The ICT Skills Forecast Project

First Report: Quantifying Current and forecast ICT Employment

August 2008

Centre for Innovative Industry Economic Research Inc.

About the Australian Computer Society

As the professional body for ICT practitioners, the ACS plays a critical and growing role in establishing and promoting standards of excellence and maintaining members' expertise by providing access to quality education.

There are around 280,000 ICT professionals employed in Australia, with over 60% of those directly employed within the ICT industry, and the balance interacting with the industry from their roles in business, government and academia.

The continued, sustainable growth and prosperity of the ICT industry is therefore vital to the continuance of the ICT profession.

The ACS is the leading professional body in ICT in Australia. Members of the ACS are professionally qualified and accredited.

About the Centre for Innovative Industries Economic Research

CIIER is an Asia-Pacific Centre, formed to create a facility, repository and think-tank for consistent, competently researched, up-to-date and analysed data on employment, markets, revenue streams, R&D, processes and management methods, specifically focussed on high technology, innovative, and emerging industries. CIIER produces the *'Top 250' ICT Industry Research Report*, widely recognised as the leading creditable indicator of trends in the Australian ICT industry, and conducts detailed analysis and reporting on Information Technology, and Reports on other high technology industries.

Whitehorse Strategic Group Ltd provided the analysis for this publication. Whitehorse is an Australian owned management consulting practice specialising in ICT Market Research and analysis, ICT policy and strategy, especially in the Government sector, Business Process Management and Economic Development.

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Project Background

The ICT Skills Demand Forecasting Project was established two years ago to draw upon established expertise and access to national and international data on ICT skills.

Its tasks include:

- The collection and analysis of a wide range of data on historical and forecast trends relating to: GDP and GSP; economy wide markets and industries, employment and occupations; training commencements, completions and graduations; inward and outward skilled migration trends; labour productivity trends; gender and age demographics at the national and state levels, as well as developing an understanding of the potential implications of globalisation and trade in such areas as offshoring ICT and ICT-enabled business services;
- The development and formalisation of a model capable of embracing and reflecting the many trends in the above data, reconciling the numerous unconnected nomenclatures and data structures, converting both current and historical data into comparable formats ; and
- The building, formalisation, testing, validation and further development and refinement of the model.

This project is supported by the ACS and AIIA, and by Universities and other stakeholders. Initial funding has been provided by the ACS, private companies and individuals. Federal Government assistance for this important research has also been requested.

This report is the first outcome of the project; the second report will focus on analysing the now quantified demand for the next few years by the particular skills required, and in identifying regional and industry sectoral variations.

Contents

Executive Summary

There are around 280,000 ICT professionals employed in Australia, with over 60% of those directly employed within the ICT industry, and the balance interacting with the ICT industry from their roles in business, government and academia.

The continued, sustainable growth and prosperity of the ICT industry is therefore vital to the continuance of the ICT profession.

The ICT Skills Demand Forecasting Project was established two years ago, with the support of the ACS, and now AIIA, to draw upon established expertise and access to national and international data on ICT skills, and to quantify and qualify ICT Skills employment supply and demand.

Acknowledged ICT skills shortage

It is universally acknowledged by the ICT community that Australia does not have sufficient skilled ICT practitioners to satisfy its needs today. This report quantifies that shortfall and projects the supply/demand equation to the year 2020.

Accurately quantifying ICT technical and professional employment has, historically, been difficult. It can, however, be argued that the most economically justifiable and socially responsible approach to satisfy future ICT skills demand is through domestic supply, both of ICT graduates, and of other domestic entrants to the ICT technical and professional workforce.

Who are we?

ICT professionals work in all industry sectors, however a large proportion of ICT professionals work for the providers of ICT goods and services (the ICT industry). ICT industry employment also includes not only those professionals but also many ICT non-professional technical, sales, logistical and administrative staff.

Over half of all employees in ICT companies in Australia are technically or professionally qualified, while over 70% of ICT technical and professional staff work in the ICT industry.

ICT economic contribution

ICT is also very important to Australia's economy. A number of studies has indicated that ICT is one of the biggest contributors to Productivity gains across all sectors, as well as being a major contributor in its own right.

According to ABS data from 2006, ICT is economically more significant to the Australian economy than:

– Mining
– Education
– Defence
– Agriculture
– And all individual Manufacturing sectors

Underlying ICT employment growth

ICT technical and professional employment has grown steadily over a long period, displaying a consistent underlying growth trend. While fluctuations have occurred, they have mainly been related to normal economic cycles and usually resolved back to a reasonably consistent trendline within a three year window. The two trendlines are broadly consistent and both are easily projected.

State by State variation

ICT Industry Employment by State varies from 1.25% of the FTE workforce in the NT to 3.3% in the ACT, while ICT technical and professional employment in all industry sectors varies from 4% in Tasmania to 14% in the ACT, with the Australian average at 5.5% of FTE.

Analysing ICT employment

Analysing the ICT labour market requires access to a significant number of baseline statistics and indicative demand and supply drivers.

Factors can include:

- *General economic trends*, especially the pace of innovation;
- *Employment supply constraints*, such as education outputs and migration targets and caps;
- *The Brain-Drain* of skilled and competent workers to external destinations;
- *Increases in the installed base* of ICT systems and applications, both by expanded usage and through general economic and structural growth;
- *Changes in spending on ICT* by ICT user industries;
- *Changes in technology* directly through their impact on labour requirements and skill needs and indirectly through the impact of new technologies on broader demand conditions for ICT products and services;
- *Changes in investment* in the ICT producer industries, especially in ICT-related R&D;
- *Changes in employment structure* in the ICT producer industries; and
- *Changes in net exports* of ICT products and services and in our relative cost position as a supplier of ICT products and services.

As well as considering a conservative economic forecast, the report analyses the trend in permanent skilled migration and the relative proportion that ICT skilled migration represents of the total Skilled migration target set by Government, and the trend of ICT 457 (temporary) visas issued each year.

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The report also analyses commencement and completion data for Australian resident ICT tertiary courses, and retirement projections based upon an age categorisation of the current ICT work-force.

ICT Employment projections

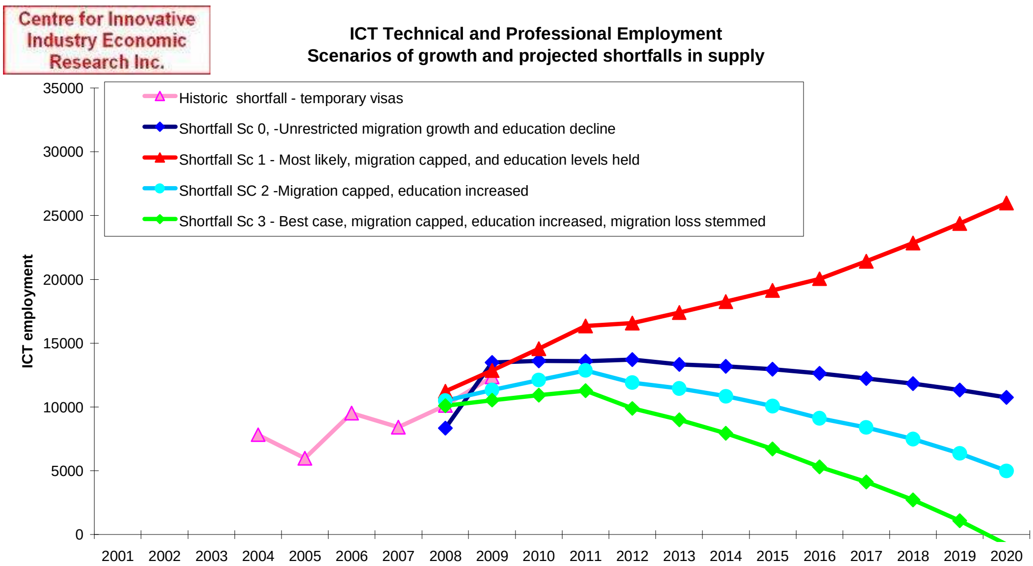
A series of Scenarios is canvassed in the report starting with Scenario 0 – "Current trends unchecked by economic reality", and including:

Scenario 1 – Holding inwards - migration to current budget settings
Scenario 2 – Holding the line – and lifting education
Scenario 3 – Best case - holding the line, lifting education, slowing the brain drain

The relatively conservative scenarios outlined in the report indicate:
Continued ICT skills shortages will continue at current or worse levels until at least 2012, regardless of optimistic presumptions in respect to forecast levels of graduates and migration settings.

The current shortfall is being addressed through the use of temporary Visa migrants, but even the current historically high numbers of these Visas will not be sufficient for future ICT demand, even on the most optimistic scenario, until 2012.

After 2012, assuming that some of the scenario assumptions become reality, the more optimistic scenarios suggest a gradual reduction in the need for temporary skills support.



Scenario 1, which is the most likely outcome on current settings, shows continued and rapidly growing ICT skills shortages, which would inevitably translate into reduced economic performance for all Australian industry sectors.

The "most-likely" outcome indicates the shortage growing by 29% by the year 2010 to over 14,500 FTE, worsening to 19,000 by 2015, and then to over 25,000 by the year 2020 unless current policy settings and paradigms change.

Even the "best-case" scenario delivers little substantial improvement until after 2010.

This analysis leads to the conclusion that a "policy free-zone" on future ICT employment is not an economic option. The current "most-likely" outcome resulting from previous policy settings is unacceptable, both economically and politically. While it is unlikely that the “best-case” scenario can be achieved, any advance towards it would be positive. Action is required to minimise the long-term damage to Australia’s economy

The Next Step

This report quantifies current and future ICT employment. It does not answer the question: What **kind** of ICT jobs will be in demand in 5-10-15 years time?

Quantifying the overall ICT skills requirement was the first phase in analysing ICT skills needs. We now have to shape both the current ICT employment structure and the future needs of ICT employers based on quality and up-to-date data.

With the support of both the ACS and AIIA, CIIER researchers are conducting an ICT skills needs survey, well supported by ICT employers from every industry sector. This new data, collected in July-August 2008 , allows us to populate the forward ICT employment demand paradigms, reflecting **actual** skills needs, based upon major ICT employers responses. This data will be integral to the next report – “The Shape of Future ICT Employment”.

The purpose of this report

It is universally acknowledged by the ICT community that Australia does not have sufficient skilled ICT practitioners to satisfy its needs.

This is evidenced by the continued requirement to supplement domestic entrance to ICT technical and professional ranks with both permanent and temporary migration, currently at historically high levels.

However, temporary migration may not necessarily be able to be sustained at a level that can satisfy future requirements, and, in any case, is not intended to be other than a mechanism for alleviating temporary skill demand, and for providing for occasional specialist capability that may not be immediately available.

More accurate quantification of the current demand and supply for ICT, technical and professional employment, and a more systematic calculation of likely future demand and supply allows the various stakeholders - employers, educators, government's, professional bodies, and ICT technical and professional staff, to make more logical and longer term recruitment, employment, and training decisions, of both a strategic and tactical nature.

