



AIIA Submission

Review of Australian Higher Education

August 2008

Australian Information Industry Association Secretariat

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1 Executive Summary

1.1 Introduction

The Australian Information Industry Association (AIIA) welcomes the Federal Government's review on the future direction of higher education in Australia.

1.2 Importance of ICT in the Australian context

The Australian Information and Technology (ICT) industry has a major role in the Australian economy, businesses and communities, and with Australian citizens.

Our industry is important to all Australian businesses whether big or small. ICT is vital to banking, healthcare, telecommunications, education, transport, resource exploration, manufacturing, tourism, primary and mineral production, security, environmental management, and many other areas vital to the economy and community.

Our industry is important to Australian communities and is the fabric that connects people to their social and interest groups, their local libraries, their schools and their charity organisations; it links professional and trade bodies, women's and indigenous groups; it delivers services from government to a wide and diverse range of non-government support bodies; and it brings rural, regional and metropolitan Australia together to share and participate.

Our industry is important to individual Australian citizens. Our industry creates jobs, careers and opportunities. Our industry helps people create art, music, entertainment and enjoyment. Our technologies help Australians in their education and training, to enjoy good healthcare, to provide measures of safety and security. Our communications allow family members to connect across distances and time zones.

Our industry will be important to governments, business, and the community to reduce the industrial emissions of greenhouse gases, to design and develop alternative energy sources, to introduce more efficient systems and technologies to manage energy use, and to establish and run countries' greenhouse gas emission trading schemes.

1.3 Importance of higher education

Some twenty-eight of Australia's universities as well as other post-school education institutions offer ICT and related-disciplines to produce graduates and post-graduates to work in ICT occupations specifically and in many other occupations,

and to undertake research and develop ICT associated technologies and their application.

ICT skills play an increasingly vital role in most occupations, and contribute to productivity gains, innovation and job growth across all Australian industries.

However, Australia is facing a widening gap between the demand for ICT skills and the supply of qualified ICT workers.

This means that the continued productivity dividend by ICT to the Australian economy will be jeopardised if Australia does not have sufficient people with ICT skills participating the Australian ICT workforce.

1.4 Key observations

Australia needs an internationally competitive higher education sector, which has a strong focus on ICT education and research, and which is benchmarked against other OECD countries.

The Federal Government's higher education policies should encourage universities to focus on their strengths in particular areas of higher education teaching, scholarship or research, and to achieve excellence in those strengths.

Excellence in teaching performance must be encouraged within universities so Australia has a higher education sector capable of producing well-educated ICT graduates and post-graduates for Australia's workforce and research centres.

The Federal Government has an integral role in maintaining a high level of support for public sector R&D, in focussing on the commercialisation of public sector research investment, and in ensuring that its policy mix is such that investors view Australia as a competitive place to invest in R&D.

Proven performance in research and the national research priorities should be the prime determinants in the funding of research in higher education. Australia can and should commit to support and foster a number of leading institutions, which will lift the top ranks of Australian students and academics to global research eminence.

2 Higher education for Australia

Skilled and highly educated people are the most important component of the ICT industry as they provide the genesis, implementation, and support **for** the technologies **delivered by** the ICT industry.

But highly educated people with skills associated with ICT are not just important for ICT companies. They play major roles throughout the Australian economy, businesses and communities, and in our culture, our environment, our private lives and families, and our connections with others in Australia and elsewhere.

Consequently, the ICT industry is heavily dependent on the success, commitment and effectiveness of Australian universities to educate people with well-developed ICT knowledge and aptitude.

Our Association recognises that universities are vital for the future growth of the ICT industry and to realise Australia's potential as a leading supplier and user of ICT.

The knowledge and information repository within our universities and teaching and research exchange delivered by our universities provide opportunities for Australia and Australians.

AIIA acknowledges that our universities do and must provide opportunities for Australians to contribute to their own personal development and experiences and to society. We accept that universities need to play a role in providing for individual improvement, social inclusion and diversity, and opportunities for all.

Our Association agrees with the statement of functions of teaching and research for our universities and agrees with the seven points listed as being desirable characteristics for our universities as presented in the discussion paper.

AIIA agrees with the proposition that our universities also help satisfy our intellectual curiosity, our interest in learning, and increase our self and collective knowledge and social well-being.

