



**Tasmanian ICT Industry
Sector Assessment Report
2009**

Section 1 – ICT Industry Survey and
Statistics

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About the Centre for Innovative Industry Economic Research:

**Centre for Innovative
Industry Economic
Research Inc.**

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 credible 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 provides the analysis for this project.



Whitehorse. is an Australian owned management consulting practice specialising in ICT Market Research and analysis, ICT policy and strategy, especially in the Government sector, Information Management, and Economic Development.

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Statistical Panel

Centre for Innovative Industry Economic Research Inc.	July 2003	July 2008	July 2009	Trend
Tasmanian ICT Industry				
Employees in Tasmanian ICT Industry	2,820 (1.33% of Aust ICT)	3,572 (1.33% of Aust ICT)	3,647 (1.29% of Aust ICT)	Up marginally in number but down in percentage
Overall revenue of Tasmanian ICT Industry	\$1.1b (1.8% of Aust ICT)	\$1.4 b (1.6% of Aust ICT)	\$1.1b (1.4% of Aust ICT)	Back to 2003 levels and with a lower percentage
Revenue of Tasmanian ICT Industry software and services sector	\$98.4 million (0.8% of Aust ICT)	\$252.9 million (1.44 % of Aust ICT)	\$287 million (1.55% of Aust ICT)	Continued increase in \$ value and percentage of Australian market
R&D of ICT Industry (Survey companies only)	\$11.3m	\$29 million	\$32 million	Continuing to increase. Boosted by CSIRO

Introduction

It is well recognised that the ICT industry in Australia is a key productivity enabler for other industries, but direct ICT employment, both in total and relative to other industries, shows that the ICT industry is also a major employer. By the broadest definition, ICT employment accounts for nearly 5.5% of total Full Time Equivalent (FTE) employment in Australia, more than many other Australian industry sectors, including Mining; Electricity, Gas and Water supply; Banking and Finance; and TV, Radio, Media. The ICT industry is also a significant source of export revenue, and accounts for nearly 80% of ICT R&D performed in this country.

TASICT received funding approval from the Intelligent Island MAPP program to perform a Tasmanian ICT Industry Capability Assessment to be conducted annually over a period of three years. CIIER were engaged by TasICT on an annually renewable three year contract to provide the analysis and report.

Four separate reports were provided by to TasICT by CIIER last year as part of this engagement, the first three may be downloaded from either the TASICT or Whitehorse Strategic Group websites¹, the final report was a proposed ICT industry strategic framework, prepared for the TasICT Board.

It is not intended that the 2009 report repeat material covered extensively in 2008, but that, instead, it will analyse changes and progressions from that point, and focus on economic impacts.

The Report is in three Sections.

Section 1 – ICT Industry Survey and Statistics, has been prepared to give an overview of the current state of the Tasmanian ICT Industry sector, as of July –Dec 2009, based upon a CIIER Survey of the Industry, and on other reputable statistical sources.

Section 2 is a SWOT review of ICT sector Innovation and R&D, both private and public, and Section 3 includes an evaluation assessment and economic impact review.

A further annual ICT Sector assessment report is scheduled for 2010.

Research Support

The conduct of a research task such as this cannot take place effectively without the support and freely given time of many people. The consultants wish to thank all of the individuals and companies who assisted us by providing the data upon which the analysis is primarily based. This research has also been greatly assisted by the helpful cooperation of the Premier, the Tasmanian Government, and the TasICT board and its Project manager.

The work is also supported by the partners, staff, and research associates of CIIER and Whitehorse Strategic Group Ltd, who have generously provided access to the valuable intellectual property that has formed the basis of the CIIER economic models.

Current and former Whitehorse and CIIER Partners, Senior Consultants and Research Associates include:

Ana Govan	David Dennis
David Goble	Reg Coutts
Ian Wells	Phil Kowalski
Richard Hogg	Ian Dennis
Liz Dennis	Roy Pallett

¹ www.whitehorsestrategic.com publications tab.

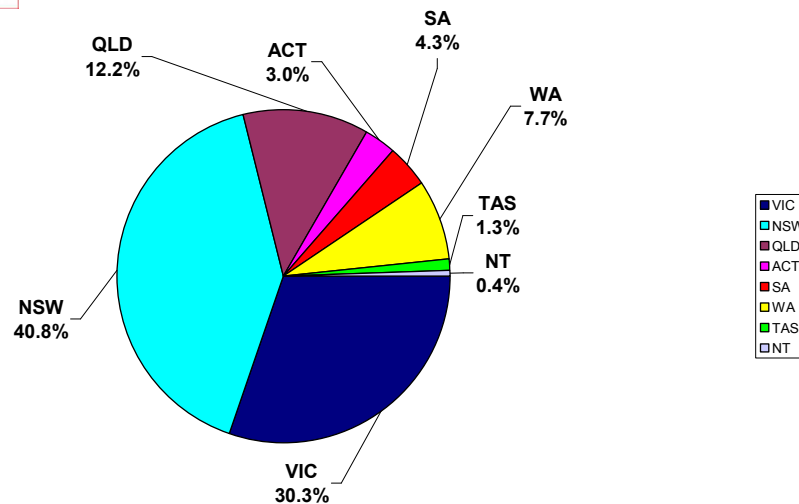
Tasmanian ICT Industry Employment

The Tasmanian ICT industry employs just over 3,600 FTE. This equates to 1.29% of Australia's ICT industry employment, a slightly lower percentage than last year, but still similar to the first analysis in July 2003 (1.33%).

Nationally, the demographic profile of the Australian ICT industry has continued to change. As the main smaller states have increased their relative percentages, and larger states (Victoria and New South Wales), having less dominance. As most of this percentile growth, took place in the mining states of Western Australia, and Queensland driven by increasing demand for ICT services in the construction and mining industries, there has also been a more pronounced flattening in these States over the last year due to the economic downturn.



ICT Industry Employment Percentage by State July 2009

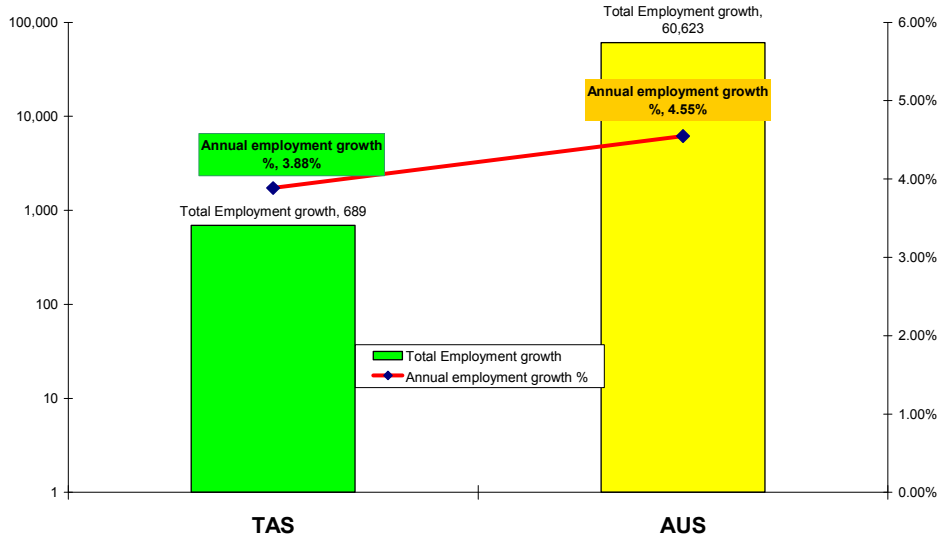


Since July 2003, Tasmania's annualised employment growth of ICT industry employment, has dropped slightly, from just over 4% to 3.88%, but remains only marginally below the total Australian percentile growth of 4.31% over this period.

During the last year, however, ICT industry employment in Tasmania has continued to grow, whilst in many other States and Territories it has shrunk. Tasmania ICT industry employment growth is almost all in software and services, as Tasmania still has a more significant employment exposure proportionally to the telecommunications sector, and this remains the sector which has seen extended employment contraction, both in Tasmania and nationally.

