental research themes, namely:

- Pervasive Applications;
- Network infrastructure;
- Instrumentation.

Staffing

The networking and pervasive computing program is expected to have an initial secondment of personnel from UNSW, consisting of one Senior Principal researcher, one Senior Principal Researcher, three Principal Researchers, and one Senior Researcher all at some fractional level of full-time.

Although there are a number of senior personnel compared to some other programs, the majority of these researchers are biased towards applied research. Therefore, in 2003 it is planned to appoint a Principal Researcher and two Researchers with very strong theoretical backgrounds.

The degree of technical support required for the networks and pervasive computing program will be high, as it will be necessary to build and maintain an experimental network and a pervasive environment with a large number of small computing devices. Therefore, in 2003 it is planned to employ two technical officers to support the activities of the program.

Receptors and Collaborations

The initial interactions the Program expects to have will be based upon some existing UNSW interactions. There are a number of background intellectual property issues to resolve. Projects that will be considered include:

- A Project on ambient networks with Ericsson (Sweden); a continuation of an existing engagement
- A START grant involving eMove (a startup company with a COMET grant) and participation from TAB.
- A possible Project involving staff from Ericsson's Asia-Pacific Lab (lawful interception group) which has recently been closed (perhaps with DSTO).
- The UNSW researchers have a strong relationship with the Centre for Networking Technologies for the Information Economy; it is expected that this will be preserved as the group moves into NICTA.

4. Formal Methods

Research Focus

Formal Methods involve the use of formal languages and mathematical techniques for system specification and verification. The universal ICT products that form the core of NICTA's vision involve increased conceptual complexities in the design of embedded systems, hybrid systems, systems involving concurrency, probabilistic behaviours, process and thread scheduling, fault-tolerance, and security protocols, since the behaviour of the system as a whole is not under the full control of the programmer, who must reason about a complex set of contingencies. Experience has shown that subtle, but critical, errors are extremely common in such systems. Formal methods provide an important contribution to addressing these complexities and increasing the reliability of such systems.

Staffing

Staffing of the program will be based on an initial four researchers seconded from UNSW, one Senior Principal Researcher and three Principal Researchers. (Percentages of the secondments remain to be agreed with UNSW. The Senior Principal Researcher is an Australian Professorial Fellow, and precise arrangements for his involvement remain to be agreed with the ARC.) We will seek to recruit up to three additional staff in 2003. It has been recognized that the program will need to source its projects internationally, given the present level of Australian industrial opportunities, and a program leader with a broad set of international industrial connections will also be sought. The Program will be led jointly by Carroll Morgan and Ron van der Meyden.

Receptors and Collaborations

Projects currently under discussion for possible commencement in 2003, and their project leaders, are as follows:

- Formal models for rights management in distributed systems (van der Meyden)
- Quantitative mu-calculus and temporal logic (Morgan)
- Compositionality in probabilistic concurrent systems (Morgan)
- Adaptive reuse in design

The program is expected to interact with commercial clients less directly than some of the other Programs, with the predominant initial client base being other NICTA programs. Nevertheless, initial discussions are underway in regard to a Project involving DSTO (jointly with the Networks and Pervasive Computing Program). If NICTA starts a new program in the area of Security and Trust Management, it is expected considerable interactions with it would also occur.

5. Empirical Software Engineering

Research Focus

The empirical validation of software engineering processes and products has been recognised internationally as one of the most important areas for software engineering research and one that will impact all areas of software research. Software engineering research is associated with either the invention of new phenomena or the understanding of existing phenomena. *Empirical* software engineering plays a central role in understanding existing phenomena and a critical role in the evaluation of new phenomena.

This Program will be the hub for Australian activity in this area and also the key link to empirical research programs in other countries. It is currently associated with the International Software Engineering Research Network (ISERN), the major collaboration organization for empirical software engineering, and a number of small and large organizations in Australia, USA and Europe.

The initial research areas will be

- software quality;
- software architectures and product lines;
- empirical research methods;
- software process improvement; and
- software engineering experience management.

These programs will build on existing experience and the established research record at UNSW and recruit from leading world Universities and corporations.

Staffing

Initial staffing to support the start up project areas of NICTA empirical will be drawn from UNSW with one Senior Principal Researcher (program leader – Ross Jeffery), two Senior Researchers, and several research support staff. Recruitment will provide leaders for each of the project areas identified; most likely at the Senior Principal or Principal Researcher level as project area leader with other supporting research scientists as the areas develop.

Receptors and Collaborations

Much of the work in the Program will involve industrial collaboration and interaction with other programs within NICTA to provide empirical evaluation expertise. Active collaboration is expected with members of ISERN, USC, University of Maryland, Fraunhofer IESE, Carnegie-Mellon University SEI, and a large number of industrial and government organizations. The best candidates for Projects to commence in 2003 will involve:

- Software Engineering Institute, Carnegie-Mellon University. Joint activity to work with Australian Department of Defence on software quality.
- Motorola Software Productivity Research group, (Motorola Labs, Illinois) and the Motorola Australian Software Research Centre (Adelaide).

6. Symbolic Machine Learning and Knowledge Acquisition

Research Focus

This program concentrates on symbolic approaches to research in machine learning and knowledge acquisition. The aim of symbolic approaches is not only to learn concepts, but to do so in a way that the knowledge learned is accessible to humans. This research is motivated by the need to make sense out of the explosion in data and device complexity, and to develop core technologies for adaptation and personalization. The program will focus on the following key areas:

- **Learning and Unstructured Data** Most machine learning techniques have evolved to mine information from databases where data is structured. Research in learning with *unstructured* data will address conceptual challenges associated with text categorization, document clustering, rule mining from text, relationship mining, topic detection, text segmentation and text summarization.
- **Learning and Robotics** Most applications in robotics have to be carefully engineered. This is often expensive because of the complex nature of the required tasks and the wide variety of environments in which the robots must operate. Endowing robots with machine learning capabilities is an attempt at addressing this problem.
- **Learning and Knowledge Acquisition** Acquisition of specialist knowledge has turned out to be a major bottleneck in development of knowledge-based systems. The field of knowledge acquisition addresses these challenges.
- **Learning and Logic** Many complex domains require learning of complex relations. Hence, there is a need for investigating techniques with hypotheses languages richer than propositional logic. The key conceptual challenge in all these approaches is the exploitation of domain knowledge to cope with the vastly increased search space associated with richer hypotheses languages.

Staffing

The program will commence with the secondment of one Senior Principal Researcher and four other researchers from UNSW. The exact fraction of the secondments is under negotiation. Key priorities for recruitment are for two Senior Principal Researchers in the areas of Learning and Unstructured Data and with expertise in applications of symbolic techniques to life sciences and biotechnology.

Receptors and Collaborations

There are several Projects or demonstrators that will be pursued in 2003:

- Project on learning unstructured data. A test bed for the research will be the Million Book Digital Library Project - an international effort led by Carnegie Mellon University. NICTA will add the Australian collection.
- Learning in robotics. The main test bed for this research will be RoboCup.
- DSTO Symbolic issues in adversarial games situations. RoboCup is good non-military test bed for this also.

7. Statistical Machine Learning and Sensor Signal Processing

Research Focus

A hallmark of an intelligent system is that it can learn. To develop ICT products and processes that are more usable, hide their sophistication behind simpler interfaces, make use of the information in vast databases and adapt to different environments and different users will require machine-learning technology. Statistical machine learning can be viewed as an outgrowth of classical signal processing, statistics, and pattern recognition. The techniques used now are much more diverse and include methods to solve problems going far beyond classical pattern recognition.

The key areas for research are:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning
- Information Theoretic Limits to Learning Performance
- Sensor Fusion and Related Signal Processing Questions
- Techniques for Learning from Structured Data
- Data Mining and Modelling Large and Complex Data Sets
- Formalizations of Novel Real-world Learning Problems

Staffing

The program will build upon the strengths of seconded researchers from the ANU. It is expected that two Senior Principal Researchers, one Principal Researcher, and two Senior Researchers staff will second to the program (some of them fractionally).

Priorities for appointment of new staff are

- Principal Researcher with experience across the spectrum of theoretical to applied research ideally with ability to lead a program in machine learning in bioinformatics.
- Senior Researcher in theoretical foundations of machine learning
- Around 4 Researchers in areas complementing existing staff including Reinforcement learning, learning with kernels, signal processing etc.
- A research engineer to develop techniques for acoustic source localisation
- A research programmer to develop large scale machine learning codes based on research within the program.

Receptors and Collaborations

A number of possibilities for projects are being actively explored. The following are ones where relevant discussions have already been held.

- Reinforcement learning (DSTO and University of Adelaide).
- Machine Learning in Bioinformatics (with other ANU staff and possibly some start up companies)
- Machine learning in vision (with Autonomous Systems Program)

8. Knowledge Representation and Reasoning

Research Focus

With the advent of the information age and the World Wide Web, there has been an explosion in the amount of available information across virtually every conceivable area of knowledge. In this age of “information overload”, the issues of how to most effectively find and digest relevant information, how to merge diverse information, and how to update information which is constantly changing have become key concerns of our time, and affect our daily lives in a multitude of ways.

The research areas of Knowledge Representation and Reasoning (KRR) address these issues through

- Developing effective structures to capture and represent information content;
- Developing effective methods for locating and merging information;
- Developing reliable & effective reasoning and logic mechanisms for manipulating information to generate productive information outcomes; and
- The development of global ontologies.

Future opportunities which the program has identified and will target include the opportunity to make a significant contribution to the KRR platform for the Semantic Web.