Accurately quantifying ICT technical and professional employment has, historically, been difficult. Multiple different and contradictory nomenclatures and intermittent and delayed official data have made the process less than transparent.

As an example, ICT software consultants, especially those concerned with Web design, have been, and continue to be, simultaneously included in various state and federal government reports within definitions of the ICT industry, the graphic design industry, the cultural and creative industries, financial and management consulting. Even worse, the double counting of, in some cases, over 100,000 people, is sometimes then re-aggregated into even more misleading outcomes.
Conversely, the excellent export performance of the software and services sector is often minimised or overlooked in many official trade figures, (as they are primarily concerned with goods, rather than services), causing the export potential of this important sector to be overlooked.

The purpose of this report is to attempt to reconcile the multiple employment datasets, to derive from these the current equation for ICT technical and professional employment, to identify the Major trends in factors impacting upon ICT employment, and from these to project future year outcomes, based upon either continuance or identified variations of such trends.

For example, inwards permanent migration of ICT practitioners could follow existing growth trends, or could, more likely, be constrained by government policy that places a cap on migrant numbers. However, should this cap mean that not enough permanent migrants are arriving to satisfy ICT employment demand, then there will inevitably be more pressure from industry to increase temporary migration.

It can be argued that the most economically justifiable and socially responsible approach to satisfy future ICT skills demand is through domestic supply, both of ICT graduates, and of other domestic entrants to the ICT technical and professional workforce.
This report does not, however, recommend particular policies, it simply measures the likely demand, and projects the various sources of supply, based upon current and likely paradigms.

Creating a different outcome to those projected would, we believe, require policy and program changes of a substantive nature.

Who are we?

One of the significant difficulties in understanding ICT in Australia is the frequent confusion between analysis of the ICT work-force in labour market terms (e.g. what job the individual performs), and analysing the ICT work-force in Industry terms (e.g. what kind of organisation the individual works for).

ICT broad employment occurs in a number of groupings. These include:

- the providers of ICT goods and services (usually called the ICT industry).
- the purchasers and users of ICT goods and services including the government and private sectors who also employ a large number of specialists to help them apply their ICT purchases.
- the trainers, teachers and researchers into ICT who generally (but not always) operate within the universities and colleges.
- people who provide technical support to ICT, but who might, more properly, be categorised as electrical or electronics specialists
- people working in call-centres, or in desk-top publishing and graphics design

ICT professionals work in all industry sectors, however a large proportion of ICT professionals work for the providers of ICT goods and services (the ICT industry). ICT industry employment also includes not only those professionals but also many ICT non-professional technical, sales, logistical and administrative staff.

ACS represents those professionals, and especially those who have been accredited for their knowledge, competence, and professional status.

The term "ICT Industry" is also often used in the press, or by other commentators, for a confusing range of different things, ranging from a synonym for ICT professionals, to a "tight" definition of companies solely concerned with the provision of ICT products and services, but that includes companies with major units supplying ICT good and services, through a "looser" definition that may include retail ICT, that may include call centres that are mainly parts of other industries (e.g. banking), that may include significant sections of the electronics industries, and of other professional services (e.g. management consultants and, historically, accountants), to a "broad" definition that can include anyone working on ICT related matters in any industry.

ICT professional employment is also often commented on in a confusing way, sometimes including telecommunications, sometimes not.

These misunderstandings can often lead to politicians, governments and other commentators understating the relative "size" and significance of the ICT industry and of ICT professional employment.

Whilst these overlaps and distinctions have been known for some time, to date there has been little attempt to reconcile, and, more importantly, to quantify, the various components within a single employment model.

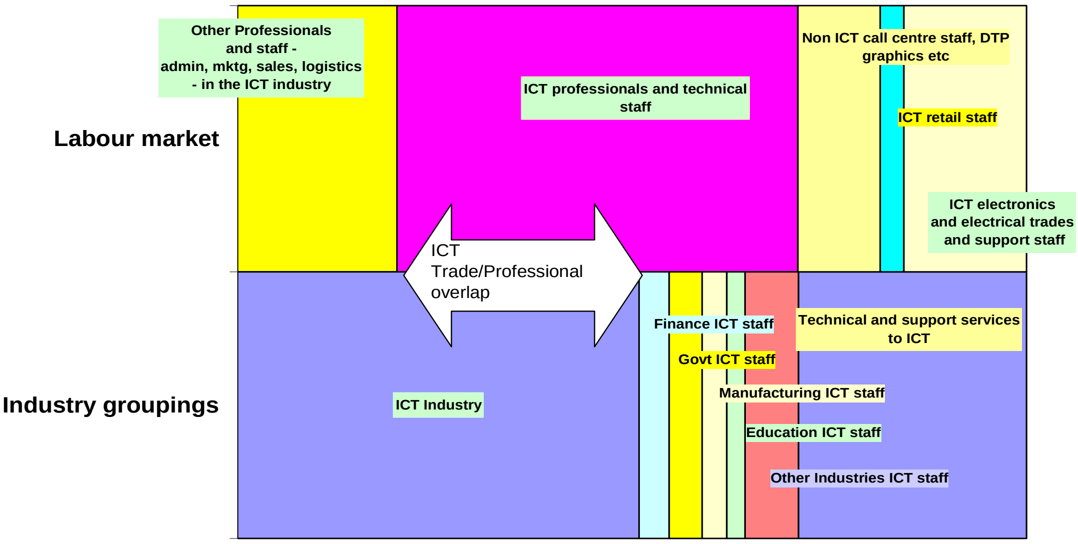
When this analysis is done, it demonstrates the significant overlap between ICT industry employment, and ICT professionals and technical staff employed across all industries, thus underscoring the common interests of ICT trade and professional bodies in Australian ICT industry development.

The size of ICT employment

Total ICT workers in Australia	**514,000 (Jan 2008)**	**Slowing but steady growth**
ICT Technical and Professional staff (including communications professionals)	**282,000 (Feb 2007)**	**2.45 % compound net growth per annum since 2000, (43,700 net growth in the last seven years)**
ICT Technical and Professional staff (excluding communications professionals)	**211,800 (May 2007)**	**5.4 % compound net growth per year, 79,000 net growth in the last ten years**

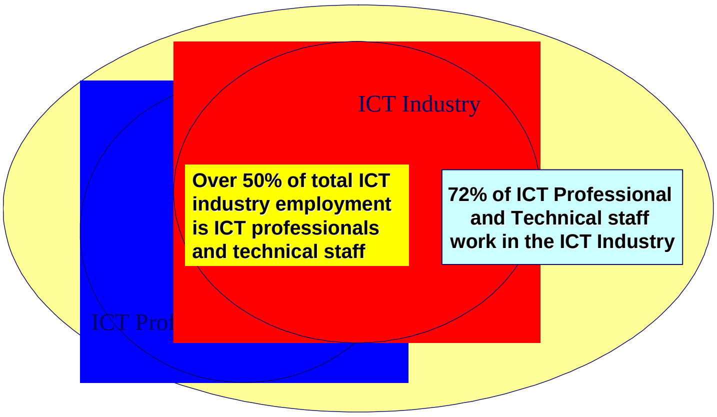
ICT Workers in Australia,- by Industry and by Labour market ,

Source ABS Labour force Feb 2006, ABS ICT Satellite account, Mar 2006, CIIER/Whitehorse T250 Dec 2005, DEWR Employment by State Dec 2005, Some data unpublished. CIIER modelling based on ABS paradigms. Copyright CIIER Inc 2006



The ICT Trade and Professional relationship

Over half of all employees in ICT companies in Australia are technically or professionally qualified, whilst over 70% of ICT technical and professional staff work in the ICT industry.



ACS, as the key ICT professional body, therefore has a direct interest in the strength and continued growth of the Australian ICT industry, and in the development of effective ICT infrastructure in Australia. Our National Council and Branch Executive, together with State and National staff, represent the interests of ICT professionals in our discussions with Government and other stakeholders, and in the development and promulgation of ACS ICT policy.
ICT is very important to our economy

The impact upon official understandings of ICT significance is also worth noting. The Australian Bureau of Statistics ICT satellite account published in 2003[1] (the only time this has been attempted) uses a very "tight" definition, both of ICT employment, in which it only includes 3 job groupings rather than the more usual 10-13, and in its definition of ICT production, where it seems to leave out software products produced by the Australian ICT industry.

The ABS ICT Satellite account concluded that ICT employment (as defined at around **235,000** persons in 2002-3) was then around **2.5%** of the total Australian employed.

However, using the broader definitions above, "ICT workers" amounted to over 514,000 persons in December 2007, or closer to 5.5% of total employed, a 120% larger contribution!

Broadening the definition for this satellite account, would therefore also increase the perceived contribution of ICT to the national economy, but even on these diminished figures we are already pretty significant compared to other industries.

Total ICT employment accounts for nearly 5.5% of total Full Time Equivalent (FTE) employment in Australia, and 4.9% of Gross Value Add to the Australian economy. This is more than many other Australian industry sectors, including Mining; Education; Electricity, Gas and Water supply; Banking and Finance; and TV, Radio, Media.

[1] ABS 5259.0 2002-3

ICT grows the entire Australian economy

A number of studies have indicated that ICT is one of the biggest contributor to Productivity gains across all sectors, as well as being a major contributor in its own right.

According to ABS data from 2006, ICT is economically more significant to the Australian economy than:

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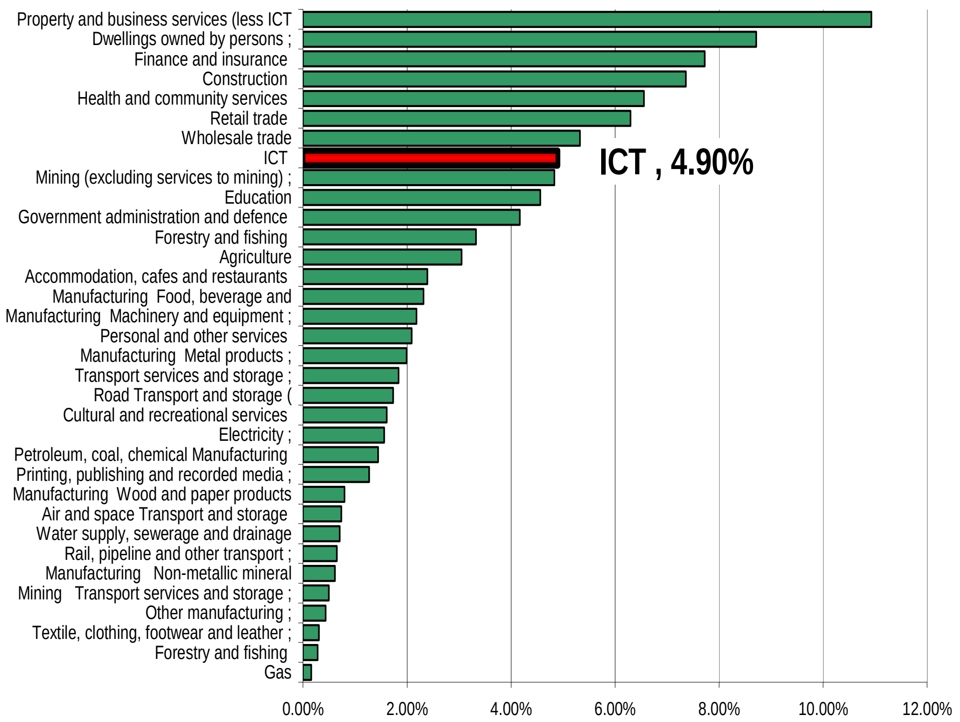
Industry sector contributions to the Australian Economy 2006 (Gross Value Add),