ICT Industry employment	AUS	TAS
Change since Jul 2008	-1.84%	2.09%

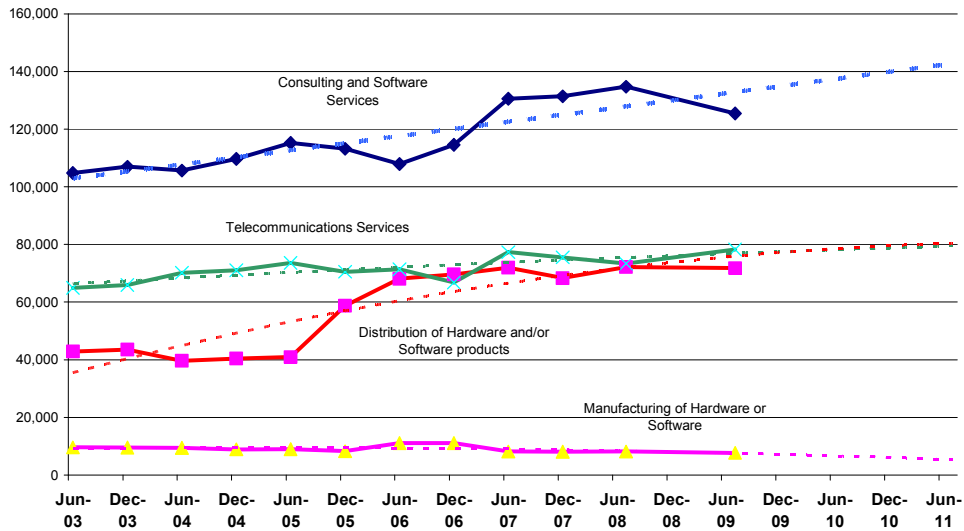
ICT Industry Employment growth July 2003-July 2009 Tasmania and Australia



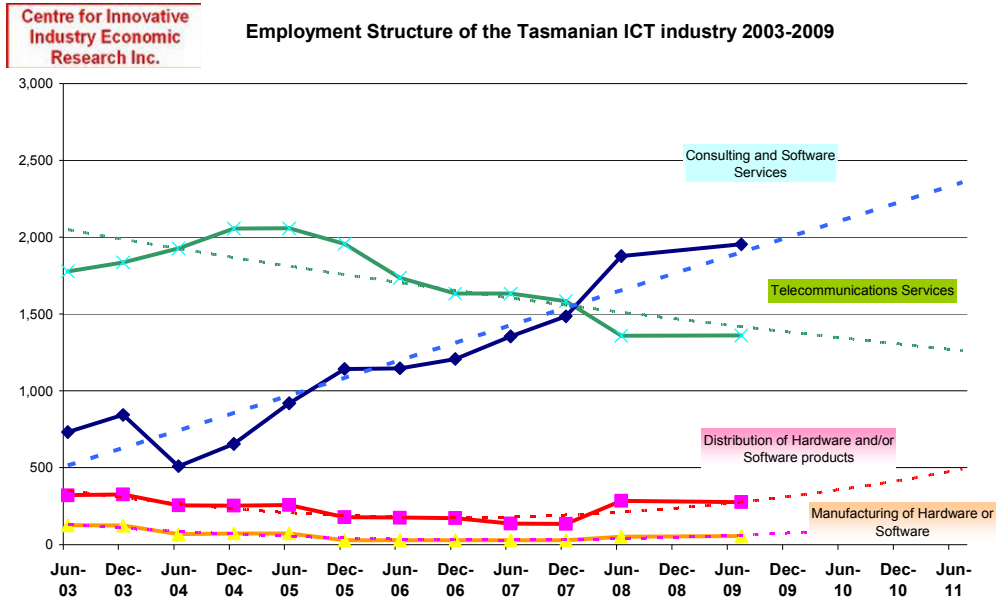
This is illustrated in the charts below, where, since 2006, national employment in distribution of hardware and software products runs alongside national employment in telecommunications services, whereas, in Tasmania, consulting and software services ICT industry employment remains more significant than telecommunications services employment, but distribution is relatively small.

Centre for Innovative Industry Economic Research Inc.

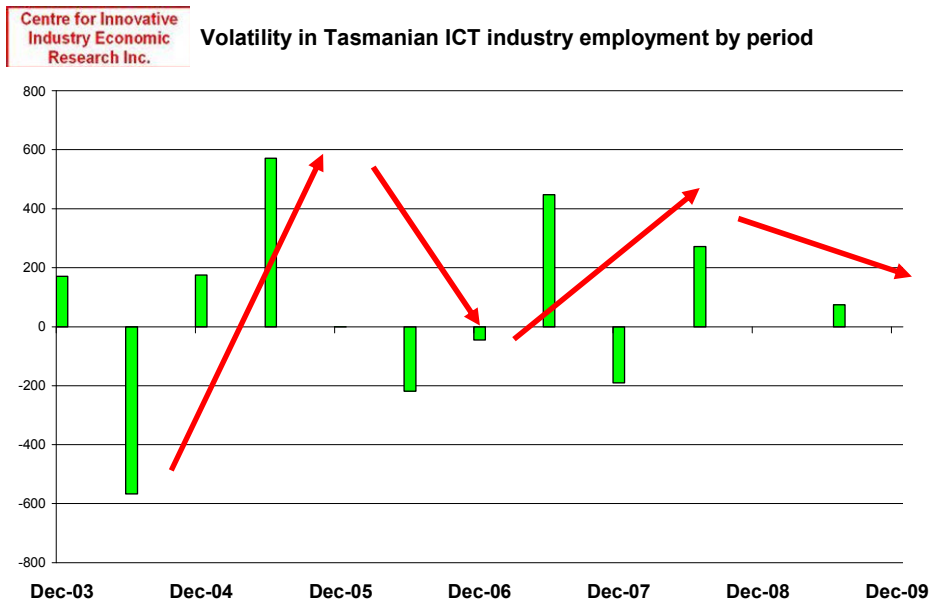
Employment Structure of the Australian ICT industry 2003-2009



Last year, we projected that “Whilst domestic software and services demand growth may slow as a result of economic turn down, it is considered unlikely that any structural, rather than economic, contraction will take place in this sector”. The latest data appears to confirm this view.



As we indicated last year, the structure of Tasmanian ICT industry employment is unique to Tasmania. It is therefore necessary to ensure that programmes for ICT industry support recognise that the engines for growth are to be found mainly in companies providing consulting and software services and to a lesser degree, distribution of hardware and software products sourced elsewhere.



The impact of the economic downturn can, however be seen in decreased employment volatility, with the pace of employment turnover diminishing, as staff stay in jobs and employers retain good staff, waiting for the economic upturn.

Tasmanian ICT Industry employment trend

Tasmania

Sector	Source	Consulting and Software Services	Manufacturing of Hardware or Software	Distribution of Hardware and/or Software products	Telecommunications Services	Total
Jun-03	Whitehorse T250	732	126	321	1,778	2,957
Dec-03	Whitehorse T250	844	123	326	1,835	3,128
Jun-07	CIIER-Whitehorse T250	1,354	29	136	1,633	3,153
Jun 07	ABS (published Oct 2008), <i>sub-sectors do not correlate exactly</i>)	1,171	59	545	1,504	3,180
Dec-07	CIIER-Whitehorse T250	1,485	29	134	1,583	3,231
Jun-08	CIIER-Whitehorse T250	1,877	52	284	1,358	3,572
Jul-09	CIIER-Whitehorse T250	1,954	56	276	1,360	3,647

The Tasmanian ICT Industry employment trend is shown in the table above, with consistent growth in consulting software and services, offset by consistent declines in telecommunications employment.

Tasmanian ICT Industry revenue

Revenue estimates 2009

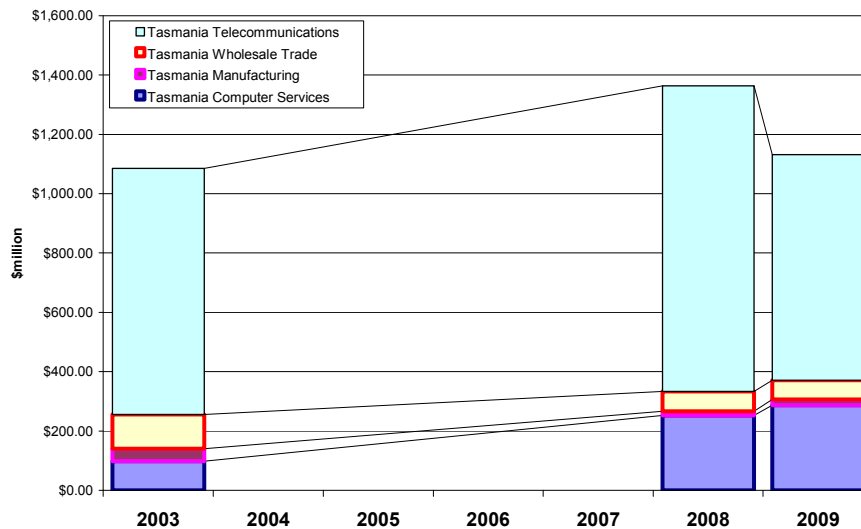
Tasmanian ICT

Industry

Industry Sector	\$Amillion
Computer Services	\$287
Manufacturing	\$20
Wholesale Trade	\$65
Telecommunications	\$760
Total	\$1,131