Initially, the program will focus on the following activities:

- Evolutionary and game-theoretic modelling of web semantics.
- Intelligent optimisation; constraint solving and planning.
- Multi-agent systems; programming, reasoning, formal semantics.
- Simulated environments for training.
- Ontologies for database applications and the web.
- Design and verification of negotiation/security protocols.
- Cognitive robotics and the logics of action.
- Temporal knowledge discovery.

Staffing

The program will build on the considerable existing expertise at UNSW and ANU. The program will initially be headed by Professor Norman Foo (UNSW). There will be two seconded Senior Researchers (one from UNSW and one from ANU.) Additionally, the program will draw on the expertise of other UNSW staff (Assoc Profs Arthur Ramer and Wayne Wobcke), and productive collaboration with suitable partner universities and other organizations will be actively sought. Two Senior Principal Researchers are targeted in the areas of logical foundations of knowledge representation. A number of junior researchers have been targeted to cover the various areas of the Program.

Receptors and Collaborations

The Program’s first priorities in developing projects will be:

- A joint Project with DSTO called KRAIVE (KR and Acquisition for Intelligence Value Estimation);
- Internal project on evolutionary and game-theoretic modelling of web semantics. This project will lay the foundations for future external engagements.

9. Autonomous Systems and Sensor Technologies

Research Focus

The initial emphasis of the group will be in Robotics and Computer Vision. The particular research areas within this will be tempered by the existence of other excellent research groups within Australia: it is desired to *complement* rather than compete with these groups. Broadly speaking the Program's area of interest will initially revolve around the problems of Computer Vision and associated problems in robotics. The problems to be addressed include:

- Segmentation;
- Image analysis and image understanding;
- Structure from motion;
- Shape from shading;
- Object tracking and recognition;
- Geometric and statistical methods for sensor data processing;
- Point correspondence for stereo or multiple camera systems.

Staffing

The Program is expected to have an initial secondment of personnel from ANU, consisting of Senior Principal Researcher, two Senior Researchers (at 50% full-time), and three Researchers. These researchers are currently supported by two technical staff who are expected to continue to support them via the ANU partner agreement.

Since the group is presently quite light on senior personnel, it is a priority to hire suitable people at a senior level. This includes another Senior Principal Researcher, and several Principal and Senior Researchers. In addition the Program will be recruiting more junior researchers. A Program administrator will also be needed (as there is a shortage of administrative staff at the ANU node who will support seconded researchers).

As more researchers are appointed, additional technical staff will also be recruited.

Receptors and Collaborations

Researchers in the Program already have strong links with several Australian companies (Seeing Machines Inc, and DDD (Digital Dynamic Depth)). It is intended to reach out to other similar companies in Australia and abroad to develop further joint Projects.

Internally, the Program will explore a possible Project on Machine Learning in Vision with the Statistical Machine Learning Program.

Collaborative projects with the Centre for Field Robotics (recently transformed into a new Centre of Excellence) will also be pursued.

10. Logic and Computation

Research Focus

- **Mechanised Reasoning**

The first major goal of the Logic and Computation Program is to implement logical reasoning methods with a view to making future software more intelligent, easier to produce and demonstrably correct. Topics under this heading are: Automated Deduction; Logical Frameworks; and Constraints and Search.

- **Pure and Applied Logic**

The study of reasoning begins with the study of logic, or the mathematical theory of inferential systems. Topics under this heading are: Type theory and lambda calculi; Non-classical logics; Foundations of hybrid systems.

- **Logical foundations of computing**

The most important broad application domain for recent work in mathematical logic is computation theory. An adequate logical model of computational processes is an absolute prerequisite for formal reasoning, whether about correctness or about efficiency. The precise research orientation of this sub-program remains speculative, pending the appointment of a senior researcher to run it, but the following topics are suggested: Logical foundations of concurrency; Semantics of programming languages; and, Specification and verification.

Staffing

It is necessary to appoint a program leader by advertising a Senior Principal Researcher position in logic and computation as soon as possible (the current acting Program Leader is a possible candidate). It is important to provide senior people with at least one junior researcher in their area, so no-one works on their own. In particular, there is a need to support the two existing senior people (ANU secondees) in mechanised reasoning and pure and applied logic.

Another early priority is to fill a senior post in Logical Foundations of Computation. Identification of around three junior research positions in logical foundations as the top priority for the second stage of expansion will be necessary to make this post attractive. Another first-stage priority is to appoint a researcher with a strong interest and track record in commercialisation.

Receptors and Collaborations

The research on electronic voting (carried out previously by seconded members of the program) is likely to lead at least to a contract related to verifying voting systems and software with readily identifiable clients and outcomes (perhaps jointly with the Formal Methods Program).

This Program expects to be involved in a project "Diagnosis and Reconfiguration for Large Scale Distributed Systems" led from the Knowledge Representation and Reasoning Program. This project has a number of overseas collaborators. An Australian partner from the power or telecommunications industry would be sought as a client.

Another Project that will be considered is "Optimisation and Approximation" which would continue an existing collaboration with University College, Cork and would likely involve the Knowledge Representation and Reasoning Program as well as a researcher from Griffith University. The client is still to be identified, but the OR group in DSTO is a possibility.

11. Systems Engineering and Complex Systems

Research Focus

The Program vision is to build on the current strength of the ANU and UNSW Systems Engineering teams in the traditional research areas of Control Systems, Signal Processing, and Optimisation; and to contribute to the emerging application areas which are the subjects of other NICTA Programs, such as:

- Vision Systems,
- Robotics,
- Telecommunications,
- Machine Learning, and
- Decision Systems,

Some staff are to work in the newer fields of Hybrid Systems which bridges the traditional areas mentioned and new challenges in coping with Complex and Uncertain Systems. Such work could well have application to a number of fields of engineering where there are large networks to be managed.

Staffing

The Program is expected to have an initial secondment of personnel from ANU and UNSW. Those seconded from ANU consist of two Senior Principal Researchers, and three researchers. Those seconded from UNSW consist of two Senior Principal Researchers and one Senior Researcher (fractionality of appointment under negotiation). In addition, there are two administrative support people at the ANU.

The graduate students numbers are currently well below supervisory potential at both the ANU and UNSW and recruitment of PhD students is a high priority for the Program.

Another priority is to hire a number of Senior Researchers to bridge the gap between Professors and Researchers as well as a number of Researcher positions. At the UNSW another priority is to hire an Administrative Assistant.

A lower priority is the hiring of two scientific programmers; one for the Canberra site and one for Kensington.

Receptors and Collaborations

The Program holds an interesting position within NICTA in that the fundamental scientific challenges and techniques span a huge range of potential application domains. Whilst it is expected there will be some Projects developed within the Program that directly interact with industry, it is expected (at least initially) that the bulk of the interactions will occur with other NICTA programs. The most likely candidates are Statistical Machine Learning and Sensor Signal Processing, Autonomous Systems and Sensor Technologies Programs, and Networks and Pervasive Computing.

Strategic Outlook for 2004-2005

It is intended to start between one and three new programs in 2003. There are some obvious possibilities that have arisen from discussions with other research organizations around the country. Discussions concerning these possibilities are ongoing. Details are provided in the confidential appendix.

These will be developed to the point of concrete proposals to be presented to the NICTA Board by end Q1 2003 with initial activity within the programs by Q3/Q4 of 2003. Our initial development of these possibilities, along with a description of the potential partner organizations, is described in the Confidential Appendix.

For programs envisaged starting after 2003 a range of processes will be set up to collect input in order to guide the selection. These processes will be set up in 2003. They will include:

- Workshops involving program leaders and NICTA researchers;
- The proposed annual outlook forum we plan to organize jointly with DSTO and CSIRO (to be held in Quarter 3/4 of 2003);
- Constitution and meeting of ISAG (International Scientific Advisory Group). This group is expected to meet for the first time in conjunction with the annual outlook forum;
- Reaction to opportunities that may arise from the possibility of star research leaders wishing to join – such as the potential of building a program around such leaders;
- Inclusion of inputs from key partner organizations (e.g. Microsoft, IBM) via informal and formal means
- Need to take account of budget constraints, especially the need to provision long term commitments from end of deed funding.

In the longer term, NICTA expects to commence approximately another 5 Programs which will not be outgrowths from the activities in the initial partner universities making up the initial Programs.

Many new Projects are expected to start in 2004-2005. The processes that will be followed for these have already been spelt out at the beginning of this section.

RESEARCH TRAINING

NICTA will aim to generate expansion in ICT education across Australia as a whole and not to simply redistribute or centralise talented students. It will aim to build the national pool of talented students in two main ways:

- Increase the number of talented students that are choosing ICT as a career path. Here the dual focus on research and commercialisation is important as it means that students will have a balanced exposure to both research necessity and economic reality.
- NICTA will attempt to attract talented students from around the world into its PhD program. As a world-class research institute, NICTA will need to draw upon a population base much larger than that of Australia.

NICTA will refine and extend the traditional PhD degree offered by Australian universities. Since NICTA will not be awarding degrees itself, all of its refinements and extensions will be grafted upon existing PhD structures, rather than creating them from scratch.

Strategies

The NICTA research training program is anchored in the traditional strengths of the Australian PhD that involves a highly specialised nominally 3-year research project. NICTA will strengthen the traditional core by concentrating the research effort through critical mass in its research programs, and will add the following four dimensions:

- Incorporate the breadth of the North American research-training model by requiring a significant coursework program as part of the PhD.
- Link with the wider research community in order to develop a broader perspective in students. Students will normally spend at least 6 months in a research program away from their home base.
- Incorporate extensive professional development training in such areas as oral and written communication of technical information, intellectual property, management, project management, and business creation skills.
- Incorporate more exposure to the innovation life-cycle than is traditional in an academic environment.