3 Industry's labour market requirements

The Australian ICT professional workforce is largely tertiary educated and as a consequence, the Australian universities play a crucial role in the development and application of ICT technologies and solutions within the industry and throughout Australia.

The ICT labour market is in a constant state of change. Desired skill sets *demand*ed by industry are dynamic and trends are unpredictable because they depend on technological change and the workplace changes they precipitate.

To meet the universities' function of meeting the needs of the Australian labour markets and specifically the ICT labour market, the Association considers that the Australian governments, industry and education providers need to develop better

labour demand forecasting modelling, improve supply side data collection and analysis.

While ICT graduates are readily employed, we see improvements being required in the organisation of the frameworks of the discipline approach to curriculum development and coursework.

3.1 Forecasting Australia's labour market supply and demand

Labour market forecasting and good labour market statistics are essential to assisting Australia's higher education institutions work effectively in providing highly educated workers to meet the Australian employment needs.

Without this intelligence, developing a real understanding of the current and foreseeable dynamics of the Australian labour market is becomes impossible.

Without this intelligence, education and training providers will be unable to develop relevant courses and curricula, teacher, researcher and staff resources, estimate infrastructure requirements, graduate demand, financial performances and investment, and much more.

Without this intelligence, industry, employers, professionals, students will be unable to anticipate labour supply issues, improve training and career planning, develop support training, decide career paths and opportunities, assist government policy development, and much more.

Without this intelligence, we will not be able to evaluate the gap between supply and demand for skilled workers even in the near future.

For our industry, the utility of university-trained graduates is measured by their capability of meeting the changes occurring in a field of rapidly changing and developing technologies and the application of those technologies. We would like our education supply channels to deliver the right quality and quantity of people, hopefully at the right time.

The Australian governments should make a strong effort to develop a sophisticated understanding of Australia's labour market dynamics and requirements. Just to asset our higher education sector would be a significant advance over the current elementary information systems.

Consolidated supply side data is not available – for example on the number of ICT students progressing through the tertiary, and vocational education and training systems in Australia.

Similarly, there is no capability to forecast demand for ICT workers although recent analyses of the aging population have provided indicators to show supply problems for the future ICT workforce.

The ICT industry has been attempting to develop an understanding of the prime indicators that influence/affect ICT skills demand—eg population/migration trends, investment cycles and technology trends, labour market dynamics, economic trends.

We are attempting to develop a methodology, which is repeatable, to identify the drivers of industry demand for ICT occupations. In developing this model, the industry has been strongly assisted by ICT faculties and schools, which also recognise the importance of this work to their own planning and deployment needs.

Ideally we will be able to produce high-quality models of the demand for and supply of ICT skills that enable gap analyses to be undertaken. In addition, ideally we would be able to pinpoint valid and reliable data sources to support the operation of the models such that both snapshot and time series analyses could be undertaken.

We believe that as a result of forecasting demand, governments, education providers, employers, employees, students and potential students will have consolidated and useful data and information on the supply and demand for workers for the Australian, State and regional ICT labour markets.

Over time, the capability to forecast should improve as the forecasts are evaluated against actuality of the ICT labour market using the same time frame, and forecasting is empowered through methodology and data collection improvements.

To continue this important work of modelling the future ICT labour market, the ICT industry requires the support of the Federal Government. The Victorian Government is undertaking research in developing a forecasting model for many sectors of the Victorian labour market. The Association considers that it should be a national priority.

Further development of good supply side data and information must be continued and this data be published openly to industry and the general public.

All Australian universities should be required to fully cooperate in collecting and contributing their supply-side data.

4 Responsiveness to skills needs

ICT graduates are being readily employed in ICT and ICT-related occupations. In general, some 85% of ICT graduates (seeking employment) will have employment in the first three months of graduating with nearly 100% within 12 months.

As discussed previously, the employability of graduates and post-graduates will be further improved with more information on anticipated ICT labour market demand.

However, the ICT industry is concerned that the structure of disciplines within universities is constraining the responsiveness of universities to meet Australia's ICT skills needs.

Australian higher education institutions face capacity constraints in providing the quantity, and in some instances, quality of graduates demanded by industry — constraints which are principally related to:

- the public funding system to which universities are bound;
- trends in the level of public funding; and
- shortages in the availability of IT teaching staff.