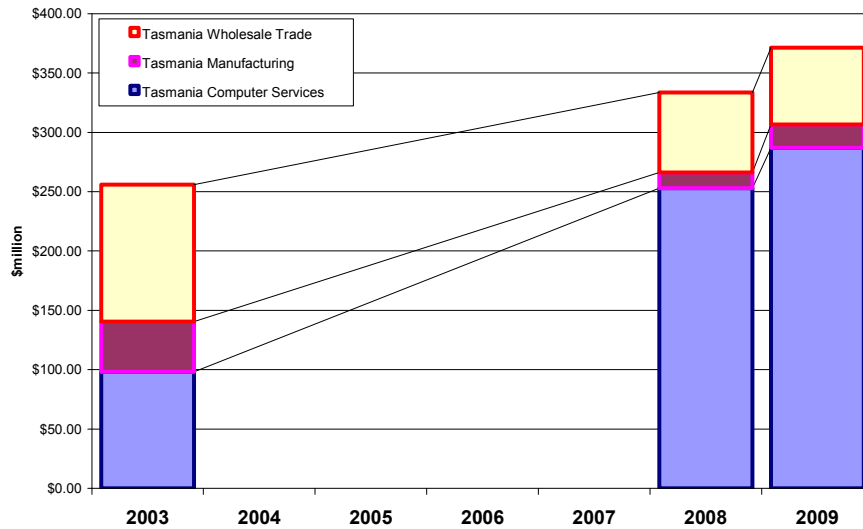
Telecommunications revenues have diminished nationally, and this is also reflected in Tasmania. Other industry sectors have varied in their revenue trends, but, overall are up on last year – despite the economic downturn. The 2009 total Tasmanian result of \$1.1 billion, is still an increase in actual dollars on 2002-3, and represents a very similar percentage of total Australian ICT industry revenue to the 2008 Survey.

Revenue of Tasmanian ICT industry



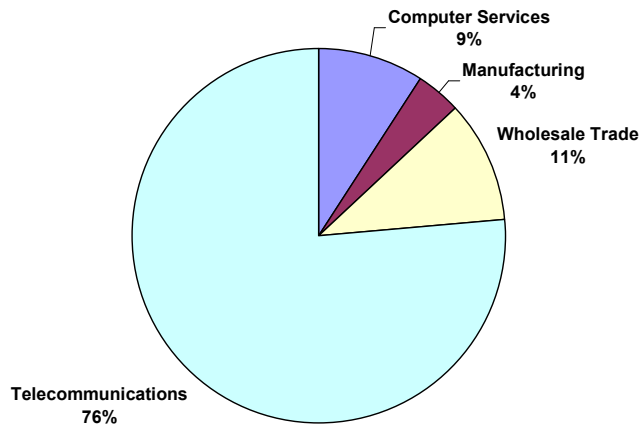
Whilst the overall increase is worthwhile, the performance of the software and services sector continues to improve.

Revenue of Tasmanian ICT industry - excluding telecommunications



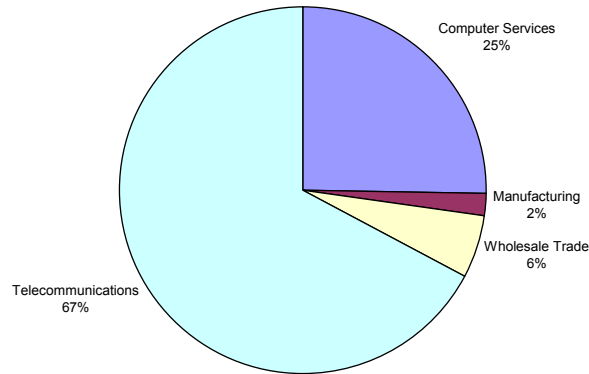
The change in the revenue map can clearly be seen, by contrasting the percentage each sector contributed to overall Tasmanian ICT industry revenues in 2003, with those now applying.

Tasmanian ICT Industry Revenue - 2003



Whilst software and computer Services represented 9% of revenues in 2000-3, they now represent 25%, and the trend has been consistent over the last four years.

Tasmanian ICT Industry Revenue - 2009

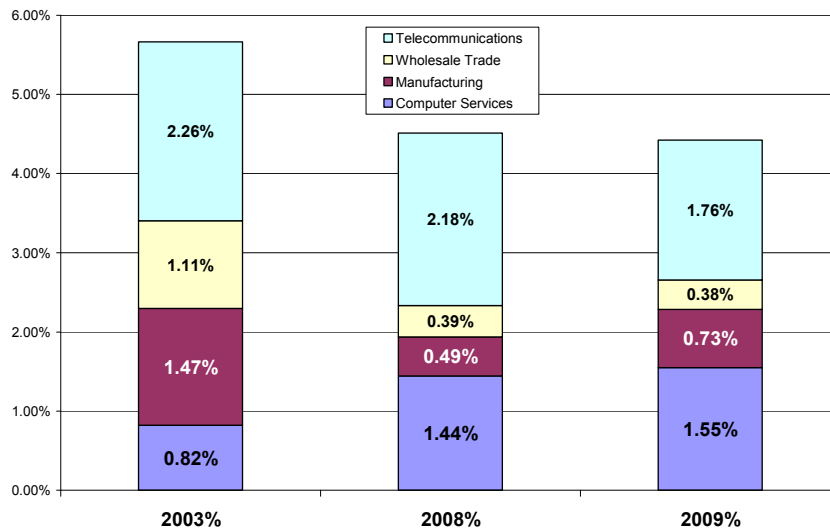


As a percentage of total Australian ICT industry revenues, Tasmanian software and computer services revenue has grown from under 1% of the Australian total to now over 1.5%.

All other Tasmanian ICT industry sectors now represent a lower percentage of total Australian ICT industry revenue than was the case in 2003, although a small growth in manufacturing revenue has occurred..

The growth in revenue for software and computer services, both in percentage and actual terms, mirrors that seen in employment demographics and reinforces the perception that the major shift in the structure of the Tasmanian ICT industry noted last year is continuing.

Tasmanian ICT Industry revenue trends, as percentage of Australian ICT industry



Tasmanian ICT Exports

According to recently published data from TradeData (www.tradedata.net), and the CSES², Tasmania's exports of locally produced ICT equipment have grown considerably over the last ten years. Worth a little more than \$1.5 million in 1998, they exceeded \$3.5 million in 2008.

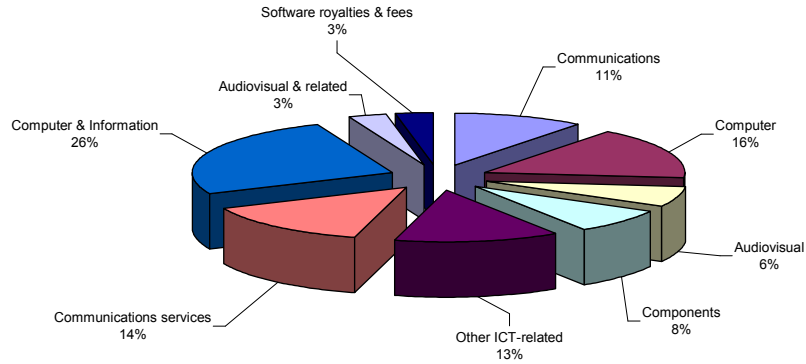
Services trade data from ABS and Tradedata are, however, very limited, with \$13 million of communications services exports and only \$1 million of computer and information services exports being reported in 2008. Software exports may be included within services data, and/or may be included within other ICT related exports as equipment exports.

2007-2008	Australia's total ICT exports(\$A,000)	Tasmanian ICT exports (\$A,000)	Tasmanian %
EQUIPMENT			
Communications	697,000	746	0.11%
Computer	1,058,000	95	0.01%
Audiovisual	410,000	292	0.07%
Components	521,000	387	0.07%
Other ICT-related	885,000	2,028	0.23%
Software Products	Na	Na	
Total ICT Equipment	3,571,000	3,548	0.10%
SERVICES			
Communications services	924,000	13,000	1.41%
Computer & Information	1,673,000	1,000	0.06%
Audiovisual & related	214,000		0.00%
Software royalties & fees	195,000		0.00%
Total ICT Services	3,006,000	14,000	0.47%
TOTAL	6,577,000	17,548	0.27%

It should be noted that, according to CSES, software goods(i.e. recorded and unrecorded software-related media), which were estimated at \$257,000 in exports in 2006, can no longer be tracked. Electronic sales not subject to customs operations are also not recorded in official data. Both National and State data are therefore assumed to be significantly understated.