Source : ABS 52060, ABS 5259.0, CIIER)



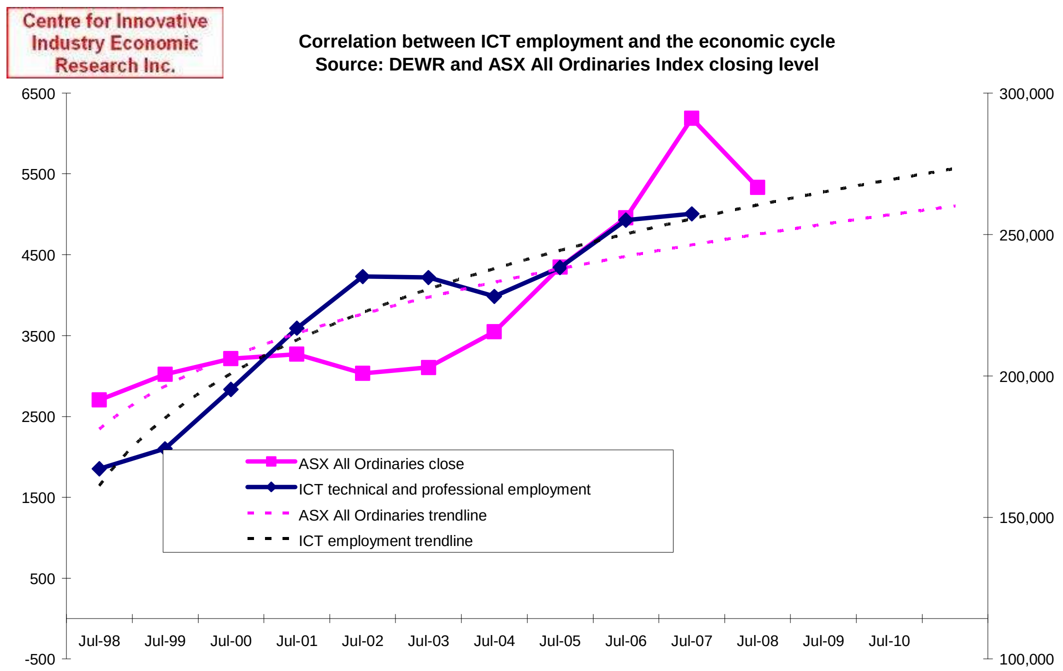
Where are we going?
Underlying growth trend

The data below is taken from the Australian Bureau of Statistics Labour Force Survey Feb 2000-2005, and similar ABS data for 1998-1999, and for 2006 and 2007.

The 5 Occupations included in this data are taken from the (old) ANZSCO nomenclature, and are those normally included in ICT:

- Information Technology Managers
- Computing Professionals
- Electronic Engineering Associate Professionals
- Computing Support Technicians
- Communications Tradespersons

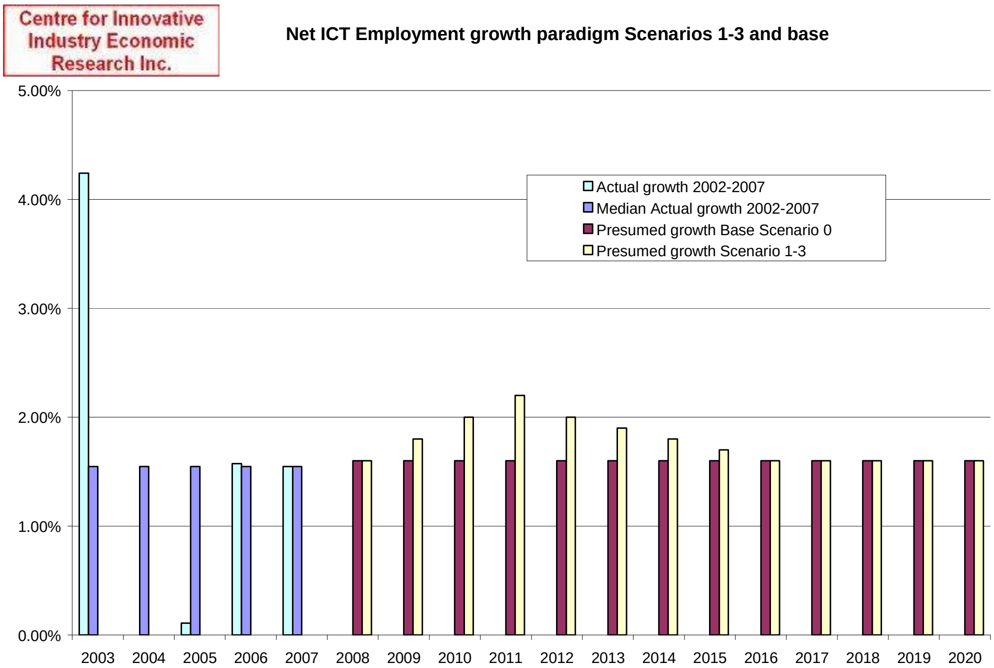
This data is then compared to the ASX All Ordinaries index level for 30 June of each year concerned, taking this Index as broadly indicating stages of Australia's economic cycle.



As can easily be seen, ICT technical and professional employment has grown consistently over a long period. Whilst fluctuations have occurred, they have been, in the main, related to normal economic cycles, and usually resolved back to a reasonably consistent trendline within a three year window. The two trendlines are broadly consistent and both easily projected.

We have therefore factored into the forecast models allowances for the current budget period, and factored a steady three-four year recovery, back towards the long-term trend rate of 2.45% compound employment growth, followed by a slower growth period, consistent with the economic cycle.

Beyond 2015, we have utilised the more conservative recent trend growth in underlying demand of 1.6% per annum for forecasts for the purpose of this study, (rather than the longer term trend of 2.45% compound growth per annum since 1998).



The models can easily be adjusted to reflect scenarios different from those we have proposed, however, since these are somewhat conservative, and despite this, show significant ICT skills shortages, any more optimistic growth forecasts simply worsen the problem.

It should be noted, however, that ICT employment growth, in common with the economy, is NOT uniform in Australia, and so, whilst national ICT employment growth may be constrained, individual States and individual industry sectors may easily be counter-cyclical, and showing stronger demand than that modeled here.

Just as there are a number of separate economic cycles (e.g. “resource states” versus non-resource states) there are also significant variations in the quantum of ICT employment based on geographic grounds, the type of ICT employment, and in the industry sectors in which the employment takes place. (For example, Government ICT employment is more significant in NT, finance sector in Victoria and NSW, Mining sector in WA).

ICT Employment by State can be measured both by ICT Industry employment and by ICT technical and professional employment across all industries.

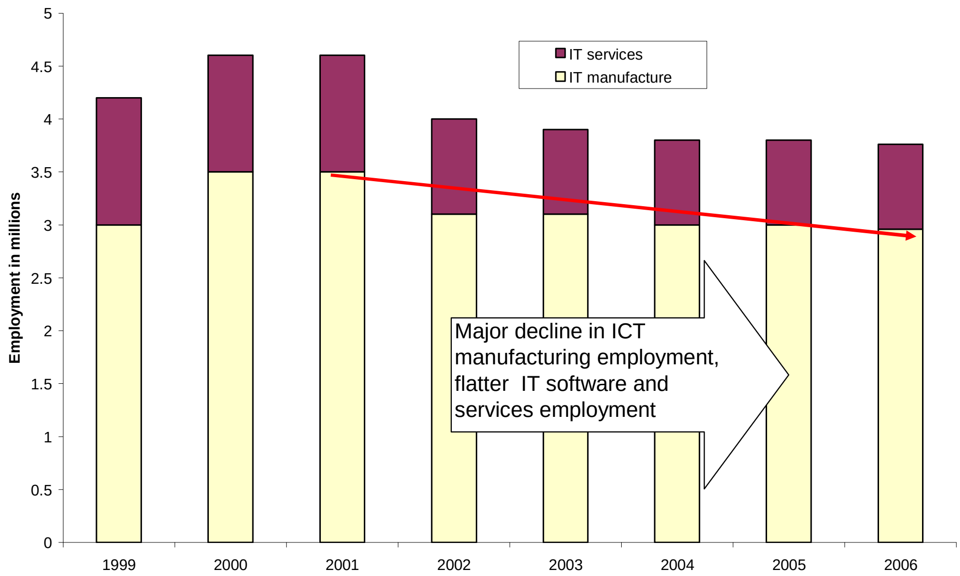
ICT Industry Employment by State varies from 1.25% of the FTE workforce in NT, to 3.3% in the ACT, whilst ICT technical and professional employment in all industry sectors varies from 4% in Tasmania to 14% in the ACT, with the Australian average at 5.5% of FTE.

The “dot-bomb” myth

Surveys have shown that one of the reasons for the reduction in the number of students selecting ICT for their future profession is the perception of a “boom or bust” ICT industry. This is based, in the main, on the significant publicity given to the so-called “dot-bomb” financial crash following the equally publicised “dot-com” period of financial indulgence.

But this perception is based upon a myth. Just as the dot.com listing frenzy was mainly a US phenomenon, so was its inevitable crash. There was a marginal drop in ICT employment in Australia, following the plunge in the NASDAQ, which was quickly recovered and passed.
But the fear created by the perception of an ICT industry bust in Australia became used to justify reductions in IT Education spending that then lead to reduced capacity.

US IT Employment trend (Source US Bureau of Labor Statistics)



The chart above shows, US ICT employment from the period 1999 to 2006. The most interesting point is that following the reduction in software and services employment from 2001 to 2002, the sector has been flat. The primary decline in US ICT employment post 2001 is, in fact, in ICT manufacture, computers and telecommunications equipment, rather than in software and services, where the.com companies operate. Australian ICT industry employment, on the other hand, whilst impacted by the American crash, swiftly recovered and has continued to grow ever since .