Tertiary studies in ICT are relatively new compared to other well-established disciplines, with most universities still without a dedicated ICT faculty. For some universities, ICT is found within the engineering departments, in other within business and other departments, and shared across departments in other universities.

The dispersal of ICT studies means that ICT is often the poor cousin in internal university funding arrangements, often in the situation of having its curriculum and courses provided in an incoherent fashion, and often struggling to fulfil its underlying role in other disciplines. The internal allocation of funding within universities is somewhat of a 'black box' to those outside the system, and due to the internal management structures within universities. The contention is that, as a discipline area, ICT is not receiving the internal funding allocation it requires.

Career and study opportunities for ICT teaching staff may be also inhibited by not having a recognised structured presence in our universities.

Given the role of ICT in Australia, its strong presence in every day life, and the numbers of people employed in ICT and related occupations, the Association believes that the universities need to reconsider their internal management structures and to be less restrictive on basing their administrative arrangements on former discipline lines.

The nature of ICT skills demand compounds these problems. Desired skill sets demanded by industry are dynamic and trends are unpredictable because they depend, in large part, on technological change and the workplace changes they precipitate.

The lack of an identifiable ICT presence on campuses may be causing some of the difficulties in attracting students into ICT tertiary studies.

4.1 University staffing issues

The discussion paper advises the aging profile of the academic staff in our universities and the impact that the retirement of a large body of academic staff will have on the capability of universities to provide quality learning outcomes to undergraduate and graduate students.

The departure of academics will be compounded by the lack of enrolments to universities has resulted in loss of university staff and reduced capabilities. This is further compounded by the evident reduction in the number of PhD students enrolling in ICT, and being available for teaching and tutoring roles.

The teacher shortage is attributable to several factors, not least of which are the income disparities between teachers and industry practitioners (partly related to limited practical teacher training), and the reduced quality of life of the academic as work loads and class sizes increase to unsustainable levels.

The ICT industry's need for more skilled people is exacerbating the problem through incentives (such as salary) that are attracting academic staff to industry.

Downsizing and even closures of academic ICT units is already taking place throughout the sector. This diminishing capacity to provide the necessary graduates, in quantity and quality, will become unrecoverable, or at best, remain inadequate for meeting present and future industry requirements.

Reductions in ICT departments and schools are occurring at the same time when industry demand for skilled graduates is increasing.

This is not an issue isolated to the ICT departments and schools. Governments and university management is going to have to recognise the strong need to maintain teaching units while other initiatives are taking place to encourage increased enrolments across the skill sets needed to meet Australia's near and future workforce needs.

The shortage of ICT teachers in universities and TAFEs is a barrier to increasing the supply of ICT graduates, particularly in the short term.

5 Participation in higher education

5.1 Industry demand for graduates and post-graduates

Information provided by the Australian Government Department of Education, Employment and Workplace Relations indicates that Australia is facing a widening

gap between the demand for ICT skills and the supply of qualified ICT workers with further growth in employment in ICT occupations is expected in the next five years.

Strong demand for ICT skills is evident. In the five years to June 2008, the ICT Vacancy Index (published by the Department of Education, Employment and Workplace Relations - DEEWR) rose by 237% to 251.1% (January 2002 = 100). This demand is also similar to trends in other countries.

The number of ICT vacancies has more than tripled in this period to a weekly average of around 23,200 in June 2008, and employers and recruitment companies are experiencing difficulty in recruiting across a wide range of ICT skills.

5.2 Falling enrolments

This strong demand is occurring at a time when the supply of qualified graduates is expected to be considerably lower than at present.

The falling enrolments into ICT disciplines have been present over the last five years despite programs conducted by government agencies, industry groups, companies and education providers to address the apparent lack of interest by Australian school students.

The Association acknowledges the work of the Federal and State governments in assisting the broad ICT industry to ameliorate the declining lack of interest in science, mathematics and technology.

Nevertheless the industry is generally concerned about the newly developing trend towards declining interest in young people in studying on completing school.

Strong support from Federal and State governments is essential to address the issues of declining enrolment rates particularly in science, mathematics, engineering and technology.

Industry, government and education providers do need to work together to encourage young people to consider the opportunities of further education throughout their lives. They do need to consider the factors that may be impeding young people and older workers in considering further education and training.