These four extra dimensions are designed to develop many doctoral graduates who are broadly competent across several areas of ICT, able to handle the non-technical necessities of professional innovation and entrepreneurship, as well as being expert in a specific research area. These extra dimensions will inevitably lengthen the NICTA PhD to 4-5 years, which is nearer to the average length of PhD training at leading North American universities, instead of the current Australian norm of 3-4 years.

NICTA will interact by agreement with any Australian university and will make its educational offerings available to all Australian universities. These offerings will comprise both access to NICTA enhanced PhD training via suitably qualified local staff being appointed as NICTA fellows and also by electronic distribution of NICTA-sourced courses to suitably equipped local sites.

NICTA will pursue several strategies to substantially increase the number of students entering and completing the PhD program:

- NICTA will supplement the duration of Australian government funded PhD scholarships that are currently limited to a maximum of three and a half years;
- NICTA will seek to gain any necessary approval from the Department of Education Science and Technology for this variation via partner universities who wish to enrol NICTA-endorsed students but also not be disadvantaged by longer completion times;
- NICTA will offer a range of highly-competitive PhD scholarships that will be available to NICTA-endorsed students and tenable at the NICTA nodes and around the country via supervision arrangements under NICTA Fellows;
- NICTA scholarships will comprise a number of components that combine principles of pastoral care, fairness, market-forces and reward of performance;
- NICTA will develop a fourth-year (Honours) thesis supervision program for talented undergraduate students across the country. Such a program will not necessarily require the relocation of students to NICTA nodes but may be carried out via NICTA Fellows for students in their own university. Graduates of the Honours thesis program will be candidates for the NICTA PhD program;
- NICTA will develop a Summer Research Scholarship program for talented undergraduate students around the country. The aim of these programs will be to introduce talented students to research early in their undergraduate studies. Graduates of this programs will feed into the Honours thesis programs and/or APA applications;
- NICTA will develop a Northern Summer Research Scholarship program for highly talented international students, typically from the northern hemisphere. Graduates from this program will boost applications for IPRS scholarships for PhD study in Australia;
- NICTA will collaborate with the secondary and technical and further education sectors to influence subject choices towards the core disciplines of ICT by pre-tertiary students. Students with appropriate secondary subject choices will be qualified to enter ICT-related undergraduate degree courses.

2003 Work Program

Establishing Enhanced PhD

In 2003 NICTA will establish the infrastructure and linkages that will form the research training program. The priorities are:

- Establish a PhD program that reflects the NICTA vision;
- Establish a PhD recruitment infrastructure;
- Recruit NICTA educational staff for administration and outreach;
- Establish procedures to allow national access to this program;
- Establish dialogue with national and international industry;
- Establish exchange agreements with prestigious PhD programs worldwide.

An implementation program for the NICTA enhanced PhD has been mapped out in terms of the above philosophy. It contains key ingredients of:

- Wide advertising and a careful student-selection process;
- Best practice student-supervision model;
- Intensive student and supervision review process;
- Coursework to provide technical breadth and professional skills;
- External placements within the research training network;
- Highly competitive scholarships with performance increments;

- Regular commercialisation scans of student projects;
- Student intellectual property policy with generous benefits for students.

There are limitations to the implementation of the NICTA PhD program in 2003. In a transitional phase, there will be a nominally 3-year version of a NICTA PhD program. It is intended that the nominally 4-year version will be adopted once all necessary changes relating to the extension of overall duration of enrolment and of scholarship awards are included in agreements with partner universities. The nominally 3-year version will require at most minor changes to the existing rule structures within partner universities. It is anticipated that at least the nominally 3 year enhanced PhD will be agreed by the ANU and UNSW within the first quarter of 2003 and that immediate progress will then be made on an agreement with the University of Sydney.

The program is complex and requires the successful implementation of a number of components as outlined below

Student Recruitment

NICTA intends to grow the numbers of research-trained ICT graduates from its partner universities by increasing the number of potential applicants for such training in order that NICTA should not reduce enrolments in other institutions.

NICTA will target a broad range of “populations” that are relevant to the recruitment of PhD students over the coming years (not just completing undergraduate students). Strategies for addressing specific targets such as attracting females into research training relevant to small to medium enterprises in the ACT will be developed.

The recruitment strategy includes the following components:

- Adopt and merge proven best practice from ANU and UNSW initially;
- Appoint education outreach officers at each node to work as a team;
- Develop a media campaign;
- Make direct representation to undergraduate students in partner universities;
- Support distinguished scholars in undergraduate ICT programs across Australian universities;
- Support fourth year and honours project work in ICT at Australian Universities with NICTA Fellows on staff;
- Develop both Summer and Northern-Summer Research Scholarship schemes;
- Develop appropriate contacts for influence in the secondary education and TAFE sectors.

Numerical Targets for Student Recruitment

Each NICTA researcher with an appointment extending for 4-5 years is expected to attract a new student each year on average. With approximately 46 such staff members expected by the end of 2003, and allowing for staging, the median expectation of student recruits in 2003 is 39 (in the range 22-56).

Student Selection

Students will be selected in close consultation with Program Leaders. The process will apply predetermined criteria to the assessment of the evidence of excellence provided for each applicant.

The NICTA conditions for student-endorsement will comprise two major components:

- A signed acceptance of the NICTA student IP policy which will include the following:
 - NICTA will ensure that all intellectual property generated at NICTA is protected for effective commercialisation. To this end, NICTA will enter into suitable IP ownership arrangements in accordance with NICTA's IP Policy.
 - The commercial benefits of any such research will be shared equitably in the same way for students as for staff.

- A signed commitment to the four components of NICTA research training:
 - Research Excellence
 - Technical and Professional Breadth
 - Networking
 - Commercialisation

Scholarship Arrangements

Scholarships are set in value at the upper end of scholarships typically available in Australia, and are available for the full candidature period if student performance is maintained. Each scholarship will have three components:

- A basic living stipend set at the rate of the Australian Postgraduate Award;
- A fixed supplementary determined by market forces;
- A performance-based component that will reward excellent performance in the research training processes during candidature.

Coursework

Coursework arrangements for 2003 will be largely transitional since: 1) NICTA needs to deal with large numbers of students completing their degrees under existing ANU or UNSW coursework conditions and under the supervision of seconded staff; and 2) Initial NICTA-endorsed students will have only a nominal three years in which to complete their degrees. They will fulfil existing ANU and UNSW coursework requirements in ways that reflect the NICTA enhanced PhD model.

The NICTA enhanced PhD model will require each PhD candidate to demonstrate both technical depth and technical and professional breadth. While technical depth will be demonstrated to a large degree via a three year personal research project, technical and professional breadth will be demonstrated via satisfactory completion of a series of courses. NICTA is therefore committed to the provision of a flexible set of courses for its enhanced PhD candidates. The flexibility will be evident in several ways:

- The accessibility of technical broadening in ICT to postgraduate students from a wide range of prior undergraduate component disciplines;
- The use of external experts in areas of professional skill development;
- The use of technologically advanced mechanisms of course presentation;
- The use of educationally advanced designs that match both the multi-disciplinary breadth of ICT students and the technologically advanced means of course delivery.

Student Placements

The NICTA-enhanced PhD proposal involves students spending a six month period working in another institution with which NICTA has an exchange or internship

agreement, or at a node of the Centre other than their home base (all such organizations will be part of the NICTA Research Training Network). Within the postgraduate interchange scheme, NICTA-endorsed PhD students may also receive supervision from international research colleagues of NICTA staff. NICTA will also host students of these international colleagues while they are supervised by NICTA staff.

Education Staffing

A Director of Education will be appointed after mid-2003. Until then, the education directorate will be managed by two Associate Directors of Education located at the Canberra and Sydney nodes respectively. These will be formally appointed early in 2003.

In 2003, two staff dedicated respectively to educational outreach and to educational administration at each of the Canberra and Sydney nodes will be appointed. The main foci of these staff will be the recruitment of high-quality students, and the implementation of the student management arrangements in a manner that complements and exploits the mechanisms of the partner universities. Their detailed work programs will be the responsibility of the Director of Education.

Some educational staff may be provided as part of the in-kind funding provided by the partner universities that second staff to NICTA.

Expected Outcomes

Main program (NICTA-enhanced PhD)

The main expected outcome is the NICTA-enhanced PhD. This will be a 4 year program (nominally) from 2004 onwards. (It will be 3 years nominally in 2003 as a transitional measure). Between 22 and 56 students are expected to be recruited in 2003 to participate in the program in 2004. A crucial activity during 2003 is to secure agreements with partner universities to implement the various components of this program.

Subprograms

There are three subprograms that will be implemented in order to increase the potential pool of students for the NICTA-enhanced PhD program.

Vacation Research Schemes

High-performing 3rd and 4th year undergraduates in ICT related disciplines will be offered the opportunity to carry out a research project of 8-12 weeks duration over the summer break. Some 50-100 students are expected in 2003.

Honours Scholarship Schemes

Final year undergraduates in ICT related disciplines who are supervised by NICTA Fellow or co-supervised by any NICTA researcher will have the opportunity to obtain a NICTA scholarship for their Honour's project. It is expected to start in 2004 (with planning occurring in 2003).