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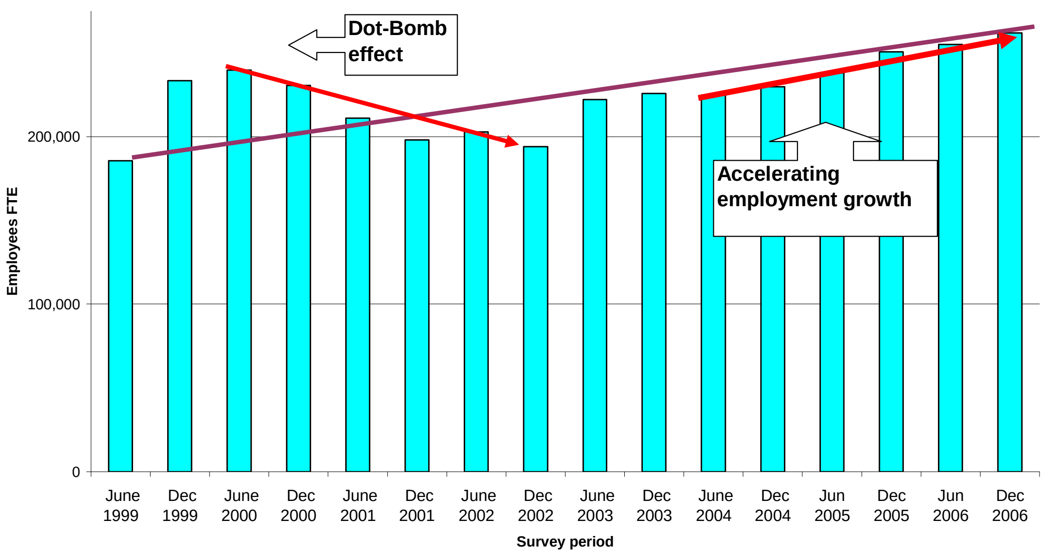
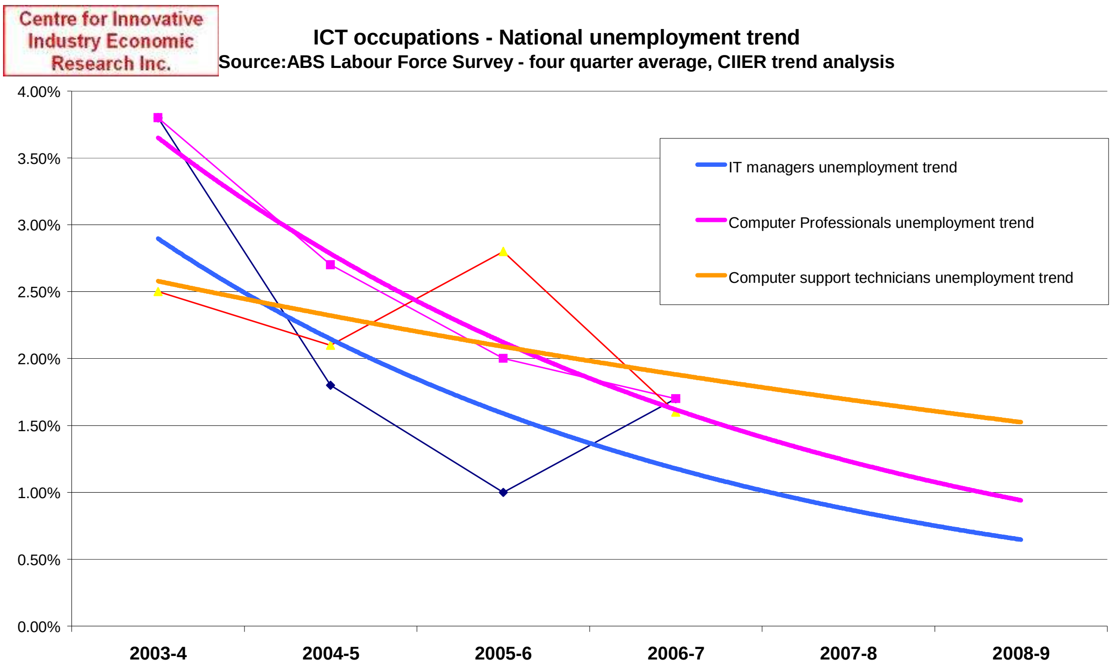
Australian ICT industry employment



Supply Constraint



Another of the major items of evidence of ICT skills demand comes from official federal government data on ICT unemployment from 2003 to 2007.

The unemployment trend for the three major old ANZSCO ICT employment groupings has gone steadily down. The projection of these trends to 2009 shows continued decline, i.e. further supply constraint, with unemployment levels below 2%. It should be noted that a 3-4% unemployment level can often indicate supply issues, since there is always a percentage of under qualified new entrants, or those in transition, so levels below 2% indicate severe supply constraint.

ICT Intensity by industry sector

Some Federal Government research last year, (within the context of the joint ACS/AIIA Industry Leaders Group working Group on ICT workforce and Labour market intelligence), developed a measure of "ICT intensity", based upon sectoral analysis of ICT employment, R&D, and investment. The measure gives some guidance as to the relative significance of ICT to those sectors.

The following caveats were indicated by DEWR

a) Annual averages for each of the indicators were estimated for each sector using the following data: annual ICT investment for 1996/97 to 2004/05; annualised ICT employment for 1997/98 to 2005/06; and ICT R&D for 1995/96 to 2004/05. Sectoral averages across these years were expressed as a percentage of total investment, employment and expenditure respectively.

b) ICT Industry is calculated by extracting group-level ICT data from the manufacturing, wholesale trade, retail trade, communication services and property / business services divisions. ICT investment data is not available at the group level and as a result ICT investment within the ICT industry could not be calculated directly.

c) ICT R&D data was not available for government administration and defence as it is documented separately as part of the ABS's public R&D data series. The public R&D series includes government expenditure on higher education and competitive research. Government ICT R&D expenditure on its business functions (such as Centrelink payments and electronic tax lodgement) is not separately available.

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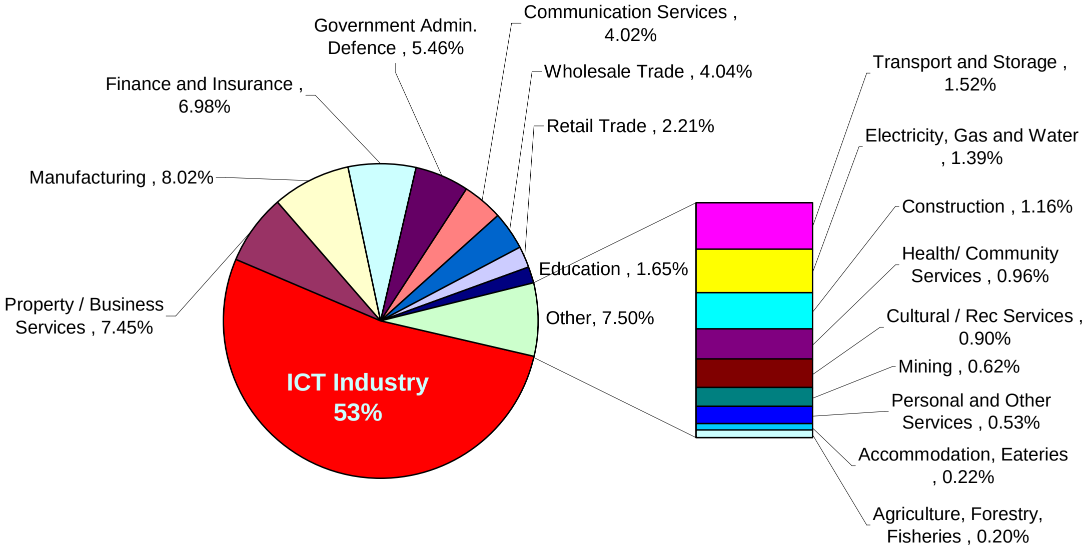
"ICT Intensity" Measure of ICT employment, investment and R&D by industry sector.
Source: DEWR April 2007, adjusted by CIIER to compensate for ICT Industry sector excision



The chart above presents those measures, adjusted by CIIER by removing the "ICT Industry" data from its embedment within the traditional industry sectors previously applied (e.g. property and business services, communications, manufacturing).

The data needs, however, to be treated with caution, since the level of ICT outsourcing varies considerably between sectors, (hence the relatively lower levels indicated for finance and for mining), and the measure will only indicate activity within the industry sector, not activity by that proportion of the ICT industry that treats that sector as a market.

The ILG study concluded that the data shows

1. *ICT employment is highly concentrated in the ICT industry (accounting for 50% + 2% of total ICT employment over the last 8 years).*
2. *ICT investment is more evenly distributed across the economy than ICT employment and ICT R&D.*
3. *ICT investment is highest in the property and business services division (accounting for 16% + 1% of total ICT investment for the period) several years).*

CIIER analysts note, in relation to these findings,

1. since at least 56% of the “Property and business services” sector is acknowledged as being, in fact, the software and services part of the ICT industry, this would logically be a major component of total ICT investment, and
2. the “ICT Industry” definition used above appears to exclude 75% of the “Communications Services” sector.

suggesting that the ICT Industry may be even more significant in overall ICT employment and investment intensity than previously recognised.

Analysis of the ICT Labour Market

The Drivers

Current Snapshot of the ICT Labour Market
- types of skills in demand
- overall employment levels
- internal labour markets
- demographics
- training and education
- role of immigration
- role of emigration
- regional distribution
- industry distribution
- under-employment
- skill shortages
- employment status
- outsourcing
- import/export of ICT work

Demand Drivers
- investment spending
- increase in installed base
- technology
- export demand and offshoring
- government programs

Supply Drivers
- university & TAFE enrolment and graduation trends
- immigration trends
- emigration trends
- trends in exits from ICT labour force
- diversity trends

Outlook
- expected changes in skill requirements
- expected need for new entrants into ICT labour force
- likely areas of skill shortage and skill surplus
- risks to outlook

Implications for
ICT professionals
education planners
policy makers
industry associations
HR planners
CIOs
CEOs

Analysing the ICT labour market requires access to a significant number of baseline statistics, and indicative demand and supply drivers.

Factors can include:

- *General economic trends*, especially the pace of innovation
- *Employment supply constraints*, such as education outputs and migration targets and caps
- *The Brain-Drain* of skilled and competent workers to external destinations
- *Increases in the installed base* of ICT systems and applications, both by expanded usage and through general economic and structural growth.
- *Changes in spending on ICT* by ICT user industries
- *Changes in technology* directly through their impact on labour requirements and skill needs and indirectly through the impact of new technologies on broader demand conditions for ICT products and services;
- *Changes in investment* in the ICT producer industries, especially in ICT-related R&D,
- *Changes in employment structure* in the ICT producer industries
- *Changes in net exports* of ICT products and services and in our relative cost position as a supplier of ICT products and services.

Not all of this data is readily available.

For the purpose of this report we have given greater priority to data that is:
- sourced from government, or direct from ICT industry sources
- statistically verifiable,
- as up-to-date as possible,
- as detailed as possible,

And in the case of trends:
- sourced from independent and reputable analysis,
- consistent with historical data,
- and broadly correlating to international trends.