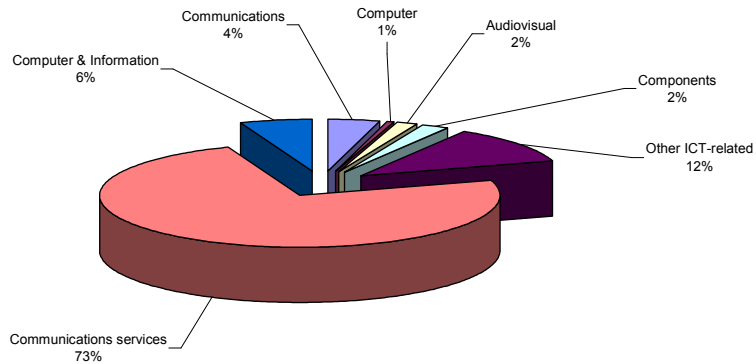
² ABS and TradeData (www.tradedata.net), Centre for Strategic and Economic Studies (Victoria University) Analysis

National ICT exports structure

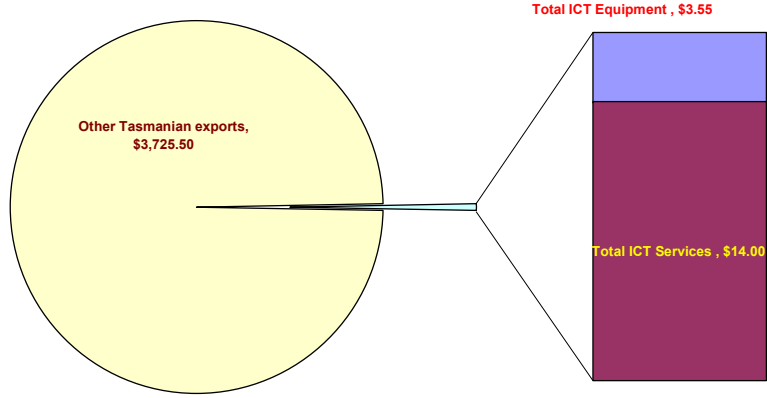


The Tasmanian percentage of national export totals is low overall, compared to the Tasmanian percentage of national ICT industry employment of around 1.3%, with only communications services exports exceeding that percentage.

Tasmanian ICT Exports structure



Tasmania' ICT exports (\$Amillion)



ICT Industry R&D in Tasmania

Further analysis of ICT research will be included in Section 2 of this report, titled “ICT Research and Innovation in Tasmania”.

Official data

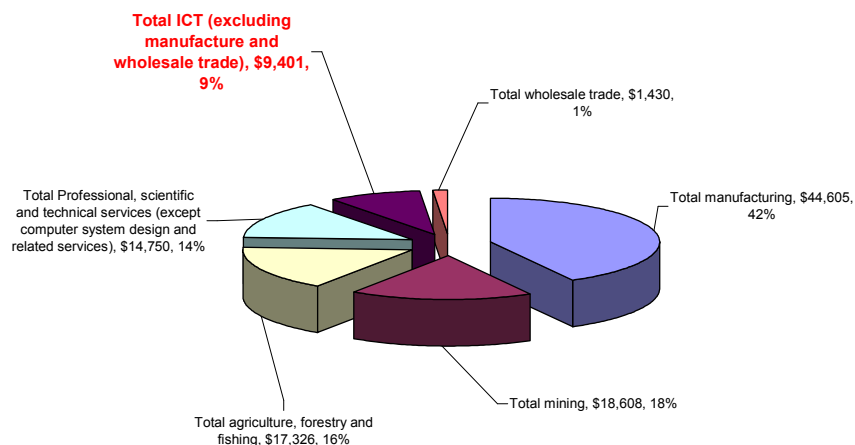
Comparing ICT to other industry sectors statistically is made complicated by the segmentation of ICT data, in Australian Government sources, across a number of different industry sectors and sub-sectors.

For example, Telecommunications and internet are listed under the Information telecommunications and media category, whilst computer systems design is within the “professional scientific and technical services” grouping. Data for ICT distributors, retailers, and manufacturers are within non-specific categories within separate trade and manufacture groupings, and some consulting and ICT services data is aggregated within other technical services.

In addition to these considerations, for R&D data, in the ABS data Australian and sectoral totals do not necessarily agree with sub sectoral aggregations, as some R&D is only allocated at the total level, and some takes place overseas.

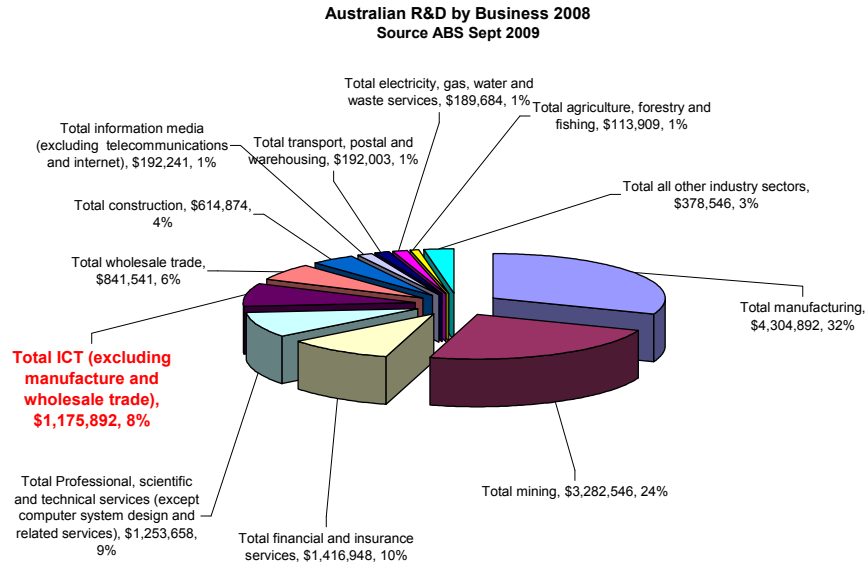
For the charts below, only data relevant to companies categorised as computer systems design, telecommunications, or internet service providers has been able to be extracted and aggregated to the “Total ICT (excluding manufacture and wholesale trade)” heading we have used.

Tasmanian Research and development expenditure by Business 2008
Source: ABS 81040 2007-8 published Sep 2009 (analysed by CIER)



Even on this significantly reduced basis however, on the basis of ABS data, ICT Business R&D represents over 9% of all business R&D in Tasmania allocated by industry sector, however there is a variance of \$25 million between the total for Tasmania allocated to the industry sectors shown, and the overall total recorded by ABS for Tasmanian ICT business R&D. If the larger total is used, the ICT % becomes 7.13%. National ICT Business R&D, measured the same way, is 8.4% of Australia’s total, or 8.2% on the higher figure, including unallocated R&D. On either comparison, Tasmania records a comparative percentage for ICT of total State business R&D.

The ABS Tasmanian total also only includes computer systems R&D. This is because the ABS data shows no telecoms R&D outside NSW. As this is demonstrably incorrect, with significant telecommunications research activity taking place in a number of other States, it is likely that data for one or more large telecommunications businesses have simply been aggregated to a particular head-office location rather than recorded where the research actually took place.



For computer systems design, the Tasmanian percentage is the same – 9% on the allocated data, and 7.13% on the total. Comparative national percentages are 7% and 6.8%.

Survey data

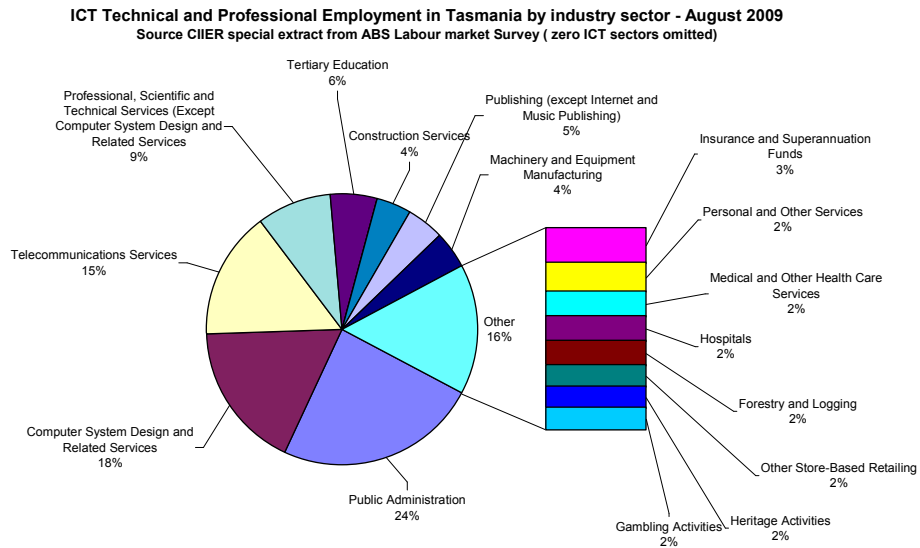
Four additional companies were added to the 35 ICT companies advising in the Survey that they conducted R&D in Tasmania. Twelve of these updated their data. There was a significant increase in total R&D expenditure of \$2.26 million by those updating, to a new total of \$32.01 million, however \$1.4 million of this increase was in one organisation, offset by three other organisations reducing R&D spend, but only by a tenth of that amount (\$0.14 million).