Distinguished Scholar Supplementary Scholarship Schemes

1st to 3rd year undergraduates in ICT related disciplines in such university sponsored schemes whose research projects can be (co-)supervised by NICTA researchers will

have the opportunity to obtain a supplementary scholarship from NICTA. The aim of this subprogram is to increase in the number of students entering honours stream courses in ICT related subjects and following through into PhD application. It will not commence until 2004 although planning will occur in 2003.

Strategic Outlook for 2004-2005

Longer term, the most important goal will be the full implementation of the NICTA enhanced PhD:

- Commencing the full four year program;
- Building the size of the body of NICTA endorsed PhD candidates at partner universities commensurate with the growth in NICTA supervisory staff (by attracting both Australian and overseas students);
- Increasing the number of partner universities via negotiation of research training agreements;
- Increasing the size of NICTA's research training network both via Australian partner universities and via academic and industrial partners worldwide;
- Building the range of courses offered to NICTA-endorsed students both via the offerings of NICTA research staff and the endorsement of courses provided by Research Training Network partners;
- Increasing the opportunities for networking and commercialisation for NICTA-endorsed students by building on the resources of an increased cohort of NICTA staff and on the initial experiences gained in 2003;
- Strengthening recruitment processes within target populations via increased connections in the relevant sectors and increased engagement with the growing NICTA staff cohort.

COMMERCIALISATION

In order to reap the benefits from research it is important that the knowledge and information resulting from the research be transferred to the wider community and in particular to business sector. NICTA will do this via its commercialisation processes.

Strategies

NICTA will pursue strategies aimed at facilitating the transfer of research outcomes to both users and producers of the technologies involved.

NICTA recognises that a successful commercialisation program requires a strong infrastructure that:

- Nurtures the commercialisation objective;
- Acts as a catalyst for cultural change to promote entrepreneurship;
- Identifies and assesses intellectual property that may be a commercialisation candidate;
- Provides the linkages, networks, assistance, and incubation access for commercialisation.

A major part of this strategy depends on the development of a strong policy on intellectual property, and this aspect will be covered by a separate document written and compiled in accordance with clause 19 of the deed.

2003 Work Program

Activities

NICTA's initial activities plan focuses upon the strategic and staged development of the commercialisation infrastructure.

Staff Appointment

NICTA has commenced a national search for personnel (Directors) responsible for commercialisation and intellectual property and industry development. The Director Commercialisation and IP will be experienced in taking ICT to the marketplace particularly through start up companies and the venture capital industry. The Director Industry Development will have a proven track record in generating new ICT business (their role is further explained in the Section on Networks and Linkages – see page 30.)

International Business Advisory Group

NICTA will establish an International Business Advisory Group (IBAG) to advise the NICTA board on high-level strategic business issues associated with the research enterprise. It is planned that the group be constituted in time for the Annual Outlook Forum in which it will participate along with its companion body the International Scientific Advisory Group (ISAG).

Education and Scanning

An early task for the newly appointed directors described above will be to initiate an education program within NICTA to educate staff and students about the pathways to commercialisation. Another task will be to set up processes for regular scanning of research Programs for commercialisation opportunities.

Intellectual Property Policy

An immediate major task for NICTA is to finalise an Intellectual Property Policy. NICTA will investigate best practice in relation to Intellectual Property Policies in Australia and other countries, and in particular in the United States. NICTA intends that its Intellectual Property Policy will serve as a platform document from which Protocols and Procedures will be developed.

The aims of these Protocols and Procedures are:

- To provide the functional framework for commercialisation
- To record NICTA's processes
- To serve an educative function to staff whose awareness of commercialisation issues may need to be increased.

Advisory Panel

NICTA will establish a Commercialisation Assessment Advisory Panel which will assess projects under consideration and make recommendations to NICTA. It is intended to draw on a range of experts, from both NICTA and external sources, who will be invited to join the Panel and provide their time on a voluntary basis.

It is anticipated that the composition of the Panel will be as follows:

- NICTA's Chief Executive Officer
- NICTA's Director, Commercialisation and Intellectual Property
- Experts from industry such as:
 - CEOs, CFOs, directors and senior management of successful ICT companies
 - Venture capitalists and business angels
 - Consultants.

First Look Rights

Funding Network

NICTA will establish a register of venture capitalists, business angels, and private high net worth individuals. The benefits conferred upon these groups when joining this network will be first look rights. They will be given the first opportunity

- To be presented with new start-up company opportunities (the "first look")
- To express interest in investing into the start up company opportunity
- To negotiate the terms of an investment into the start up company.

It will only be if the members of this Network all decline the opportunity, or any negotiations with them are not concluded, that the start-up company will then be presented to potential investors outside the network. This preferential access to NICTA's start up company candidates will establish strong and committed networks and linkages to the investment community, and will facilitate the pathway from NICTA to graduation from NICTA.

NICTA does not believe that investors into start-up companies are usefully viewed as competitors since it is not uncommon for a number of co-investors together to invest into a start up company. Accordingly, it is possible to give first look rights as described to a group of investors.

Industry Network

Some commercialisation candidates, for a variety of reasons, will be assessed as being more appropriate to be commercialised by way of granting licenses, rather than by way of start up company formation. In this case, licensing to private sector companies, which are ready to take a technology and add it to their product portfolios for commercialisation, will be essential.

In order to facilitate the licensing process, NICTA will establish a network of private sector companies that register with NICTA an interest in considering licensing opportunities.

Intellectual Property Register

Registers will be compiled and continually updated, to complement the intellectual property Protocols and Procedures (referred to above) in relation to the identification of intellectual property, its disclosure, its assessment, and its protection. These registers will be as follows:

- Intellectual property identified and disclosed to NICTA;
- Background intellectual property provided to NICTA
- Intellectual property that is the subject of patent protection.

In this way, NICTA will always be aware of the intellectual property commercialisation candidates available to it, and will be able to make informed commercialisation decisions about them.

Strategic Outlook for 2004-2005

It is expected that by 2004-2005 there will be some commercialisation activities (which have grown out of NICTA research) well underway. It is not expected that any direct commercial gains would have arisen by then.

NETWORKS AND LINKAGES

One of the key features of the vision for NICTA is to provide an open and collaborative framework which will support and nurture national excellence in research. 'Open' here means open to excellent researchers anywhere in Australia, and from any sector, whether Government, Industry or Education as long as their research aligns with the overall NICTA vision. 'Collaborative' means that the intention is to work together with partners in common areas of interest, rather than competing with existing research facilities.

Strategies

The three key strategies NICTA will adopt in setting up all networks and linkages are that

- 1) Research collaboration has to be *real*;
- 2) The proposed collaboration has to be *excellent*; and
- 3) The research has to *align* with the overall NICTA research vision.

The *reality* criterion means, for example, that the involvement of external researchers who commit only a small notional fraction of their time (e.g. 10%), as is common with CRCs, is deprecated. It also means that a formal collaborative arrangement with another organization will be put in place only after specific research projects (along with named NICTA personnel) have been identified. This is because experience clearly shows that if there is not commitment to collaboration by the researchers at the coal-face, then the collaboration is unlikely to succeed. Another consequence of this criterion is that individual research Programs are likely to have (and will be encouraged to have) a small number of high quality interactions (instead of large numbers of them just to cover all the bases.)

The *excellence* criterion means that NICTA will be quite selective about which institutions it will collaborate with. The excellence will be judged at the level of the group being considered (rather than crudely considering the institution as a whole).

The *alignment* criterion means that excellence is not sufficient: NICTA cannot afford to spread itself too thinly, either within its own research Programs or its linkages. NICTA needs to stay focussed in its research activities in order to maintain the advantage of critical mass. Relating linkages to the overall research vision of Universal ICT will aid this.

The above strategies will be applied in developing relationships and collaborations with several different classes of institution.

International Research Organizations

For NICTA to operate as an internationally recognized exemplar institution, it will be important that NICTA has a network of world class peer international research institutions against which it benchmarks itself. The expected modes of interaction will include: visits (both ways) of staff and students; internships for students; joint projects.

Australian Public Sector ICT Research Organisations

NICTA will aim to have substantial engagement with DSTO and CSIRO – the two main public sector research organizations active in the ICT sector. In order to comply with the above strategies, the interactions are expected to be focused into a relatively small number of Projects run jointly between NICTA and DSTO and between NICTA and CSIRO, where there is a substantial input of resources from both collaborating organizations. In addition to these Projects, NICTA will jointly collaborate with CSIRO and DSTO in research planning via the *Annual Outlook Forum*.

Australian Universities

The key mechanism for interacting with excellent researchers at Australian Universities is the notion of a NICTA Fellow. A NICTA Fellow remains a staff member at his or her home institution but enters into a Project agreement with NICTA. NICTA will provide support to the university researcher (potentially in the form of student scholarships, other research support, teaching relief or salary supplementation or partial replacement). The NICTA Fellow in turn commits to work on a NICTA Project under the direction of the Project leader.

Cooperative Research Centres

CRCs play a significant role in the Australian R&D sector. NICTA will collaborate with both ICT CRCs and CRCs in other sectors that are extensive users of ICT. NICTA expects to develop a detailed engagement model in collaboration with the CRCs (and potentially via the newly established council of ICT CRCs).

Sophisticated ICT Users

A significant number of advances in ICT have resulted from the need to solve problems in other sectors of the economy. Also, NICTA's mandate is to enhance the competitiveness of Australian companies by making them more intelligent users of ICT. Both these imperatives require that NICTA engage with sophisticated ICT users, both in the commercial and in the Government sectors. The mechanism of a NICTA research Project will be the vehicle for these interactions.