Main Data Sources

- **Federal and State Government**
  - Australian Bureau of Statistics Labour Force series and ICT Industry survey (1996,1999, 2001, 2003, 2005)
  - Census data 2006
  - DEWR ICT technical and professional employment (quarterly to March 2007)
  - Department of Immigration and Citizenship data 1997-2006 and projections
  - Australian Budget 2008
  - State Government of Victoria, (MMV), ICT Skills snapshot
- **Joint ICT Industry, Profession, and Government, Working Group**
  - ILG ICT Labour Market Overview,
  - ILG ICT Labour Market Indicators, and
  - ILG Drivers of ICT Skills Demand, April – August 2007,
- **Australian ICT industry and profession**
  - ACS National Employment Survey (annual for 4 years), and other sectoral surveys and reports
  - IBSA analysis of ICT employment
  - IBSA Cultural and Creative Industries report , Jan 2008
  - Olivier ICT employment index (quarterly)
  - ITCRA (IT Computer Recruiters Association) vacancies and placements
  - CIIER (Whitehorse T250) ICT industry surveys (1998-2007)
  - CIIER ICT industry job demand analysis (2003-2007)
  - CIIER Software Industry Review (DCITA 2005-6)
- **International**
  - US Bureau of Labour Statistics
  - E-Skills UK
  - Canadian government and CATA (Canadian industry body)

Planning for the future

Analysing the factors

The equation

Underlying growth in net demand for ICT workers

MINUS Inwards migration, career entries, local graduates, overseas graduates,
PLUS Retirements, career exits, emigration, overseas graduates returning home,

EQUALS Australian ICT Skills shortage

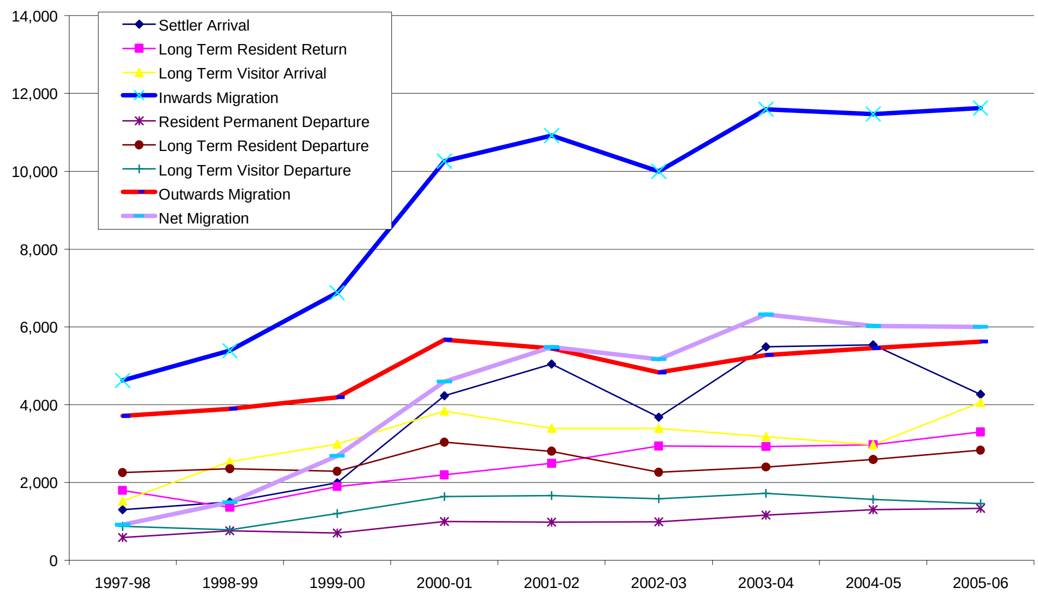
MITIGATED BY DEDUCTING
temporary visas commencing and continuing
LESS temporary visas ending,

EQUALS remaining ICT Skills shortage impacting on economic growth

Inwards and outwards permanent and temporary migration

The charts following are derived from federal government reports and published material. The first chart shows the trends in ICT migration over the last eight years, inwards and outwards, temporary and permanent. The second chart shows the trend in permanent skilled migration and the relative proportion that ICT skilled migration represents of the total Skilled migration target set by Government.

ICT Long term Migration data 1997-2006



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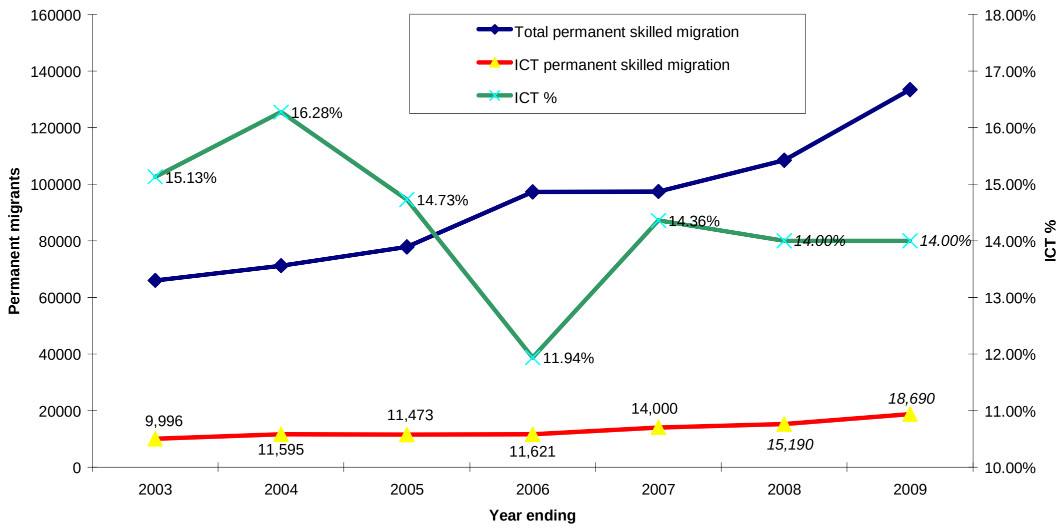
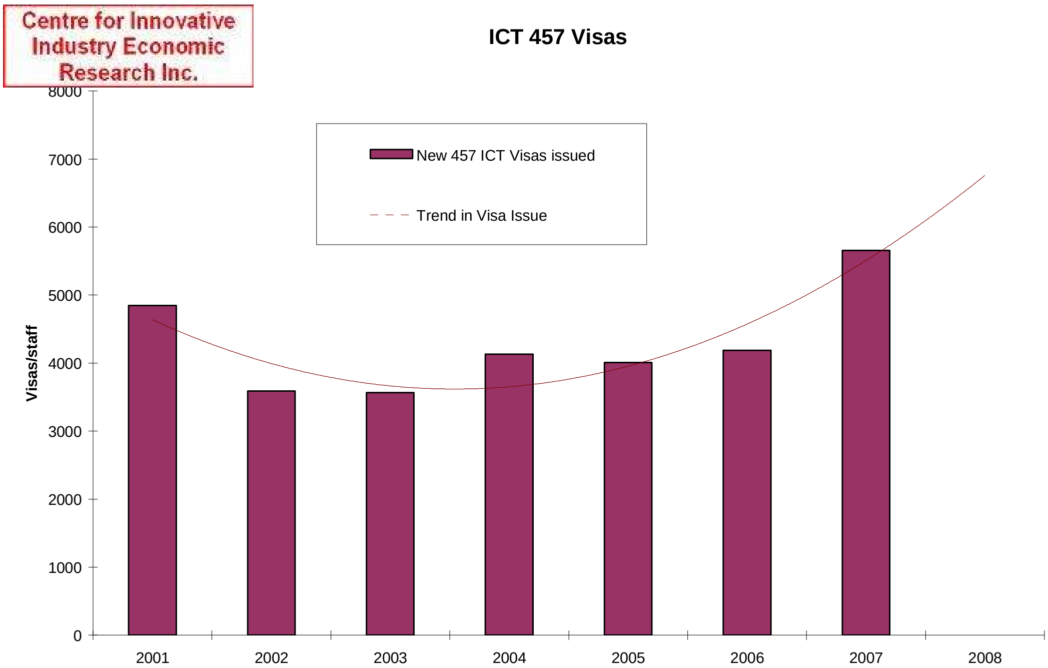
Trends in ICT permanent migration via "Skills" programme
Dept of Immigration and Citizenship data for 2003-6 and programmes for 2007-9, trend analysis by CIIER



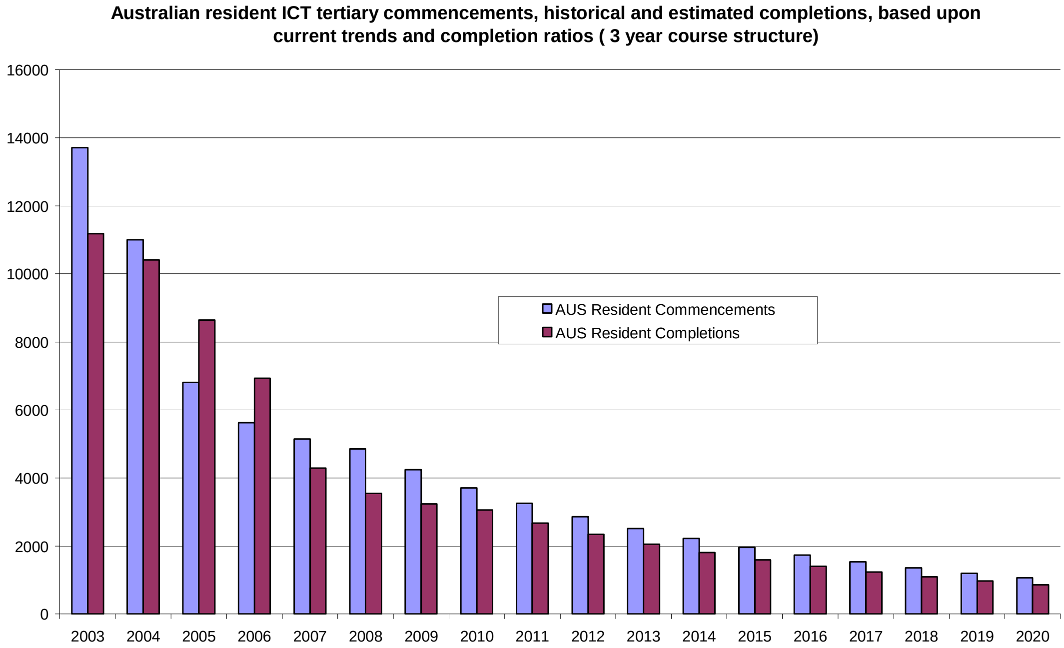
This chart shows the trend in “new” ICT 457 (temporary) visas issued each year from 2001 to 2007. As these visas can extend to three years, the total number of 457 visa holders in the work-force in a particular year is, of course, higher than the “new” issues.



For the baseline scenario following, each of the separate migration trends has been projected to 2020, and “mean” migration results derived. In later scenarios, this data has been adjusted to reflect the migration ceilings announced in this years Federal budget. ICT percentages of future “skilled” migration have been assumed to continue at 14% of total skilled migration.