Most research foci remained consistent with last year. Further analysis of Tasmanian ICT research will be included in Section 2 of this report.

Tasmanian ICT technical and professional employment

Whilst the primary focus of these reports is the Tasmanian ICT Industry, i.e. companies` which supply ICT good and services, it is common for the term ICT industry to also be interpreted as including both those companies, and also the many individuals who provide ICT good and services to their employers, i.e. ICT technical and professional staff.

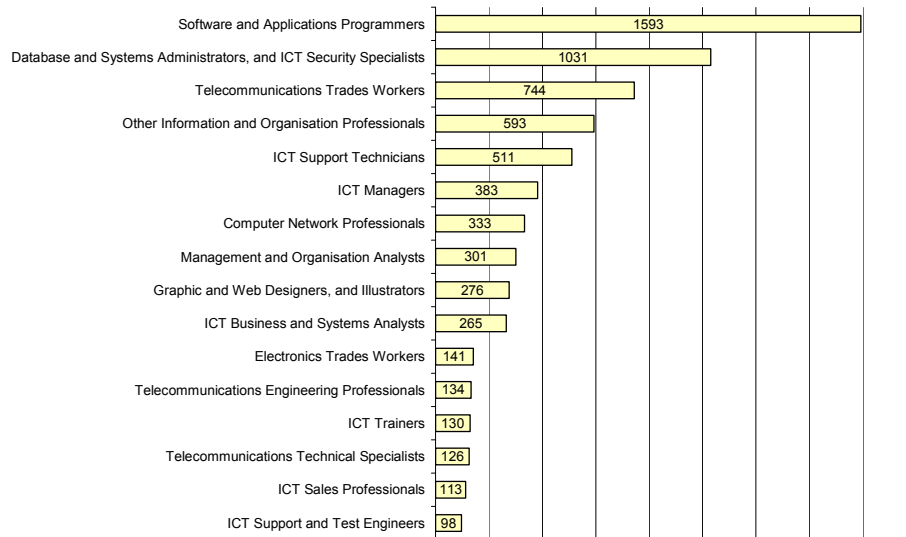
Naturally, a large number of such staff work in the ICT industry, but the ICT industry also employs logistical, ancillary and administrative staff.



This chart shows the ABS labour market assessment of ICT technical and professional staff employment by industry sectors (ANZSIC Level 2) in Tasmania as at August 2009. It is derived from a special extract commissioned by CIIER.

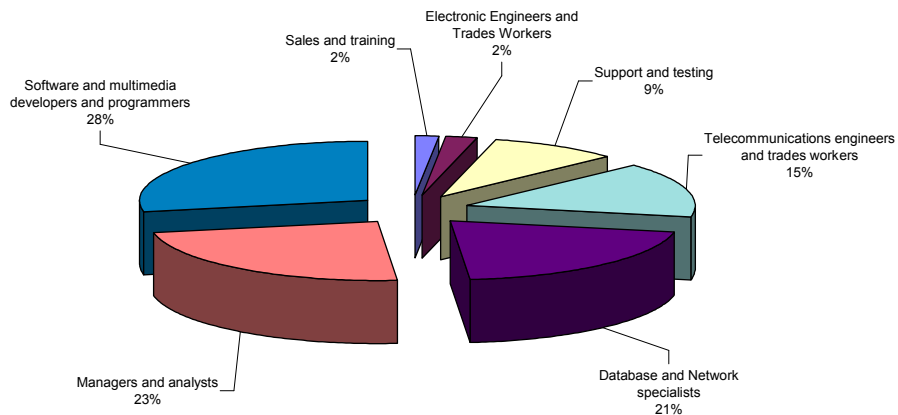
Nationally, the ICT industry comprises all of the Computer Systems Design and Telecommunications sectors, a significant proportion of the Professional Scientific and Technical services sector, and a small proportion of the Manufacturing, Wholesale trade and Retail trade sectors.

ICT Technical and Professional in Tasmania by occupation
 Source: CIIER extract of ABS Labour Market Survey August 2009



The ABS assessment of occupations undertaken by the 6,770 ICT technical and professional staff it identified in August 2009 is shown above (ANZSCO level 2-3). ABS cautions against excessive drill-down of such data to industry sectoral level however, due to random sample errors at that level, and the consequent likelihood of statistical aberration.

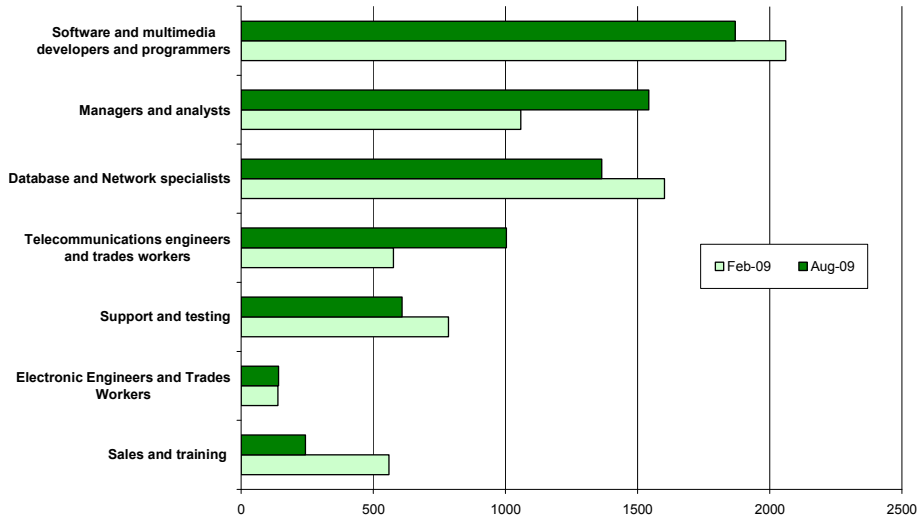
ICT Employment in Tasmania by occupation groupings
 Source: CIIER extract from ABS Labour Market Survey August 2009



Grouping to broader work categories in the CIIER analysis above, helps to overcome such sampling variations.

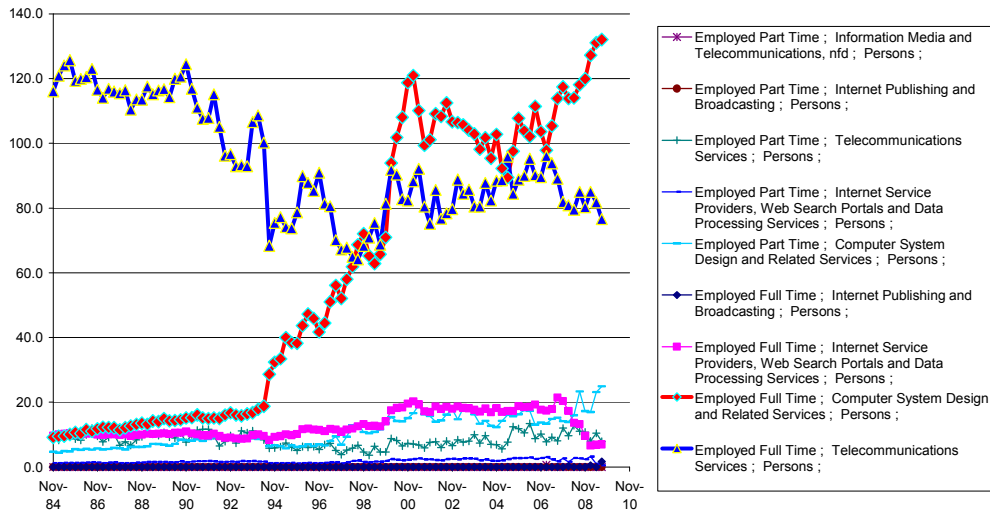
Based upon this grouping analysis, some interesting variations can be seen between the Feb 2009 labour market data and its August 2009 equivalent.