Small and Medium Enterprises

Engagement with SMEs is a crucial part of NICTA's vision and strategy. The engagement is likely to involve Projects, an SME club, student secondment and training courses. The engagement with SMEs will be facilitated by specialist staff (SME liaison officers) which NICTA will appoint.

ICT Multinational Corporations

NICTA cannot afford to ignore engagement with ICT multinationals, especially with their overseas R&D laboratories since they often develop the infrastructure platforms and standards on which most future ICT products and services will be based. It is of strategic value to NICTA that it is aware of these developments, and is engaged with these organizations. A crucial component of the engagement model with multinationals is that there must be a net national benefit to the interaction.

2003 Work Program

The highest priority is to develop an engagement strategy for the various different classes of organizations listed above consistent with the three key principles outlined at

the beginning of this Section. This strategy will then be used to guide the following (indicative) interactions.

International research institutions

- Make an initial approach to approximately 15 institutions;
- Exchange formal letters of engagement with approximately 8 institutions;
- Visit by NICTA researchers/students to approximately 5 institutions;
- Visit to NICTA by researchers/students from approximately 5 institutions;
- Explore application for funding of collaborative research with approximately 2 institutions.

Australian Public Sector ICT Research Organisations

- Initiate joint research activity with DSTO and CSIRO with a combined value of approximately \$1M.
- Organize the Annual Outlook Forum and use it as an input to the development of future NICTA programs.
- Provide expression of interest to organize at least one conference jointly with either DSTO or CSIRO.
- Promote NICTA PhD program to employees of DSTO and CSIRO.

Australian Universities

- Initiate a research engagement with a cluster of excellent researchers at one non-partner Australian university.
- Engage NICTA Fellows at various Australian Universities.
- Make an initial interaction with all relevant NSW and ACT universities and get a capability statement of their research groups with ICT research strengths.
- Organize information session on NICTA at a number of geographic centres such that all relevant universities in Australia are covered.

Cooperative Research Centres

- Finalise a MOU between NICTA and the Council of ICT CRCs outlining a broad framework for collaboration.
- Develop a detailed IP implementation document for engagement with CRCs.
- Initiate a joint project with an ICT CRCs
- Initiate exploration of joint activity with some CRCs that are users of ICT.

Sophisticated Users of ICT (Government and Commercial)

- Initiate discussion with at least 3 sophisticated ICT users in the commercial sector
- Engage at least one sophisticated user as a client in a joint research Project.
- Develop and provide at least two high end training course/consultancy input from NICTA researchers to sophisticated ICT users.

Multinational ICT Companies

- Identify approximately 15 ICT MNCs with significant R&D investment.
- Initiate and progress discussion with approximately 8 ICT MNCs.
- Formalize linkages with at least 2 ICT MNCs for joint research activities, exchange of researchers, and visits by NICTA students.
- Exchange researchers and/or students with at least 2 ICT MNCs.

SMEs

- Director Industry Development appointed.
- SME Liaison Officers employed at both the nodes.
- SME Officers to engage with the Commonwealth and State Regional Development offices to assist with formation of SME clusters.
- SME officers to interact with all the relevant clusters (those at the ATP and ATPi, those funded by BITS incubators, those funded by the COMET programs, Western Sydney etc).
- Exploit contacts through Canberra Knowledge Industries Board and liaise with the Government Agency Business ACT.
- SME Officers to work with the Director Industry Development to prepare a detailed Industry Development strategy.
- Make contact with government departments outside of ACT, NT and NSW with responsible for IT SME outreach, with a view to establishing how information could best be provided to the relevant community in the state.

Strategic Outlook for 2004-2005

The key difference that is expected between 2003 and the years 2004-2005 is that by 2004-2005, there will be a broad range of interactions in place, with some of them already drawing to a close making way for new ones.

HUMAN RESOURCES

NICTA's Mission is to encompass research, research training, commercialisation and linkage building in an integrated framework. To reflect this, and to clearly define the NICTA culture, NICTA's recruitment strategies, remuneration structures and personnel policies must be driven by outcomes of excellence in all facets of the NICTA Mission. In such an entrepreneurial culture, where both individual and team performance reward is to be an essential component, it is important that from the outset, NICTA clearly enunciates the value it places on its staff and that all staff are informed of and understand the impact of NICTA HR policy and processes (that is, processes are transparent within the organisation) and of how remuneration will apply across the organisation.

Strategies

There are two categories of staff that NICTA will deal with:

- 1) Staff directly employed by NICTA; and
- 2) Research staff at the partner universities who are seconded to NICTA as part of the partner agreements.

In so far as it is practically possible, NICTA intends to deal with both categories of staff as equally as possible in order to build a unified culture and to get the seconded staff to identify with NICTA as an organization. The seconded staff play a crucial role in the establishment phase of NICTA bringing instant international credibility and critical mass to the research programs. Their presence will aid the recruitment of many directly appointed staff. Whilst in early 2003 seconded research staff are expected to outnumber directly appointed research staff, NICTA expects that the number of directly appointed researchers will rapidly grow and outnumber the secondees over the first couple of years of operation.

The following strategies are written primarily for the first category of staff, but many aspects carry across to the secondees.

General Principles

NICTA is committed to attracting exceptional research and support personnel to carry out its Mission. Four key motivators will be emphasised in this search:

- The stimulus of a prestige intellectual environment
- Excellent resources and facilities for all staff
- Internationally- and market-competitive remuneration levels
- An excellent quality of life in Australia - Canberra and Sydney.

NICTA will draw on industrial best practice primarily in the industry and university sectors in developing its overall HR policy framework. It will be committed to, and implement, an innovative performance incentives framework, contemporary web-based delivery for information retrieval and dissemination, comprehensive induction programs and professional development opportunities for staff, and it will be an organisation committed to occupational health and safety, and also equity and diversity issues.

Remuneration Strategy

The key objective for NICTA is to attract and retain world-class researchers. NICTA's total remuneration package will comprise the following:

- Internationally competitive base salary for researchers.
- Market competitive base salary for managers and support staff.
- Employer superannuation contribution of 17% for most staff. Minimum 9% superannuation guarantee levy option available to senior staff.
- A performance incentive program for teams, for research staff and senior support staff.
- Salary sacrificing options.

Priorities for Appointment

The priorities for appointment of staff are:

- Management and Executive Support staff.
- Research and Research Support.
- Support staff.

Initial strategies will include:

- Executive search for the Chief Executive Officer.
- Executive search and recruitment initially for key management staff and initial support staff.
- Advertisement for research staff in Australia and overseas.
- Personal contact, including targeting specific individuals.

Immigration Approach

Discussions have been held with Ashmore Brown Chait with a view to obtaining specialist immigration support to NICTA to facilitate the immigration of overseas researchers. Australia has a highly complex and legalistic visa system which requires applications to be carefully prepared in accordance with the legal requirements. NICTA wishes to ensure that overseas staff recruited to Australia are assisted at a high level in this process. As a first step ABC have met with the Canberra Regional Immigration Office and ACT and NSW Governments to establish the most effective and timely mode of operation for immigration matters. These discussions will be used to formulate the immigration model for NICTA.

Policy and HR administration

In determining policy drafting milestones, strategic checks will be made to ensure that key operational policies, those required under statute (e.g. Occupational Health and Safety, Privacy, etc.), and those critical for partner universities' agreement, are given priority in the drafting process.

Staffing

NICTA's long-term objective (by end 2006) is to achieve the following approximate staffing ratios:

- | | |
|-------------------------------------|--------|
| ▪ Non-partner supported researchers | 75% |
| ▪ International research recruits | 50% |
| ▪ Continuing research staff | 30-40% |
| ▪ Fixed-term research staff | 60-70% |

The transition of research staff from being partner-based to NICTA-based will be achieved through both allocation of appropriate NICTA resourcing levels and recruitment strategies. Research Program Leaders have initially been allocated \$900k per program for activities through until end 2003 to commence this transition. Recruitment will be both national and international. Particular care will be taken when considering candidates from Australian universities to offer involvement in NICTA as a NICTA Fellow in order to avoid “hollowing out” their ICT departments.

To ensure that NICTA does not impact unfavourably on ICT research in Australia and its universities by drawing away exceptional tenured talent to NICTA, and to ensure high international standing, NICTA's long-term objective, subject to review, is to achieve an overall research population comprising a high number of international recruits, particularly continuing staff.

With a major emphasis on postgraduate recruitment for a 4-year PhD, there will be a necessity to have a strong core of continuing staff as primary supervisors for students. Appointing fixed-term staff for periods of between 4 to 5 years will also provide an effective pool of co-supervisors for students.

2002 Tasks Completed

In order to understand the 2003 work program, the progress made during Q4 2002 is recorded here.

Recruitment

- Appointment of Heidrick and Struggles to recruit CEO.
- Appointment of the Green and Green Group to recruit to short-listing stage key senior management and support personnel for ATPi, Kensington and Canberra sites.
- Appointment of Alexander Mann to recruit to short-listing stage Directors of Commercialisation & IP and Industry Development, and SME Liaison Managers at ATPi and Canberra sites.
- Selection of these senior managers, directors and support staff.
- First round advertisement for Postdoctoral Research Fellows.
- Selection of first-round Postdoctoral Research Fellows.
- Commence planning for research program staffing, and drafting advertisements for initial new research positions.
- UNSW and ANU seconded staff identified and in place.
- Engage immigration agency to facilitate arrival of overseas research staff.

HR Policy Development

Drafting completed for:

- Delegations (3-stage level)
- Conditions of appointment (but to note that IP policy attachment will be developed by Director, Commercialisation and IP)
- Appointment policies and procedures (including interview expenses policy), and related policies required for staff appointment
- Remuneration strategies (salary profiles, performance incentive principles, salary sacrificing options).