Education and retirement data

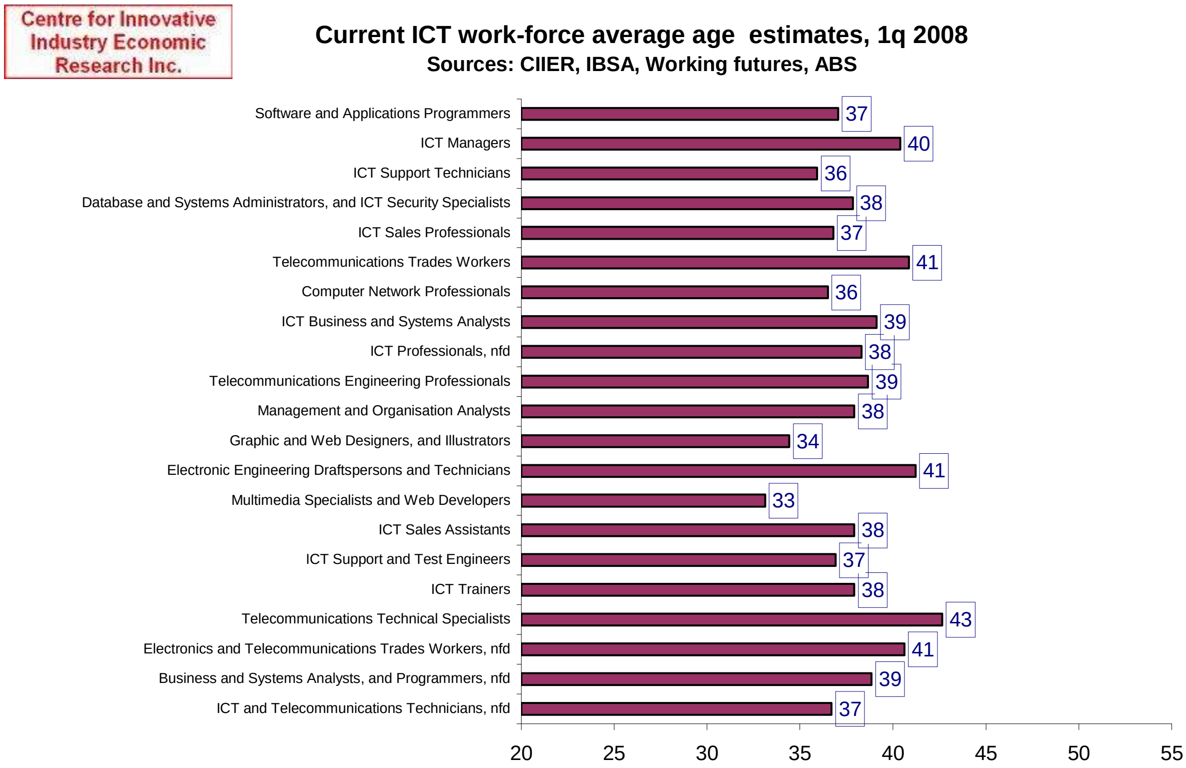
The data below shows commencement and completion data for Australian resident ICT tertiary courses. Baseline scenario completions for future years are based upon historic completion ratios, applied to current commencement (for the next three years), and then on projected commencements, based upon current trends continuing unabated.



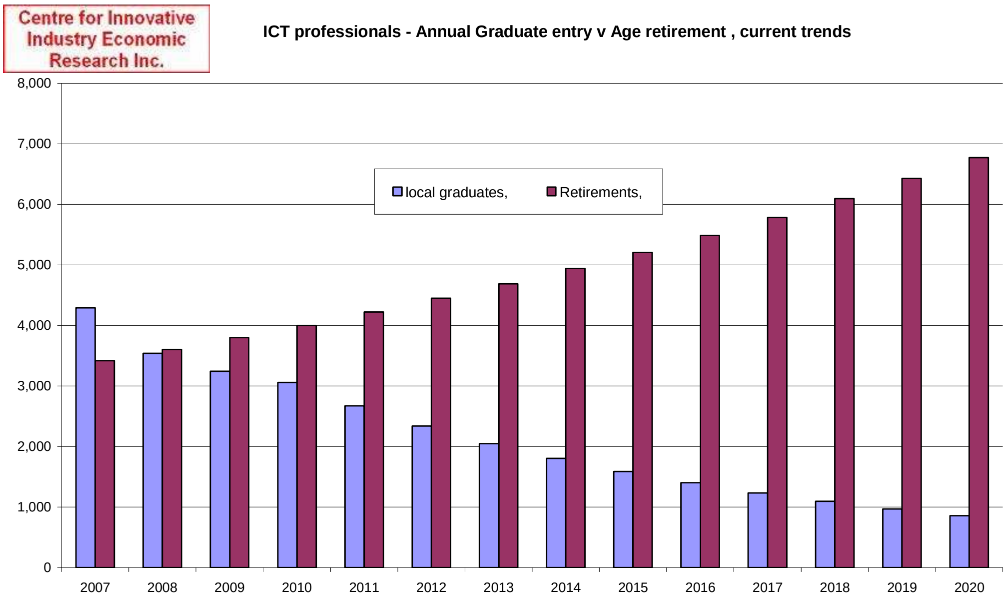
Later scenarios have presumed that a gradual diminution to zero ICT graduates is neither likely nor politically tenable. Scenarios have therefore reflected firstly a halt in the decline (Scenario 1), holding future graduates at 2007 levels, and secondly (Scenarios 2 and 3) a gradual increase in graduates, based upon commencements improving from 2008 by 12.5% per annum compound, (thus re-achieving 2001 completion levels by 2013.)

Age categorisation of current ICT work-force

The data below is derived from analysis conducted for Innovation and Business Skills Australia (IBSA), based upon ABS census data. Allocations to specific ICT skills-sets, consistent with ABS ANZSCO definitions, are based upon analysis by Working Futures and CIIER for IBSA.



Average age estimates and the demographic allocation to five year age bandwidths, allow for the forward estimate of retirements/morbidity, based upon historical and continuing trends. Potential changes in retirement ages, and variations in the part-time work-force flowing from recent changes to "transition to retirement", have not been factored in to future scenarios.

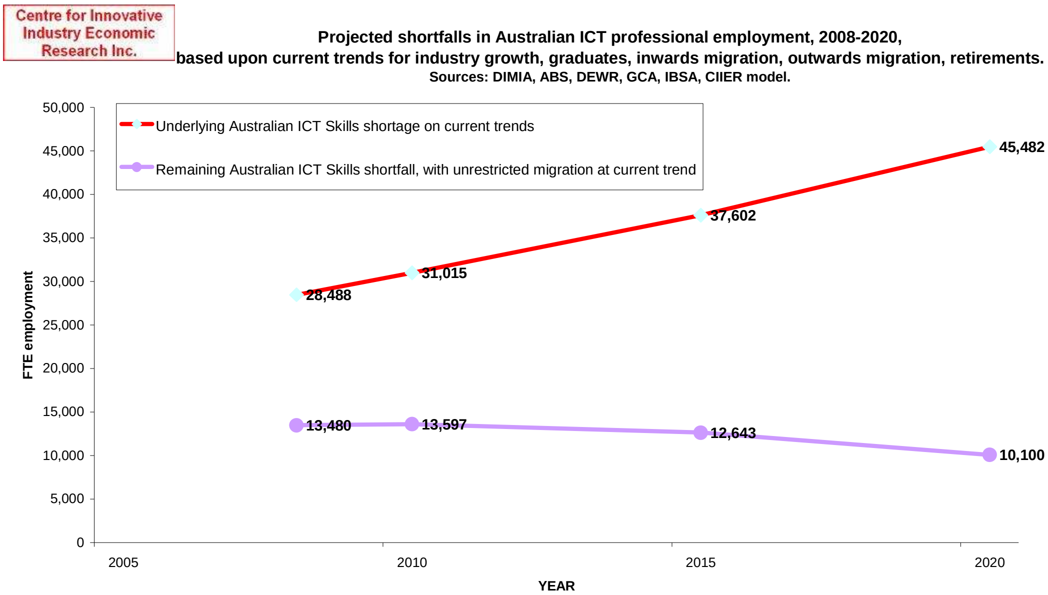


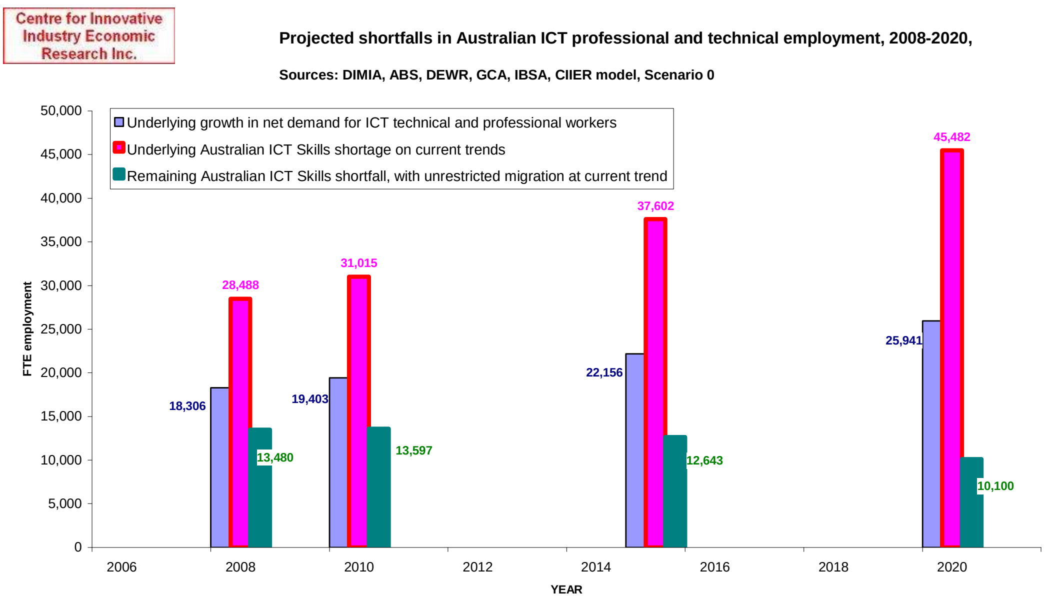
This chart illustrates the stark reality of the aging work-force. Based on historical trends simply continuing unabated by policy or other changes, the number of local graduates entering the ICT work-force in 2008 barely exceeds retirements, and in future years, on current trends, as retirements grow, the graduate pool also declines, exacerbating the gap.

Even if ICT employment demand were stable, rather than continuing to grow, we would be facing an ever mounting skills shortage as graduate supply fails to even match age-retirement from next year.