5.3 Women in ICT

Women are under-represented in the Australian ICT workforce. In the core or specialist ICT jobs, the proportion of females has remained at the disappointing level of 18-25% over the last ten years. Similarly, the participation by females in ICT education and training has stayed below 25% over a similar period.

Disappointingly, female participation in ICT education and employment has remained at these levels despite the actions and initiatives by governments, industry and professional bodies, education institutions, and representatives groups of women to improve the female participation rate in ICT education and employment. Similar findings are found in other disciplines such as engineering, mathematics and science in general.

The low participation rates of women in ICT is also an issue for individual women, who by ignoring the education and career opportunities offered by ICT, are not optimising their personal employment capital through their job readiness (ie education and training) and job capability (ie career development and management). For women, moving into the field of ICT will give them better wages and working conditions than from many other industries.

5.4 Disadvantaged groups

The industry is also concerned over the few people with an indigenous background found in ICT employment and in ICT businesses.

Over the years, the industry and ICT education providers have participated in campaigns to offer work placements to indigenous university and TAFE students in varying degrees of success.

However, it is difficult to increase the number of indigenous students at higher education while few indigenous students complete their schooling. The industry recognises that activities of Federal, State and Territory governments to address the major issues associated in indigenous schooling.

In terms of students and employees from migrant backgrounds, the industry does employ people from a diverse range of backgrounds as it regards a diverse workforce being important to business success. The ICT industry is one of the largest receivers of permanent and temporary skilled migrants.

Changes to the employment arrangements for overseas students completing their degrees has helped them establish their careers in Australia.

5.5 School curriculum

The industry considers that the quality of teaching and the presentation of ICT in secondary school may be deterring students in considering ICT as an option for further study. The AIIA considers that the Federal Government should commission research to assess the teaching of ICT in schools through the work on national curricula.

5.6 University infrastructure

A major challenge being faced by the ICT departments and schools is rapid obsolescence of their ICT laboratory infrastructure naturally arising from the rapidity of technology change and uses. The present levels of funding do not account for the need to provide

Students are not educated with the latest technologies and with current deployments associated with technologies used in business and in government. Equipping laboratory classes with necessary up-to-date resources is increasingly difficult as capacity is reduced.

The demand for resources required for teaching students is ever increasing in order to achieve the return on the investment made by many in our university education.

6 Connection with other education providers

The importance of both the higher education, and the vocational education and training (VET) sectors is well recognised by the ICT industry. The ICT industry draws graduates from both sectors to meet its workforce needs, and uses both sectors to maintain knowledge and skills of its workforce. A reasonable percentage of employees have ICT-related qualifications from both sectors, and so the effectiveness of the interface between higher education and vocational education and training is important to the ICT industry.

Keeping the reasonably clear and distinct roles for both sectors will support the objective in having a diverse education system that is adaptive and capable of meeting the range of demands and requirements by business and community.

But a more strategic and coordinated management of interface between both sectors is necessary to achieve more synergetic outcomes to student, educators and business. Diminution of learning outcomes, unnecessary duplication, rigidity, and bureaucracy should not result from the interface between both sectors.

Given the current ad hoc, piecemeal and inefficient arrangements for credit transfer and articulation options, the Federal and State/Territory governments should jointly examine ways to introduce national policies to establish more formal and streamlined mechanisms to assist students, employers and educators. This should precede any examination into ways to increase information on VET-to-university credit transfer arrangements and articulation options for students.

Student financial anomalies arising from the higher education-VET interface needs further research and consultation. The State Governments need to undertake a comprehensive review of the funding arrangements of, student fee contributions to, and students' private benefit from, the VET sector.

The issue surrounding the VET sector undertaking applied research beyond the current level also requires further examination by Federal and State/Territory Governments. The VET sector should maintain its focus around its specialisation of non-university competency-based training designed to meet the needs of industry, and should not establish a substantial interest in research.

From the employer point of view, the concept of VET 'degrees' is not strongly supported, as the term 'degree' is well recognised and accepted as a higher education qualification. Instead, the State Governments and the VET sector should do more to enhance the status of VET qualifications within the business and broader community, as is the case with European technical qualifications, in providing real and useful learning outcomes to the Australian workforce and community.

ICT students and employers do see the value of maximising personal development and career opportunities through combining higher education and VET study for the same reasons as do university students taking double degrees.