Induction and Induction Training

- Preparation of Induction material

2003 Work Program

Recruitment

Quarter 1

- Short-listing and interviewing for CEO.
- Selection and announcement of CEO appointment by 31 March.
- Commencement of initial senior management and support personnel.
- Commencement of first Researchers.
- Conclude planning for research program staffing, and commence first-round recruitment of new research Program staff.
- Commence recruitment and initial selection of NICTA Fellows.
- Commence recruitment of additional support staff.

Quarter 2

- Commencement of additional Postdoctoral Research Fellows.
- Commencement of new researchers at the rank of Senior Researcher or higher.
- Commencement of additional support staff.
- Engagement of NICTA Fellows.

Quarter 3

- Commencement of CEO.
- Commencement of new researchers
- Commence second-round recruitment of research Program staff.

Quarter 4

- Commencement of further research Program staff.

HR Policy Development

Quarter 1

- Finalise drafting of key operational policies, those required under statute (e.g. Occupational Health and Safety, Privacy) and those requiring agreement with partner universities.
- Define key performance indicators for all staff categories.
- Workshop for all staff on performance review policy and process.
- Workshop for all staff on promotion policy and process.
- Workshop other policies or procedures as necessary.

Quarter 4

- Review terms and conditions of appointment.
- Consider development of an EB or AWA framework in consultation with staff.
- Review with staff, key performance indicators for different categories of staff.
- Review appropriateness of performance incentive scheme.
- Review all other policies and revise if necessary.

Induction and Induction Training

Quarter 1

- Workshop with key individuals in relation to induction processes.
- Monthly induction sessions for all new staff commence - research and support.

Quarter 4

- Review induction processes and information and revise if necessary.

Professional Development and Training

Quarter 1

- Develop NICTA policies and procedures.
- Identify needs and develop strategies for professional development of Program Leaders.
- Identify training opportunities and providers.
- Workshop in conjunction with performance review policy and procedures.

Systems

Quarter 1

- Access to all HR material made available on-line, including all forms.
- Evaluate and identify an on-line web-based recruitment system to facilitate the application capture and circulation process.

Aggregate Staffing Numbers

Whilst it is impossible to be very accurate at this stage, for the sake of facilities planning NICTA has some crude estimates of *total* staff numbers at the end of 2003 at each of the three sites. These figures should be viewed as very approximate. They are

| | |
|------------|----|
| ATP | 65 |
| Kensington | 70 |
| Canberra | 80 |

Strategic Outlook for 2004-2005

The year 2003 will see the implementation of operational critical policies and systems, and appointment of core staff. Initial HR strategic planning will have been commenced and strategies implemented. The end of 2003 will require a review of these activities and recommendations for the future.

The objectives to be considered in developing the strategic outlook for 2004-2005 could include the following, but will be tempered by the focus determined by the permanent HR Manager:

- Attract, appoint and retain a high quality and innovative work force.
- Provide a work environment, conditions, work practices and services that maximise the effectiveness of the staff in terms of the NICTA Mission.
- Have staffing practices and staffing structures that recognise the distinctiveness of NICTA and provide maximum flexibility for the organisation, and components of the organisation.
- Have appropriate decision-making and consultative processes to monitor, review and develop staffing strategies to meet emerging new needs.
- Maximise equal employment opportunities for all staff and to provide those opportunities within a healthy and safe environment.

ACCOMMODATION

The primary driver in providing facilities and equipment for the Centre is to establish NICTA as a landmark centre of excellence in ICT research and research training, which will attract and retain the best Australian national researchers and research students, as well as the best researchers and research students from overseas. The Centre's facilities and accommodation will provide a physical environment which supports Australia to develop its ICT innovation capability, realise its potential for ICT innovation in both scientific and commercial fields, and attain a world's best practice standard in ICT research, development and training.

Strategies

NICTA is structured with two nodes, one node located in Sydney, NSW and the other in Canberra, ACT.

The Sydney node has two facilities: the National Headquarters and research facility located at the Australian Technology Park (ATP), Eveleigh, and the other major research facility located on The University of New South Wales (UNSW) campus at Kensington.

The Canberra node is currently located within the Australian National University (ANU) campus, and in future will be located on its own site adjacent to the ANU.

Cohesion between the three sites is a key consideration in the rollout strategy. A vital component of the strategy is high speed, effective telecommunications and video links between the sites, and state of the art information sharing platforms.

2003 Work Program

Programs/Activities

- Development of Sydney Node – ATP site
- Development of Sydney Node – Kensington site
- Development of Canberra Node – ANU site
- Provision of Special Facilities and Equipment to all sites

Sydney Node – ATP site

NICTA's Headquarters have opened at the ATP. Commercial, administrative and research functions are operating from that site using temporary accommodations secured at the Australian Technology Innovation Centre. NICTA plans to move to a much larger interim space at the ATP in April 2003. The fit out of this space, located at ATP's Bay 15, is currently being designed, with installation planned to take place in February/March 2003.

A new NICTA National Headquarters Building will be developed for the Centre at the ATP. The building will be based on an initial commitment to an area of 4,600m². It is intended that NICTA will occupy space according to its needs, whilst active strategies are promoted in partnership with the ATP Precinct Management ("ATPPM") to attract ICT SMEs to co-locate adjacent to NICTA in additional space provided by ATPPM.

Joint master planning with ATPPM for the new Headquarters space is due to commence in January 2003.

Sydney Node – Kensington

NICTA Centre's initial premises have opened at the University of New South Wales with Centre staff operating from the site.

Refurbishment of the Initial Centre Premises at Electrical Engineering Building (G17) was completed and handed over to NICTA on 18 December 2002. This provides a full fit out of 670m², and accommodates 12 staff and 24 PhD students. Kensington-based NICTA Commercial, Administrative and Research personnel are in the process of relocating from the CSE building (K17) to these new premises at G17. Lease agreements are subject to NICTA Board approval.

A project to construct a new building, L5, on the current Unisearch House site in Anzac Parade Kensington has been approved by the UNSW Council and by Randwick Council. This project will demolish the existing Unisearch House, and erect a new building specifically for NICTA. The building will provide NICTA with 4,000m² of space, to be leased from UNSW. It is expected that NICTA will share the building with one or more other UNSW tenants. This building is scheduled for completion in Quarter 4, 2004. Geyer, the appointed Space Consultants, have commenced the planning of NICTA's fit out at L5 under McLachlan Lister's supervision.

UNSW have undertaken to provide additional space to NICTA on campus as needed for NICTA's expansion prior to the completion of the new building at L5. UNSW have pledged to provide a minimum of 1,000m² additional interim space under this agreement. UNSW are currently investigating suitable offerings for NICTA's expansion on campus and discussions will begin in earnest in January 2003. Specific arrangements with UNSW as to leasing arrangements are specified in the Members Contribution Agreement with UNSW.

A strategic accommodation plan has been prepared by McLachlan Lister to take NICTA staff located at the Kensington site from the 670m² acquired in December 2002, to the full L5 accommodations of 4,000m² in comfortable stages without over-commitment on the one hand, or restrictions on growth on the other.

Canberra Node – ANU site

NICTA Centre's initial premises opened at the Australian National University with Centre staff operating from the site out of the Information Sciences and Engineering Building (RSISE). The ACT Government has offered two greenfield sites for a new landmark NICTA building adjacent to the ANU, of which one will be the final offering. The terms of this offer are specified in the Partner Deed with ACT Government. McLachlan Lister is undertaking a preliminary commercial assessment to derive and confirm a commercial structure to develop a structured leasing proposal for NICTA to offer to developers. This will allow NICTA to proceed without investing significant funds or taking any development risk.

A transitional plan is being constructed by McLachlan Lister to take NICTA staff located at the Canberra node from the RSISE building to the new building in comfortable stages without over-commitment on the one hand, or restrictions on growth on the other.

Branding and National Identity

NICTA's facilities will provide a recognizable presence and branding, and a National identity that supports its objectives and culture. Both local expression and cultural differences will be supported. NICTA will make every effort in its choice of suppliers to support the best of Australian innovation in architectural and workspace design, infrastructure, utilities, and in office and research equipment and facilities, in all areas where this can be achieved without significant disadvantage to NICTA.

Best Practice Benchmarking

Geyer has benchmarked international best practice ICT facilities as well as existing accommodation at UNSW and ANU to derive best practice principles for NICTA's accommodation, based on excellence and innovation and aimed at providing a truly leading edge solution.

Built-in Flexibility

NICTA's approach to work area design includes a modular approach which will build in flexibility, allowing easy restructuring of the space for future growth, reorganization of research groups, and changes of focus within and between research programs over time.

A flexible kit of components will be provided, including enclosed offices and open work stations, access to shared collaborative space, centralised reception, a variety of meeting rooms of various sizes for various functions, including facilities for interaction and showcasing with both commercial and research interests, and learning and training facilities for NICTA's people and partners.

Special Facilities and Equipment

Communications between Sites

An Optical Fibre Link between the Kensington and ATP sites has been ordered. The installation of one pair of optical fibres between UNSW and the ATP will provide high-speed networking to support NICTA's research and commercial activities. The link will provide the capacity for multiple videoconferences and satisfy the high bandwidth requirements of particular research areas.

In addition to the high-speed fibre link, \$0.5 million has been assigned for Capital Expenditure on IT infrastructure. Discussions are under way to utilise the facilities of GrangeNET to provide a high quality research, education and videoconferencing link between the three sites.