ICT Employment projections

Scenario 0 - Current trends unchecked by economic reality





This is the "Base point" scenario. It simply takes every identified trend and extrapolates to 2020. This scenario will NOT occur in reality simply because the increased levels of permanent migration would be unsustainable, and it is unthinkable that ICT graduate output would continue to decline to less than 1000 graduates per annum over the next 12 years

Scenarios 1-3 “We do not consider existing conditions likely (Peter Sellers)”

Scenario 1 – Holding inwards migration to current budget settings

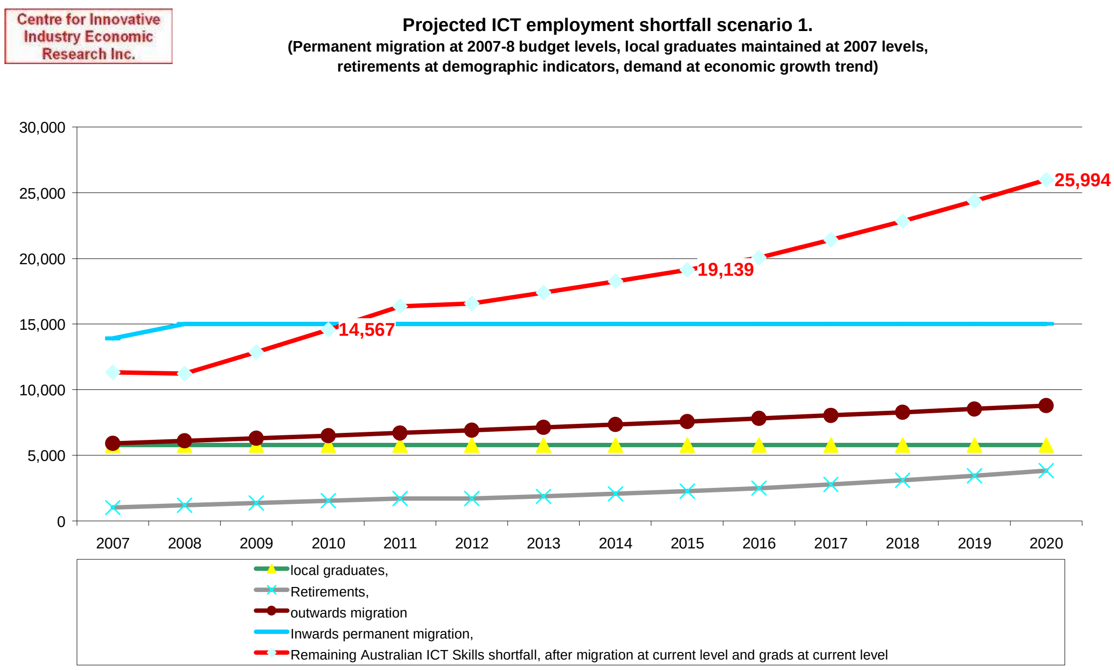
This is the “most likely” scenario on current policy settings

Assumptions

The model assumes that inwards permanent migration in future years correlates to the targets set down in the 2008 Federal Budget, and thus does not continue to grow exponentially, and it also assumes that the decline in ICT graduates is held at the current (2007) level, rather than continuing to rapidly decline as it has in the last five years. The model also factors in the economic cycle variations outlined in the earlier section on the underlying growth tend.

Implications

Whilst the assumption in respect to migration is very likely to occur, at least within the forecast budget period, holding the level of domestic graduates at 2007 outputs is going to be difficult, since the 2007 cohort reflect, in the main, 2004 entrants. The decline in entrants since 2005 has been significant, and it is only in 2007 that we are seeing a flattening, and, in some cases, a slight recovery. These new entrants will not impact upon employment numbers, however, until after 2010-11.



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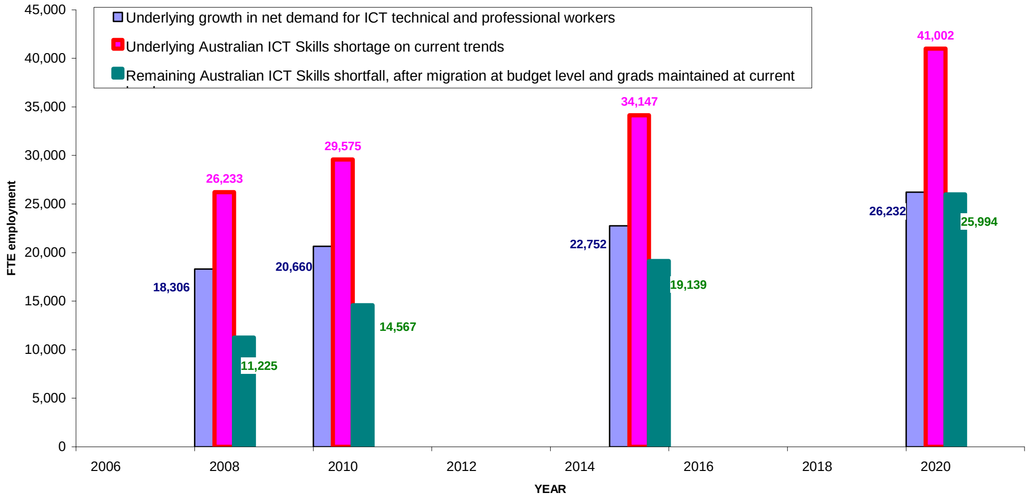
Projected shortfalls in Australian ICT professional and technical employment, 2008-2020,

Sources: DIMIA, ABS, DEWR, GCA, IBSA, CIIER model, Scenario 1



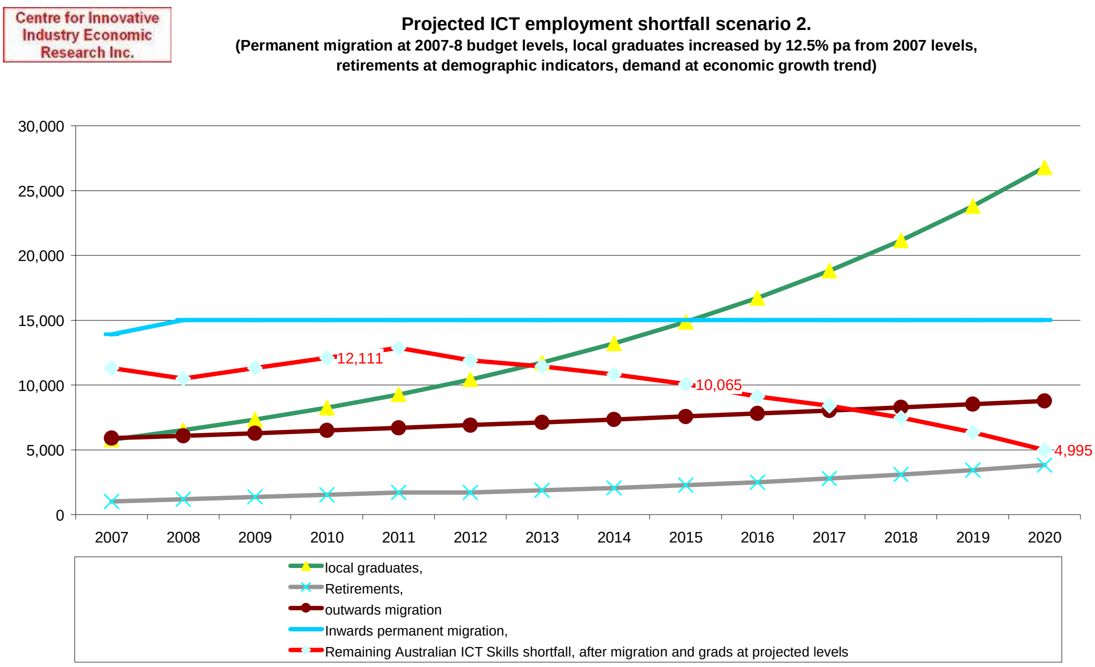
Scenario 2 – Holding the line – and lifting education

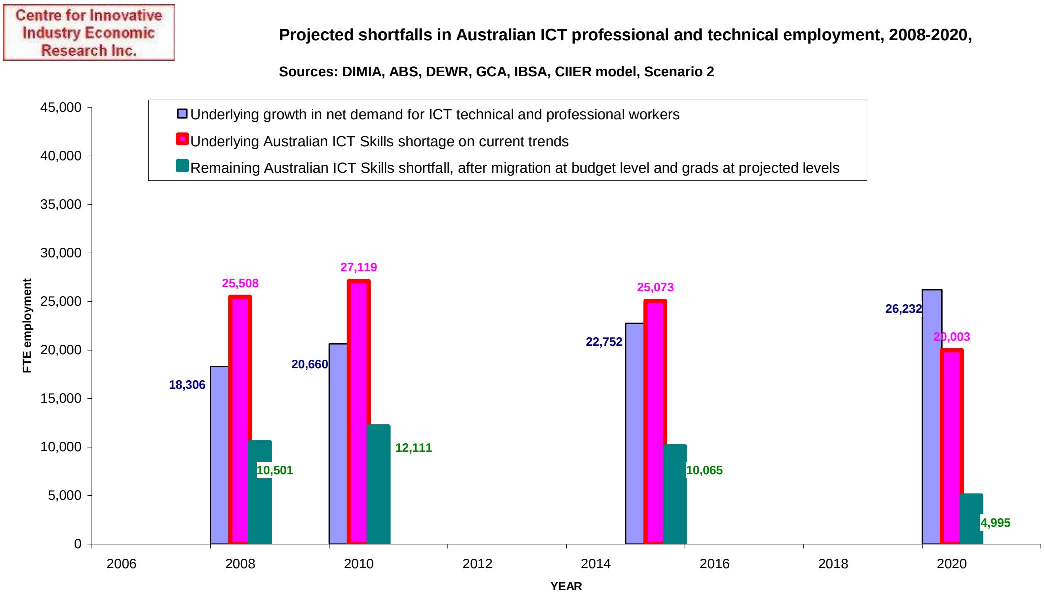
Assumptions

The model continues the assumption that inwards permanent migration in future years correlates to the targets set down in the 2008 Federal Budget, and thus does not continue to grow exponentially. The model also factors in the economic cycle variations outlined in the earlier section on the underlying growth trend. The change from Scenario 1 is that the model assumes that the decline in ICT graduates is not only held at the current (2007) level, but that domestic graduate numbers gradually improve (by 12.5% per annum compound) back up to and past former levels, reaching the 2001 level by 2013.

Implications

As with Scenario 1, whilst the assumption in respect to migration is very likely to occur, increasing the level of domestic graduates to former levels is going to be even more difficult than simply holding them steady, at least for the next four years.