7 Innovation through higher education

7.1 Innovation and research

Australia's future as a knowledge-based economy will depend upon our ability to innovate and to generate new knowledge, ideas and technologies through research.

Global and national economic, social and community structures, particularly those in developed countries, are being transformed by the innovations of the world's information and communication technology (ICT) industries. These innovations now play a major role in the strong growth, productivity and competitiveness of the developed and developing nations' economies.

All industry sectors in developed nations are achieving higher growth and productivity through the enabling property of the technological innovations of the ICT industry. For Australia, the ICT industry has delivered around 6% of Australia's total GDP.

7.2 Research and innovation and higher education institutions

Our universities have been important sources of innovative scientific and technological research and development in Australia and have assisted in the country's economic and community performance. Consequently, the Australian ICT industry looks to the higher education sector having a strong research and innovation capability in the field of science, engineering and ICT.

Most universities in Australia deliver some form of ICT qualifications and therefore they show some degree of interest and endeavour in ICT and ICT-related research. But possibly ICT research is spread too thinly across our universities to develop serious research capabilities in more than a few technologies.

Australia needs to develop and maintain world capability in research and knowledge in certain areas of advantage. Australia can and should commit to foster leading ICT research capability under a variety of situations. One excellent research school rather than a number of average schools will lift in academic and research standards and benefit the student and the nation.

There will be arguments against 'directed planning' or a 'directive approach' to enhance the opportunities of some universities to achieve world ranking as it does imply a 'targeting' of attention, funding and resources. But this is happening now under Federal and State Governments' supported research programs aimed at establishing critical mass in targeted areas of research so Australia can have the research institutions and businesses capable of making an impact on the global economy and creating a global footprint in a particular technology or innovation.

To bring new products, technologies, services and solutions to what is increasingly a global market industry, the Australian ICT industry needs to develop sustainable partnerships and collaborations with local universities and other public research institutes. But currently, there is a significant disconnect between R&D being conducted by the universities and the R&D being conducted by ICT companies. If Australia is to maximise its ability to bring new products to market there needs to be a much more strategic effort to develop the interactions and inflows between the ICT industry and universities. Multinational companies will collaborate with specific research activities in universities and Cooperative Research Centres where they are mutually attractive in terms of their business objectives.

Proven performance in research and the national research priorities should be the prime determinants in the funding of higher education research. The current funding framework does not provide sufficient focus for Australian universities to develop and maintain world capability in research and knowledge in certain areas of advantage.

Australia can and should commit to support and foster a number of leading institutions, which will lift the top ranks of Australian students and academics to global research eminence. As well as modifying the current public research-funding

framework, the Federal Government will need to increase the overall level of public research funding to a level that is comparable to that of other countries.

In summary, in the Association's view, the Federal Government has an integral role to play in ensuring that its policy mix is such that Australia is viewed by investors as a competitive place to invest in R&D; ensuring there will be sufficient skilled researchers to undertake the work on the various new initiatives, and modifying the current funding framework so that proven performance in research and the national research priorities are the prime determinants of funding higher education institutions to undertake research and work towards excellence against international research benchmarks.

7.3 Research staff for innovation

One way of getting more innovation is through skilled people. Skilled people are the most important component of the ICT industry as they provide the genesis, implementation, and support for the technology. However, Australia lacks sufficient numbers of people with ICT skills. The capacity of Australian education and training systems to supply skilled people to the ICT industry and to its customers is crucial to the ongoing economic and social development of Australia. The danger is that Australia will not perform to its full potential with an ICT industry hampered by a constrained higher education system.

8 Contribution to economic, social and cultural capital

Our Association recognises that universities are vital for the future growth of the ICT industry and to realise Australia's potential as a leading supplier and user of ICT.

But in addition to developing our economy and businesses, our industry also recognise the role of universities in developing our cultural, social and personal capital.

The Association encourages the Federal Government to develop policies that encourage our universities to manage their capacities the wider compass of social capital development. We accept that universities need to play a role in providing for individual improvement, social inclusion and diversity, and opportunities for all.

Our universities do and must provide opportunities for Australians to contribute to their own personal development and experiences and to society. Our universities also help satisfy our intellectual curiosity, our interest in learning, and increase our self and collective knowledge and social well-being.

But it is acknowledged that universities have changed particularly over the last decade and now operate along enterprise lines and so have had some of their capacity to retain interests beyond the production of graduates and research restrained.