External Communications Links

There will be links to university systems in relation to education and research matters. A seminar room will be developed at each of the three sites and will be linked by videoconference facilities (via GrangeNET). Arrangements for research use of specialised equipment and infrastructure will be entered into with various organisations.

These could include VisLab, UNSW's Usability Lab and access to ASIC Fabrication facilities.

Platform Infrastructure

The position of the NICTA IT Manager has been offered, and when appointed, the incumbent will liaise with the ANU and UNSW to develop a global NICTA IT infrastructure plan. It is envisaged that the administrative functions (commercialisation activities, finance and human resources) will have a uniform NICTA-wide IT infrastructure, whereas, the IT infrastructure for each of the individual research programs would vary, being driven by the research needs of those programs.

Specialised Facilities

Specific specialist laboratories will support the research programs, providing the facilities needed to pursue specific research interests which will evolve over time. Certain specialised equipment for use by NICTA researchers may be offered by external sources, possibly through ARC grants in the case of seconded researchers.

Financial Plan

Activities

The funding deed with the Commonwealth requires that NICTA to separately account for receipts and expenditure of Departmental and ARC funds (sub-clauses 9.3 and 12.3). The following projected statements reflect the requirements of the deed.

Statement of financial performance

Projected for year ended 31 December 2003

| | Notes | \$'000 |
|--|-------|---------------------|
| Revenue from ordinary activities | 1 | 30,022 |
| Expenses: | | |
| Employee benefits expense | 2 | 11,639 |
| Depreciation and amortisation expense | 2 | 350 |
| Other expenses from ordinary activities | 2 | 8,970 |
| Profit from ordinary activities before income tax expense | | <u>9,063</u> |
| Income Tax Expense | | - |
| Net profit | | <u><u>9,063</u></u> |

Statement of financial position

Projected for year ended 31 December 2003

| | \$'000 |
|---------------------------------|---------------|
| Current Assets | |
| Cash | <u>15,339</u> |
| Total current assets | <u>15,339</u> |
| Non-current assets | |
| Property, plant and equipment | <u>817</u> |
| Total non-current assets | <u>817</u> |
| Total Assets | <u>16,156</u> |
| Total Liabilities | <u>-</u> |
| Equity | <u>16,156</u> |

Statement of cash flows

Projected for year ended 31 December 2003

| | Notes | \$'000 |
|--|-------|----------------------|
| Cash flows from operating activities | | |
| Receipts from customers | 1 | 29,600 |
| Interest received | 1 | 422 |
| Payments to suppliers and employees | 2 | (20,609) |
| Income taxes paid | | - |
| Net cash inflow from operating activities | | <u>9,413</u> |
| Cash flows from investing activities | | |
| Payments for property, plant and equipment | | <u>(1,167)</u> |
| Net increase (decrease) in cash held | | 8,246 |
| Cash at the beginning of the financial year | | <u>7,093</u> |
| Cash at the end of the financial year | | <u><u>15,339</u></u> |

Note 1. Projected Revenue

| | \$'000 |
|--|---------------|
| Revenue from operating activities | |
| Contribution from Members | 5,200 |
| Department of Communications Information Technology and the Arts | 15,600 |
| Australian Research Council | 8,800 |
| | <u>29,600</u> |
| Revenue from outside operating activities | |
| Interest | 422 |
| Revenue from ordinary activities | <u>30,022</u> |

Note 2. Projected Expenses

| By Site | Kensington | ATP | Canberra | Total |
|--|-------------------|--------------|-----------------|---------------|
| Salary and oncosts | 4,837 | 2,402 | 4,400 | 11,639 |
| PhD Scholarships | 807 | 0 | 651 | 1,458 |
| Professional Development | 20 | 0 | 0 | 20 |
| Recruitment | 0 | 433 | 0 | 433 |
| Travel | 964 | 152 | 388 | 1,504 |
| Incidentals | 67 | 60 | 137 | 264 |
| SME Promotions | 0 | 0 | 20 | 20 |
| Insurance | 0 | 0 | 0 | 0 |
| Rent | 0 | 1,136 | 0 | 1,136 |
| MV Leases | 0 | 38 | 0 | 38 |
| Library | 0 | 0 | 200 | 200 |
| NICTA Board Meetings | 0 | 60 | 0 | 60 |
| Consultants | 0 | 714 | 0 | 714 |
| Marketing | 0 | 48 | 0 | 48 |
| Audit and accounting services | 0 | 30 | 0 | 30 |
| Fellows | 0 | 0 | 100 | 100 |
| Maintenance | 66 | 0 | 21 | 87 |
| Commercialisation | 400 | 400 | 400 | 1,200 |
| Other | 815 | 254 | 589 | 1,658 |
| Total | 7,976 | 5,727 | 6,906 | 20,609 |
| % - Expenditure by site³ | 38% | 28% | 34% | |

³ These percentages are the fractional percentage of commonwealth monies budgeted to be expended at the three main sites (and thus they add to 100%). There will be expenditure of Commonwealth monies at locations other than the three main sites; at the time of the preparation of this Annual Activity Plan NICTA does not have a precise view of where there will be spent. NICTA has an approximate overall target of 15% of the Commonwealth monies being spent at locations other than the three main sites through mechanisms such as NICTA fellows and research Projects.

| By Activity | Research | | | Executive | Node Admin | Total |
|-------------------------------|--------------|------------|--------------|--------------|--------------|---------------|
| | Programs | External | Training | | | |
| Salary and oncosts | 6,942 | 200 | 557 | 2,402 | 1,538 | 11,639 |
| PhD Scholarships | 0 | 0 | 1,458 | 0 | 0 | 1,458 |
| Professional Development | 0 | 0 | 20 | 0 | 0 | 20 |
| Recruitment | 0 | 0 | 0 | 433 | 0 | 433 |
| Travel | 1,204 | 107 | 41 | 152 | 0 | 1,504 |
| Incidentals | 164 | 0 | 0 | 60 | 40 | 264 |
| SME Promotions | 0 | 0 | 0 | 0 | 20 | 20 |
| Insurance | 0 | 0 | 0 | 0 | 0 | 0 |
| Rent | 0 | 0 | 0 | 1,136 | 0 | 1,136 |
| MV Leases | 0 | 0 | 0 | 38 | 0 | 38 |
| Library | 0 | 0 | 0 | 0 | 200 | 200 |
| NICTA Board Meetings | 0 | 0 | 0 | 60 | 0 | 60 |
| Consultants | 0 | 0 | 0 | 714 | 0 | 714 |
| Marketing | 0 | 0 | 0 | 48 | 0 | 48 |
| Audit and accounting services | 0 | 0 | 0 | 30 | 0 | 30 |
| Fellows | 100 | 0 | 0 | 0 | 0 | 100 |
| Maintenance | 87 | 0 | 0 | 0 | 0 | 87 |
| Commercialisation | 0 | 0 | 0 | 400 | 800 | 1200 |
| Other | 473 | 19 | 820 | 254 | 92 | 1658 |
| Total | 8,970 | 326 | 2,896 | 5,727 | 2,690 | 20,609 |

Comments

The projected *statement of financial performance* for 31 December 2003 has been prepared with the following assumptions:

- National ICT Australia Limited will be granted a tax-exempt status.
- In-kind contributions have been ignored, due to the uncertainty of the nature and timing of the contributions.
- The members contributions of \$29.6m are based on amounts stated in draft agreements.
- No other revenue has been projected from other members or other sponsorship organizations at this stage.

Projected expenditure by site and by activity (as above) confirms that Commonwealth Funds projected in 2003, will be spent in accordance with the initial Funding Deed.

The projected *statement of financial position* as at 31 December 2003 has been prepared with the following assumptions:

- Debtor and creditor balances have been ignored and are considered minor.
- Any amounts for GST payable or receivable have been ignored and are considered minor.

- Retained earnings balance of \$16.2m includes an opening balance of \$7.1m, which is represented by the estimated net profit for the year ending 31 December 2002.
- It has been assumed that property, plant and equipment will be paid for in cash.

The overall financial planning for 2003 has taken account of the fact that:

- Other activities are planned in 2003 which are not captured in the above tables; some of the possibilities are covered in the Appendix;
- Since we are in the early stages of operation, it is prudent to expect that NICTA will want to engage in activities in 2003 which we have not yet envisaged;
- There is a requirement to have a significant cash balance at 31/12/03 since the next Commonwealth receipt occurs only after several months into 2004.
- Subject to a formal variation of the funding deed with the Commonwealth Government, an additional \$3M exclusive of GST is expected to become available in 2003. This additional money has been presumed available in the above tables. The additional money will be utilised for the activities for 2003 that are still in the early planning stages.

Strategic Outlook for 2004 – 2005

Financially, National ICT Australia will be planning for the likely impact of the funding agreement extensions together with the development of its commercial activities. Contingency planning for ongoing commitment cover beyond the current funding arrangements will help ensure the capability of NICTA to support its longer-term obligations beyond 2006.

NICTA MILESTONES FOR 2003

Research

Quarter 1

- Selection of leaders who are seconded staff, for the 11 initial Programs and the implementation of their respective Programs.
- Initiation of 3 NICTA funded Projects.
- Appointment of 2 node directors.

Quarter 2

- Confirmation of leaders of the 11 initial Programs as NICTA appointments.
- Three new Program proposals presented to the board.
- Seven more Projects initiated.
- Secondment of staff from ANU and UNSW finalised and all such staff actively engaged in NICTA research Programs.