Centre for Innovative Industry Economic Research Inc.
Projected shortfalls in Australian ICT professional and technical employment, 2008-2020,
Sources: DIMIA, ABS, DEWR, GCA, IBSA, CIIER model, Scenario 2
Underlying growth in net demand for ICT technical and professional workers
Underlying Australian ICT Skills shortage on current trends
Remaining Australian ICT Skills shortfall, after migration at budget level and grads at projected levels
FTE employment
YEAR
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2006
2008
2010
2012
2014
2016
2018
2020
18,306
25,508
10,501
20,660
27,119
12,111
22,752
25,073
10,065
26,232
20,003
4,995

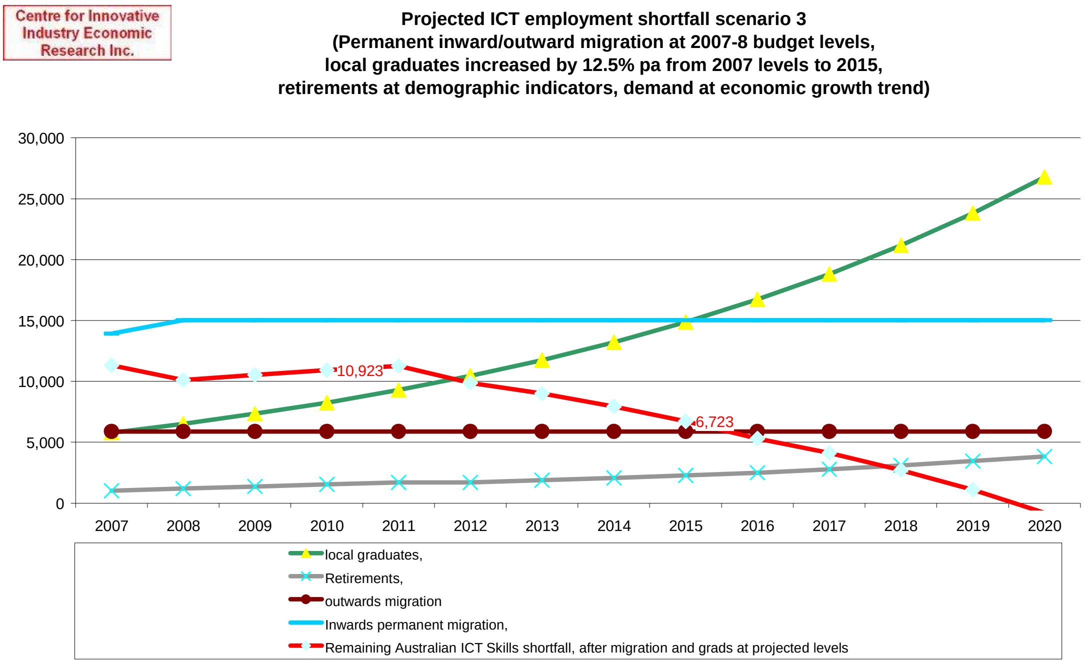
Scenario 3 – Best case - holding the line, lifting education, slowing the brain drain

Assumptions

The model continues the Scenario 2 assumptions, but also assumes a reduction in forecast outwards migration – the so-called “brain-drain”, by holding at the 2007 levels. It is an optimistic, best-case, scenario.

Implications

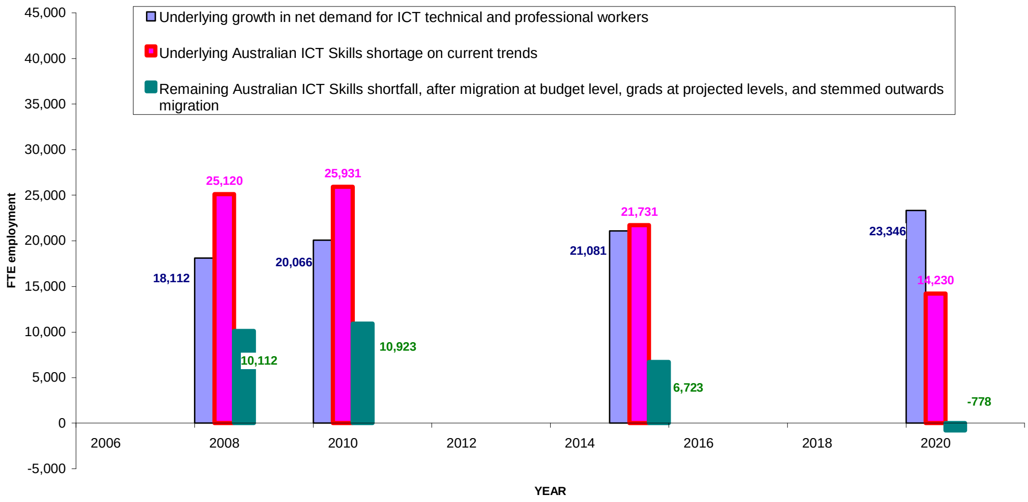
As with Scenarios 1-3, whilst the assumption in respect to migration is very likely to occur, increasing the level of domestic graduates will be difficult, and holding outwards migration back even more so. One factor in favour of this scenario in the short term, however, may be the anticipated poorer economic conditions in the US and Europe, which may temporarily deter some of the “brain-drain”.



Centre for Innovative Industry Economic Research Inc.

Projected shortfalls in Australian ICT professional and technical employment, 2008-2020,

Sources: DIMIA, ABS, DEWR, GCA, IBSA, CIIER model, Scenario 3

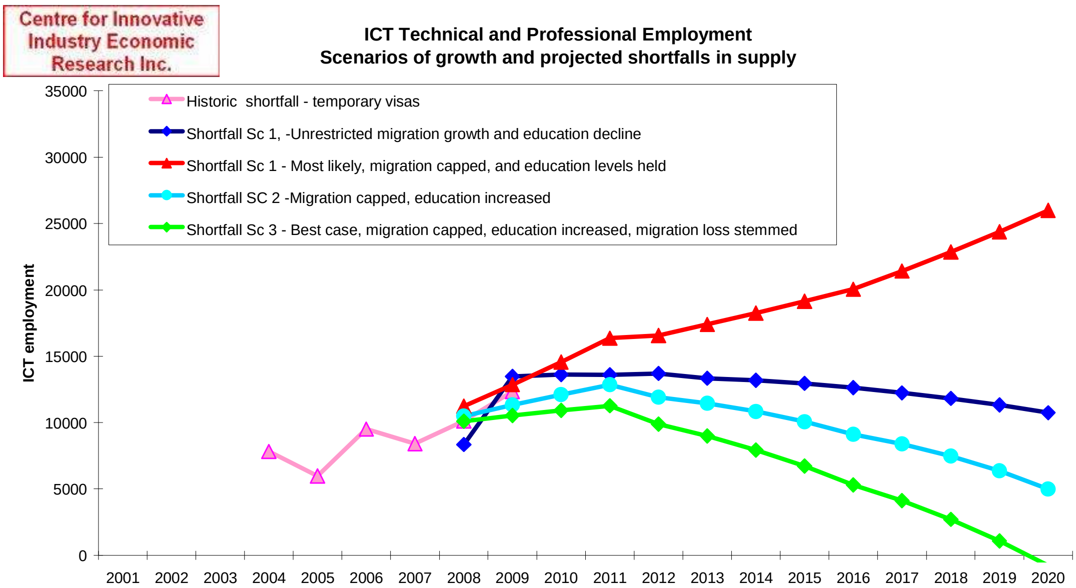


Scenario Comparisons

The relatively conservative scenarios outlined in this report indicate continued ICT skills shortages at current or worse levels until at least 2012, regardless of optimistic presumptions in respect to forecast levels of graduates and migration settings.

The current shortfall is being addressed through the use of temporary Visa migrants, but, as can clearly be seen in the chart below, even the current historically high numbers of these Visas will not be sufficient for future ICT demand, even on the most optimistic scenario, until 2012.
After 2012, assuming that some of the scenario assumptions become reality, there is, in the more optimistic scenarios, a gradual reduction in the need for temporary skills support.

Scenario 1, however, which is the most likely outcome on current settings, shows continued and rapidly growing ICT skills shortages, which would inevitably translate into reduced economic performance for all Australian industry sectors.



Conclusion

A “policy free-zone” on future ICT employment is not an economic option. The current “most-likely” outcome resulting from previous policy settings is unacceptable both economically and politically. Whilst it is unlikely that the “best-case” scenario can be achieved, any advance towards it would be positive. Action is required to minimise the long-term damage to Australia’s economy.

The Shape of future ICT employment

- What **kind** of ICT jobs will be in demand in 5-10-15 years time?
- How many people will be needed for each?
- How relevant are current ICT courses to this requirement?
- What are we doing to find out?

Quantifying the overall ICT skills requirement was the first phase in analysing ICT skills needs.

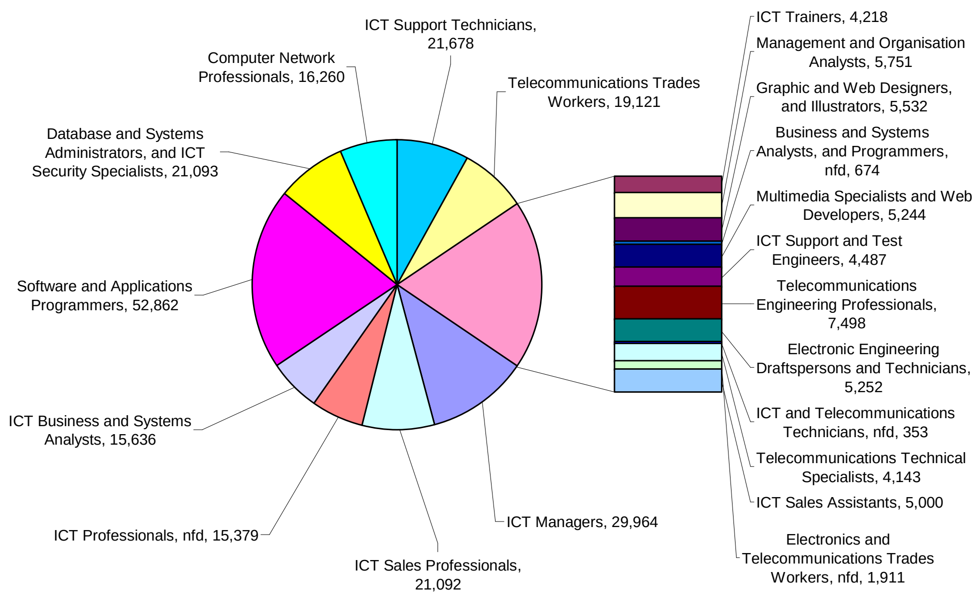
Overall numbers tell us about the dimension of the problem, but not about its shape. In order to understand what kind of ICT employment numbers will be required in the future. We have to shape, both the current ICT employment structure and the future needs of ICT employers based on quality and up-to-date data.

By combining outputs from some excellent analysis commissioned by IBSA with earlier work conducted by CIIER, and converting both datasets to the new ANZCO nomenclature, which will be used by the Australian government for future workforce analysis, we have been able to approximate the current ICT employment shape – shown here.

National ICT job structure

Centre for Innovative Industry Economic Research Inc.

Estimated National ICT occupations job structure (ANZSCO 4 digit format) March 2008



The Next Phase

ICT Skills needs data collection and analysis -The next report

With the support of both ACS and AIIA we have recently conducted an ICT skills needs survey, which has been very well supported, by ICT employers from every industry sector. The Survey is structured to the new ANZCO nomenclature format used above.

This new data, collected in July-August 2008 , has allowed us to populate the forward ICT employment demand paradigms, reflecting **actual** skills needs, based upon major ICT employers responses.

This new and important data will be analysed in depth, and will form the subject of a separate report, which will be published later this financial year.