Changes in Tasmanian ICT Technical and Professional Labour market
 Source: CIIER extracts from ABS Labour market data Feb 2009 and August 2009



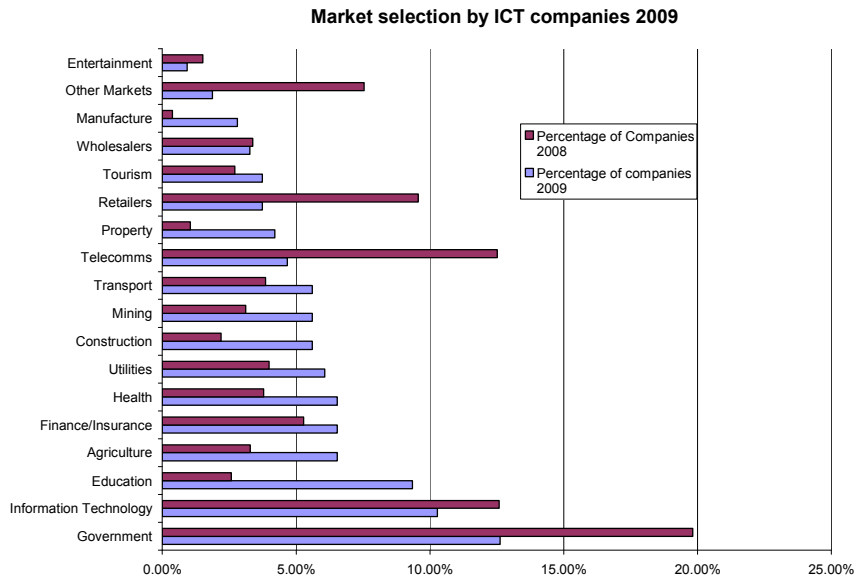
Telecommunications occupations are seen as increasing, counter to the trend of the last ten years, (as indicated in the national trend chart below), whereas sales and training, software, database, and network occupations have declined. Management and analysis occupations in Tasmania have however, increased commensurately, with net movement in ICT technical and professional occupations between February 2009 and August 2009 statistically zero.

National Trend in ICT sectoral employment 1984-2009
 Source ABS Labour market data extracts



Tasmanian ICT Industry Market Focus

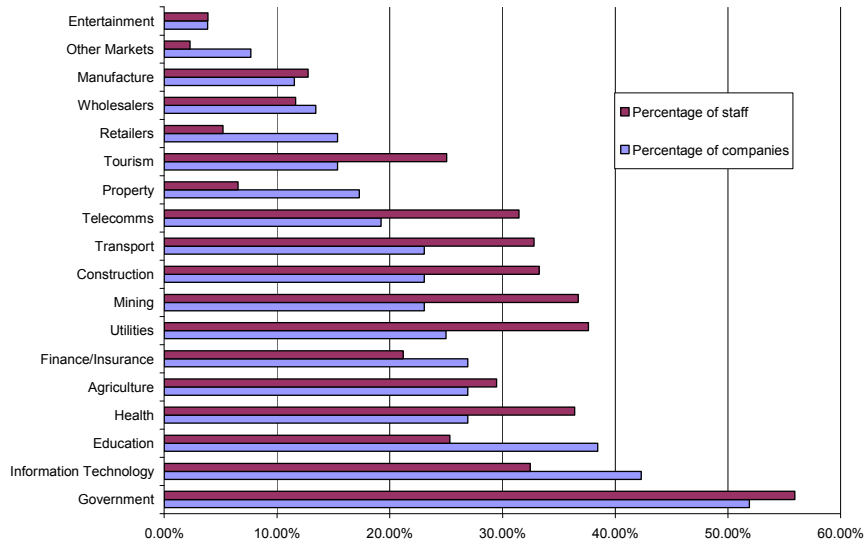
Markets were analysed in depth in last years report. As most companies continue market strategies over a number of years, it is surprising that some statistical change appears to have taken place in just a year, when based upon the number of companies selecting a market.



There are a significantly larger number of companies selecting the education market, with almost the same percentage diminishing in the government market, an exit from telecommunications and retail, and growth in those companies selecting agriculture and health.

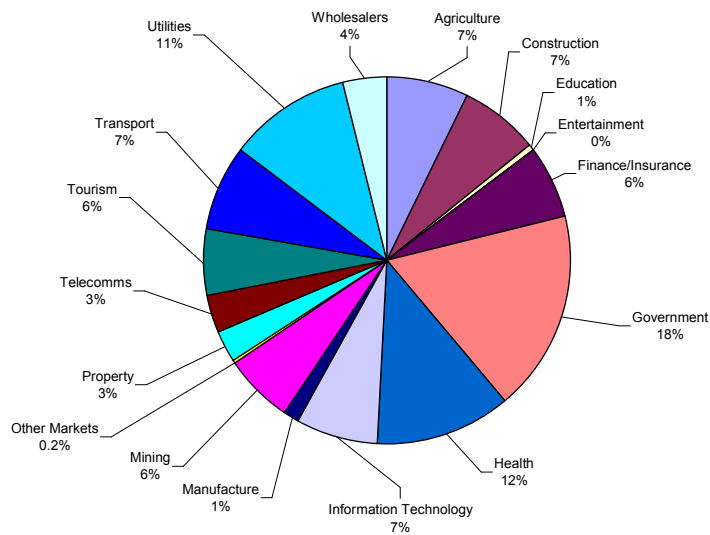
Analysis of 2009 market selections by total staff shows a generally consistent pattern to number of companies, with agriculture and health also showing significance, but with continued larger foci on more traditional industrial markets

Market selection by ICT companies 2009

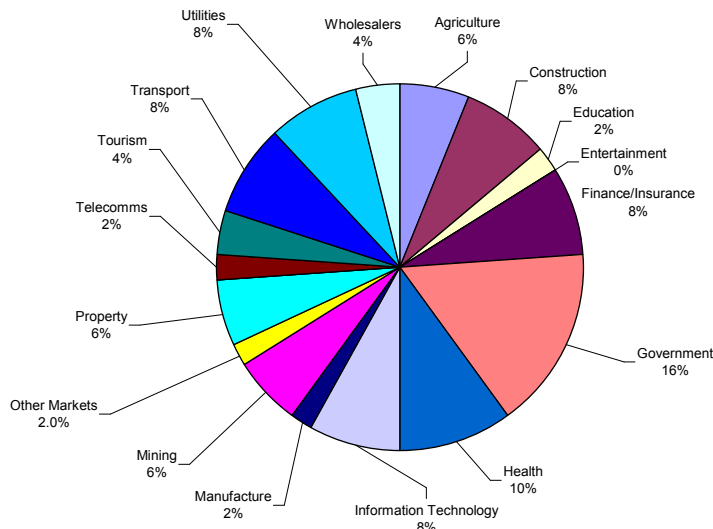


Software products companies target a varied and non-dominant range of markets, whether analysed by staff or by corporate presence. Government, however, remains the largest market by either measure.

Software products markets (% of Tas ICT staff)

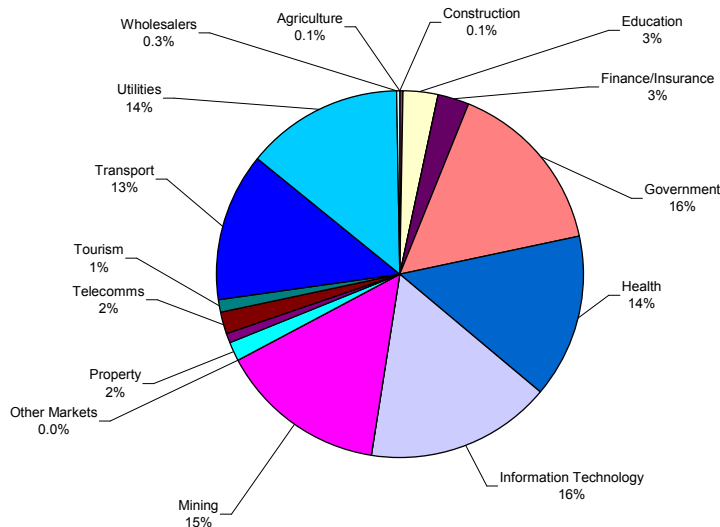


Software products markets (% of Tas ICT companies)