In order for universities to have this capability, issues such as funding, resourcing, student and teacher support, on-campus social environment should be examined.

9 Financing Australian higher education

Higher education today is a mix of public and private investment. How to get 'the right mix' between public and private financial contributions will always be a contentious issue.

Universities are facing funding pressures and some of which can be attributed to the existing funding arrangements (irrespective of the current quantum of Federal Government contribution to the higher education sector).

A further difficulty is that there is no indication that the mechanism for determining the level of internal funding for ICT faculties is responsive to market signals calling for an increase in ICT graduates. Universities are not required to respond to market signals in order to receive their operating and capital funding from the Commonwealth government.

The concern at hand is to increase the supply of skilled ICT workers. To the Australian ICT industry, the current funding system is inflexible and, unless changed, will continue to constrain the higher education sector from meeting the challenges arising from global ICT developments. The ICT industry needs the Australian higher education system to achieve greater excellence in teaching, scholarship and research so it can function efficiently and effectively to supply well-educated people to ICT occupations, and to enhance our ICT R&D and commercialisation capabilities in the global knowledge economy.

The issue raised over the setting of an appropriate balance between public and private investment in higher education is one for the Federal Government to take a policy decision. However, the Association suggests that the Government should not abrogate its duty to invest in higher education by substituting increased private investment. The Association considers that the Government must make substantial investment in ICT education to ensure Australia is capturing the business and social benefits of a technologically sophisticated economy.

The Association agrees with others that the current system of funding higher education is in need of review. The current system is not the vehicle to develop greater diversity in the Australian higher education sector, nor will it be sufficiently

responsive to emerging national, business, community, academic and student needs. Under the present system, the allocation of resources *within* universities is independent from government and industry needs.

The Federal Government can encourage students to study at particular universities or in specific studies through bursaries, and can encourage universities to focus on particular areas of endeavour through block or competitive grants.

10 Governance and regulation

The relationship between the Federal Government and universities needs to be reviewed given the proportional decline of Commonwealth funding and the changes in nature and shape of university system today as opposed on when the regulatory arrangements were created.

To a considerable extent, employers and employer groups are not aware of the extent, nature and issues with university governance and regulation. However, we are aware that on occasions, the variations with the state-based legislation and regulation is confusing and not seen to be of any worthy benefit. But our assumption is that the variations and complexity of Commonwealth-State jurisdiction divide must add costs on the universities' management.

The industry generally supports the concept of a national education accreditation body. It is essential to maintain the international standing of Australia's higher education system.

Equally for similar reasons, the industry supports a strong quality assurance framework for all tertiary education institutions, and that this framework should be equal to the framework standards of other developed countries.

The Association suggests that Australia should benchmark itself against other countries. In the interests of increasing diversity and specialisation as well as institutional management efficiency within our higher education sector, policy options should be developed to increase the opportunities for universities to merge and to acquire.

11 Australian Information Industry Association

The Australian Information Industry Association (AIIA) is the country's peak technology industry body, and represents 500 information and communications technology (ICT) member companies based in Australia.

AIIA's role is to lead and represent the ICT industry in Australia to maximize the potential of the Australian economy and society. ICT is the “enabler” that underpins Australian organisations and the economy.

Consequently, Australian governments and the Australian ICT industry together provide a business environment and business conditions that attracts global players and promotes local industry to ensure that Australia continues to lead the world in innovation and successful leverage of technology.

AIIA's membership encompasses all sectors of the ICT sector including hardware, software, services and telecommunications, and member companies range from individual consultants, small to medium enterprises to the world's leading multinational corporations.

These companies employ 100,000 Australians, generate combined annual revenues of more than \$40 billion (approximately 5% of GDP) and export more than \$2 billion in goods and services each year.

The Australian ICT industry is very important to the Australian economy based on a number of economic indicators:

- It contributes 6% Australia's total GDP (a greater contribution to Australia's GDP than agriculture, forestry, fishing, defence and education);
- It delivered the major share of Australia's productivity growth over the last decade (our manufacturing sector gaining 85% productivity growth through its use of ICT);
- It employs 380,000 ICT workers in a total of 514,000 people across the Australian economy in vertical industries;
- It generates over \$84 billion revenue
- It spends \$600 million on R&D annually.

12 Contact details

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