Quarter 3

- International Scientific Advisory Group constituted and met (Q3/4).
- Annual outlook forum held jointly with CSIRO and DSTO (Q3/4).
- Five more Projects initiated.

Quarter 4

- Formal processes in place for the development and assessment of new Program proposals including constitution of research committee.
- Initial Programs at 50% of their steady state staffing.
- One new Program commenced.
- At least two Researchers working on a specific research activity spanning the two nodes.

Research Training

Quarter 1

- Agreements established with ANU and UNSW regarding student selection, student management and scholarship conditions.
- Appointment of Associate Director of Education at Canberra node.
- Appointment of Acting Associate Director at Sydney node.
- Appointment of Education Administration and Outreach Officers at each node.
- Creation of initial student body of at least 20 PhD students which will be drawn from approximately 100 existing students of seconded staff plus any new recruits made.

Quarter 3

- Appointment of Director of Education.

Quarter 4

- Begun negotiations with universities, research institutes, and companies to participate in a research training network with NICTA.
- Endorsement of 22 new PhD students enrolled at Australian universities for 2004.
- Establish agreements with partner Universities regarding implementation of NICTA enhanced PhD.

- Plan implementation of full NICTA enhanced PhD including policy, process and dates of implementation, subject to receiving any DEST approvals or agreements required.

Commercialisation

Quarter 1

- Selection of Director Commercialisation and Intellectual Property.

Quarter 2

- Commencement of Director Commercialization and Intellectual Property
- Board to approve initial IP policy statement.
- Establishment of
 - IP register;
 - Background IP register for secondees.
- Development of procedures and protocols identified in the IP Policy statement.
- Establishment of Commercialisation Assessment Advisory Panel.

Quarter 3

- Establishment of Funding and Industry Networks.
- Establishment of International Business Advisory Group and involvement of the group in the Annual Outlook Forum. (Q3/4)

Quarter 4

- Initiated education and scanning program.

Networks and Linkages

Quarter 1

- Selection of Director, Industry Development.

Quarter 2

- Commencement of Director, Industry Development.
- Appointment of 5 NICTA fellows in non-partner Universities.
- Appointment of Canberra and Sydney SME Liaison Officers.
- Preparation of industry development strategy with focus on SMEs.
- Initial contact between SME Liaison Officers and SMEs listed in bid.

Quarter 3

- Preparation of engagement strategies for, and the making of initial contact with different classes of organizations including:
 - International Research Institutions;
 - Australian Public Sector Research Organisations;
 - Australian Universities;
 - Cooperative Research Centres;
 - SMEs;
 - Sophisticated ICT users;
 - Multinational ICT Companies.

Human Resources

Quarter 1

- Short-listing and interviewing for CEO.
- Selection and announcement of CEO appointment by 31 March.

- Commencement of 5 Researchers⁴, and 4 Senior Management staff.
- Finalisation of all operation critical employment policies and procedures documents, with priorities determined by IR and legislative imperatives and partner agreements.

Quarter 2

- Commencement of another 10 Researchers.
- Selection of 10 researchers at the rank of Senior Researcher or above.
- Commencement of 10 additional support staff.

Quarter 3

- Commencement of CEO.

Accommodation⁵

Quarter 1

Sydney Node - Headquarters, ATP Phase 1- Bay 15

- Complete Phase 1 Accommodation Brief for Bay 15
- Complete bay 15 Fit out and occupy (Q1/2).

Sydney Node - UNSW Node Phase 1- Interim Campus Accommodation

- Complete move of relevant personnel from CSE K17 Building to new NICTA facilities on Level 4, G17 Building

Canberra Node - ANU Phase 1

- Complete installation of NICTA signage
- Confirm expansion capacity of RSISE building

Canberra Node - ANU Phase 2- New Building adjacent to ANU

- Choose site.

Quarter 2

Sydney Node - Headquarters, ATP Phase 2- New Space

- Complete Phase 2 Accommodation Brief for ATP HQ.
- NICTA Board approval of Master Plan (prepared by NSW Government)

Sydney Node - UNSW Node Phase 1 – Interim Campus Accommodation

- Confirm quantum of additional space with UNSW and finalise access agreements

Sydney Node - UNSW Node Phase 2- L5 Building

- Complete Phase 2 Accommodation Brief
- Confirm Schematic Design

Canberra Node - ANU Phase 2- New Building adjacent to ANU

- Confirm site suitability.

⁴ Recall that there are 4 ranks of research staff within NICTA: Researcher, Senior Researcher, Principal Researcher and Senior Principal Researcher.

⁵ It is recognised that the satisfaction of NICTA's accommodation requirements is less under the control of NICTA than the other categories in this list of Milestones. All of the Milestones under the Accommodation heading have the caveat that they rely upon organizations other than NICTA completing certain tasks in a timely manner, or that all approvals (such as planning approvals) will be granted. Furthermore, many of the Milestones are intrinsically sequential. Thus failure to meet an early one will likely cause a failure to meet subsequent ones.

Quarter 3

Sydney Node Headquarters, ATP Phase 2- New Space

- Complete agreement to lease.

Sydney Node- UNSW Node Phase 1 – Interim Campus Accommodation

- If additional space is needed, design & commence fit out (by UNSW).

Sydney Node- UNSW Node Phase 2- L5 Building

- Commence Construction (by UNSW).

Canberra Node- ANU Phase 2- New Building adjacent to ANU

- NICTA Board in principle approval of commercial concept and proposed structured lease.
- NICTA to seek ACT Government in principle approval of agreement to assign site leasehold to developer.

Quarter 4

Sydney Node- headquarters, ATP Phase 2- New Space

- Development approval completed, developer appointed (by NSW Government).

Sydney Node- UNSW Node Phase 1 – Interim Campus Accommodation

- Complete fit out and prepare (additional) space ready for occupation by NICTA personnel.

Canberra Node- ANU Phase 2- New Building adjacent to ANU

- Complete and offer a package to engage a developer (prior to commencing design).

Finance

Financial analysis of the Centre will be carried out in separate 6 monthly reports.

Milestones under this heading will therefore be confined to those activities required to set up the framework for ongoing financial reporting.

- Establishment of internal management accounting systems, including a chart of accounts.
- Establishment of asset register.
- Finalise audit plan.
- Finalise risk management plan.
- Establishment of Audit Committee.
- Establishment of process for tracking externally generated revenue.
- Preparation of budget for 2004.

PERFORMANCE INDICATORS

Performance indicators are longer term measures and it can be expected that in the main they will not vary in major content over the life of the funding deed. It can also be expected that in the progressive monitoring of NICTA's activities performance indicators will be refined by the mileposts extant at the time. In assessing NICTA's performance is necessary to take an holistic view as there is obvious overlap between individual indicators listed below.

| OBJECTIVES | FEATURE | INDICATOR |
|--|------------------------------|---|
| Researchers of the highest calibre internationally | Qualitative and Quantitative | Overall visibility and quality of NICTA researchers as against that in comparator institutions (which will be defined during 2003, bearing in mind the ease of data collection). The indicator will be partly descriptive, especially in relation to new researchers, but will dwell also on indicators of visibility and quality such as <ul style="list-style-type: none"> ▪ Invited Talks ▪ Specialised individual Citation recognitions ▪ Membership of Staff on program committees and editorial boards of top conferences and journals ▪ Prizes and awards, e.g. honorary doctorates ▪ Membership of academies |
| Research activity recognized internationally and supported by external organizations both within Australia and overseas. | Quantitative | Average number of outcomes per researcher at least as good as those in comparator institutions (to be defined in 2003), with possible segmentation into <ul style="list-style-type: none"> ▪ Journal articles published ▪ Books ▪ Book chapters ▪ Conference presentations |
| | Quantitative | Citations, provided agreement can be reached with ARC in 2003 in respect of <ul style="list-style-type: none"> ▪ Capacity to cover the field, ▪ Adequacy of number of individuals to ensure a valid comparison, and ▪ Cost of collection |
| | Qualitative | Description of the three best research achievements across NICTA. |

| | | |
|-----------------------------|--|---|
| Quality graduates | Quantitative | PhD students per continuing researcher and absolute numbers of students and numbers completing PhD |
| Effective Commercialisation | <p>Qualitative</p> <p>Type with qualitative and quantitative data</p> <p>Value</p> | <p>Description of destination of completing students.</p> <p>In the initial stages, NICTA needs to focus on establishing the commercialisation structures and processes. However in the longer term, the realisation of NICTA's objectives will be measured by the number and quality of following outcomes;</p> <ul style="list-style-type: none"> ▪ Staff intellectual property disclosures ▪ Commercialisation candidates identified and assessed ▪ Patents applied for ▪ Start up companies ▪ Joint ventures ▪ Licence agreements ▪ Other commercialising mechanisms. <p>Related revenue earned by NICTA</p> <p>Overall national benefit of NICTA activities, assuming that a methodology is available for assessing this as reasonable cost. A current ARC study may provide the methodology, and the decision concerning feasibility including methodology will be taken in 2003 in conjunction with the Commonwealth.</p> |
| Extensive Linkages | Type with qualitative and quantitative data | <p>A key requirement for NICTA is to provide an open and collaborative framework which will nurture excellence in research; one which is attractive to excellent researchers from many sectors. NICTA's success will be measured by the quality and number of linkages with the following types of organizations:</p> <ul style="list-style-type: none"> ▪ International Research Institutions ▪ Australian Public Sector Organisations ▪ Australian Universities ▪ Cooperative Research Centres ▪ SMEs ▪ Sophisticated ICT users ▪ Multinational ICT Companies |

APPENDIX – CONFIDENTIAL INFORMATION

[omitted]