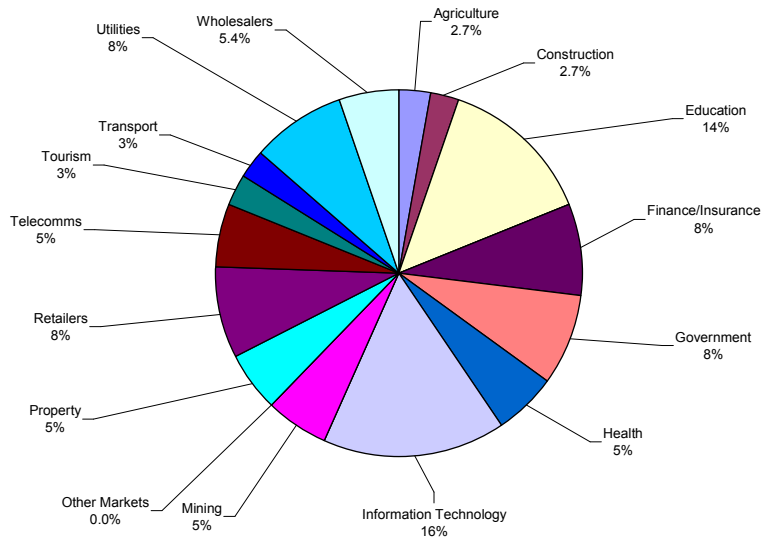
Systems integration is remarkably similar, with, again Government the leading market, when analysed by staff.

Systems integration markets (% of Tas ICT staff)



However when analysed by company, Information Technology and Education are the market targets of choice, suggesting that smaller companies either prefer to market to the ICT industry, possibly as sub-contractors, to the education sector, or possibly, that Government is seen as a more difficult market for SME's.

Systems integration markets (% of Tas ICT companies)



Barriers to success

Respondents to the ICT industry Survey in 2008 identified a limited number of “barriers”, with comments mainly correlating to the group below, with minor variations:

Access to capital
Access to external markets
Access to funding
Availability of experienced enterprise architects
Government procurement in Tasmania limits the size and extent of work
Lack of channel development capability
Sales & marketing skills

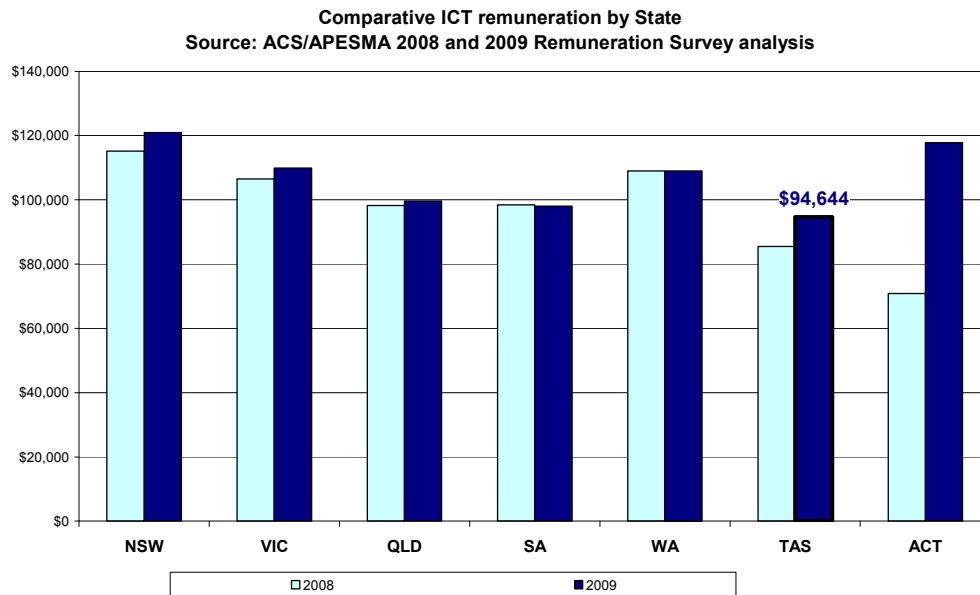
In 2009, a broader range of comments on barriers were made

- Access to capital
- Access to funds for R & D investment
- Access to government funding often costs more in compliance than amount received
- Access to research staff
- Access to sales/marketing skills
- Any reduction in demand for IT infrastructure and associated services
- Australian and State government procurement policies
- Capital investment
- Cash flow to fund bigger projects (server projects)
- Difficulty in securing long term contracts
- Economic climate
- Economic conditions
- Funding for companies to support significant external R & D activities
- Gaming restrictions
- Guidelines for funding are so restrictive that they do not reward innovative, or cost saving methods of operating
- Having to incur costs and carry them for a significant period before reimbursed restricts growth opportunities
- Lack of qualified staff
- Lack of resources (development) due to a lack of funding
- Lack of trained people with good work ethics
- Managing the growth and maintaining quality etc
- Skills development/retention
- Skills Shortage
- Slowdown in BPM & EA Market
- Tasmanian Government Budget - lack of funds
- Tourism downturn

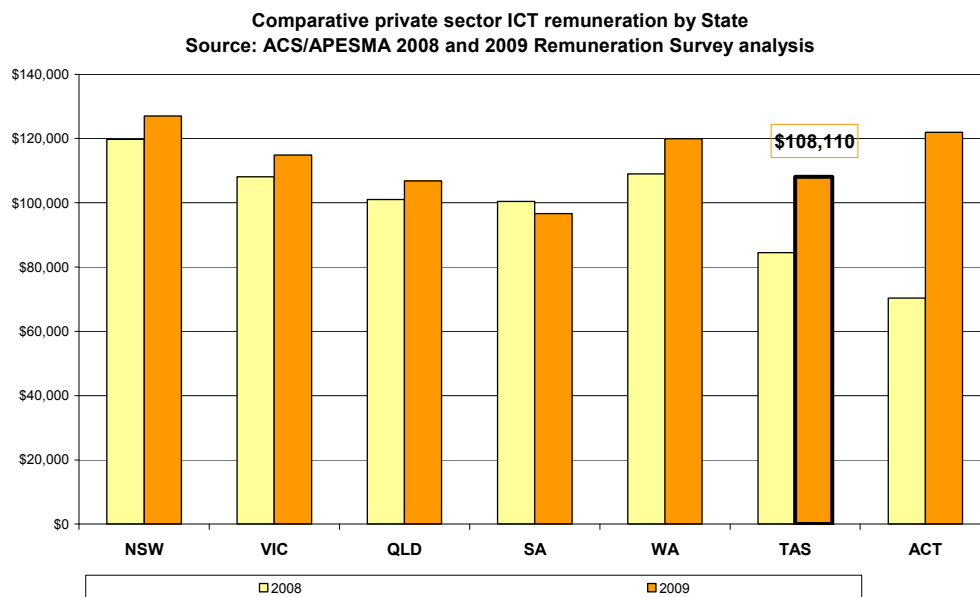
It is noticeable that the key constraints continue to be: Capital, Skilled staff, and Market.

ICT Remuneration in Tasmania

Last years` report addressed the belief that wage costs were lower in Tasmania than on the mainland, and that Government contract rates were below the national norms. The data below is taken from the Australian Computer Society 2008 and 2009 Remuneration Survey reports, analysed by APESMA, and demonstrates that these beliefs are well founded.



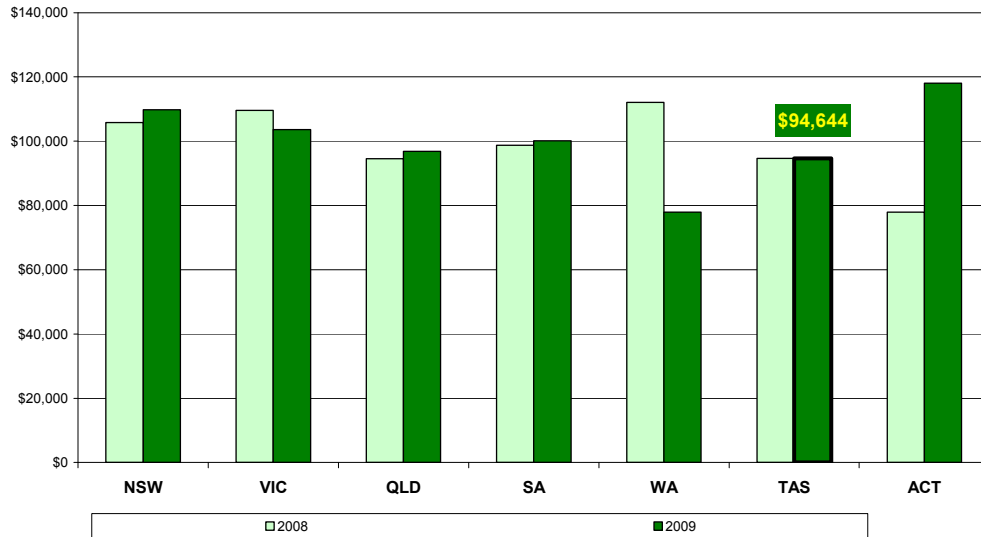
It is, however, encouraging to see that the Tasmanian figure has improved considerably from 2008 to 2009, and the overall median is now closer to national norms.



This recovery is quite noticeable in the private sector data, with an even greater correlation to the national median.

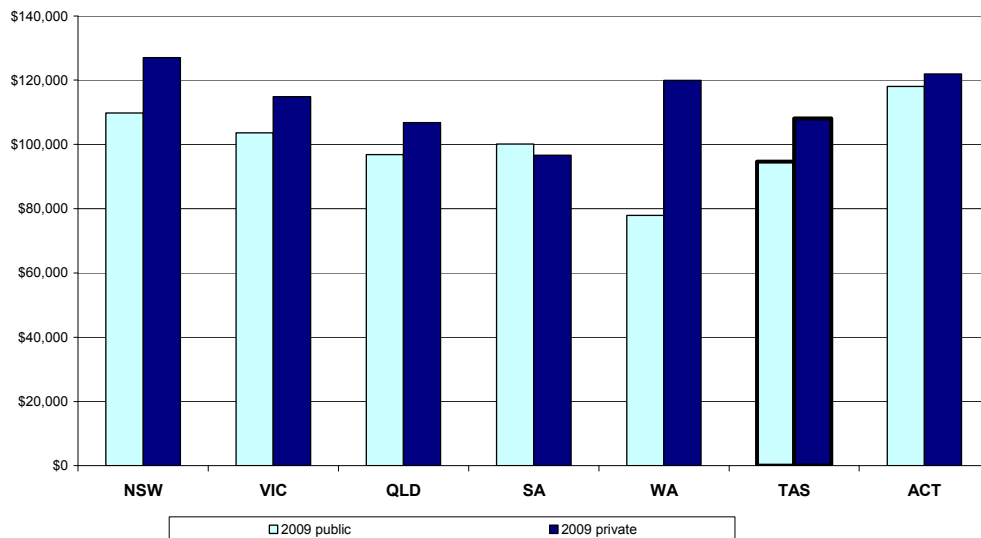
Public sector remuneration comparatives continue to have a narrower band of variation between the States, perhaps because public sector bandwidths are more widely published and understood. Tasmanian public sector ICT employees continue to command similar but slightly lower returns to their colleagues in most other States.

Comparative public sector ICT remuneration by State
 Source: ACS/APESMA 2008 and 2009 Remuneration Survey analysis



When public and private total package medians are compared, it can be seen that private sector medians are roughly equivalent to or higher than public sector medians in most States with larger ICT industry sectors, and Tasmania now follows this trend, reversing the 2008 position.

Comparative ICT remuneration by State
 Source: ACS/APESMA 2008 and 2009 Remuneration Survey analysis



The previous contention that ICT salary wage-rates being achieved in the public sector were not being matched by commensurate contract rates being paid to the Tasmanian ICT industry, reducing the ability of the Tasmanian ICT industry to pay nationally competitive wages, appears, therefore, to no longer be sustainable.

Appendix A - Sources of information

The following were the main sources of information for this section of the report

- Statistical survey and industry model of Tasmanian ICT companies
- National survey and industry model of ICT companies
- In-depth research by Australian Bureau of Statistics on August 2009 Labour market (Specially commissioned by CIIER)
- ABS Labour market industry sector time-series data
- ABS national accounts and research data
- Tradedata/CSES and ABS Export statistics

Other sections will draw upon

- Online attitudinal Survey
- Interviews and focus groups

Survey and Analysis Process

The primary mechanism that is used to provide the quantification data for this and other Reports is a detailed survey of ICT companies in Australia, known as the 'Whitehorse Top 250'. The methodology employed includes a questionnaire both mailed and emailed out to respondents and direct verification telephone contact with a significant proportion of the survey base. The survey is supplemented by web-searches, press reports, Annual Reports, and other public sources of data.

The Whitehorse "Top 250" database contains detailed data since 1998 on now over 800 operating companies with 140,000 staff, \$80 billion in revenue and over \$600 million in R&D expenditure. Historical data is also kept on companies which have been acquired, merged, or closed during this period, leading to a database with over 1000 company entries.

The current data, gathered between June and November 2009, represents approximately 54% of total current industry employment and 90% of total current industry revenues in the ICT industry in Australia.

Of this sample, Tasmanian employing entities included over 60 companies, employing over 53% of ICT industry employment in Tasmania. A further 6 unusable responses (either unverifiable, due to anonymity; out of scope as not within the Tasmanian ICT industry; or abusive) were received from Tasmanian companies.

Statistical verification

There are two methods for deriving industry sectoral data. They are to conduct a comprehensive Census, or to undertake a statistical survey and model.

A comprehensive Census is expensive, intrusive, and time-consuming, (which is why the Australian government only conducts the National household census approximately every four years). We note specifically that a Census of the Tasmanian ICT Industry is not part of this project.

Industry surveying and modelling is undertaken by ABS from time to time, however the last such ABS survey for the ICT Industry was in 2006-7³. (Prior ABS ICT Industry reports are 1996/1998/2001/2003/2005).

The ABS methodology surveys a statistically representative sample in an industry sector, and then models that data to produce estimates of overall industry size and shape (employment, revenue, sub-sectoral structure etc). The number of companies in the sample is limited, and rarely more than 5% of the total number of companies operating in the sector.

The models CIIER create are tested by reference to other available data on employment and income. The ABS national and State model for the ICT industry in 2006-7, published in October 2008, was consistent with the CIIER national and State model for the same period. We are in continued dialogue with the ABS, and ABS has advised that it has no plans to undertake a further ICT industry survey and model for at least the next two years. The ABS 2006-7 summary data for Tasmania for 2006-7 is shown below.

Tasmanian ICT Industry 2006-7⁴		<i>Manufacturing</i>	<i>Wholesale trade</i>	<i>Information media and telecommunications</i>	<i>Computer system design and related services</i>	<i>Electronic and precision equipment repair and maintenance</i>	<i>Total ICT industry</i>
Number of businesses (b)(c)	no.	11	[^] 71	[^] 58	[^] 209	[^] 41	[^] 391
Employment	no.	[^] 59	545	1 504	[^] 922	[^] 149	3,180
Wages and salaries	\$m	[^] 2.0	[^] 26.0	92.2	[^] 38.8	*3.6	162.5
Sales of goods and services (d)	\$m	[^] 5.9	np	np	[^] 117.6	[^] 12.3	[^] 135.8

CIIER, and its predecessor Whitehorse, have used a very similar approach to that of the ABS for ICT Industry modelling, with 14 Surveys, at least annually, since 1998. CIIER has tested its models against ABS models throughout this period, as they have become available, with very high levels of correlation recorded. CIIER samples for the ICT industry are at a significantly higher employment density level than those of ABS. CIIER national samples are approximately 55% of total ICT industry employment, across all industry sub-sectors and States.

ABS also undertakes regular quarterly national labour market surveys of all industry sectors. The data for August 2009, published in September 2009, has also been utilised for this report.

CIIER has commissioned special ABS detailed extracts of February 2009 and August 2009 labour market data, focussed on ICT occupations and State estimates not normally

³ ABS 8126.0 2006-7

⁴ ABS 8126.0 2006-7 Selected state and territory indicators, by ICT industry grouping(a)

(a) Refer to the ABS Glossary for ANZSIC classes contributing to each industry grouping.

(b) Provided for contextual purposes only, refer to Explanatory Notes 21 and 22.

(c) Multi-state organisations are counted in each state in which they operate

[^] estimate has a relative standard error of 10% to less than 25% and should be used with caution

* estimate has a relative standard error of 25% to 50% and should be used with caution

np not available for publication but included in totals where applicable, unless otherwise indicated

available, which has also been accessed for these reports. ABS advises, however, that some caution is required when analysing such data at micro levels, as the RSE (survey sample potential error level) rises at the lower data levels (i.e. whilst totals for a group of cells may have a variation of plus or minus say 2%, individual cell numbers may vary by say 5%. Categorisation variances – e.g. calling someone an ICT manager in one survey, and a Business analyst in another, will also occur between such surveys.

Appendix B - CIIER ICT Industry & sector mapping

During a recent CIIER project for the (then) Department of Communications, Information Technology, and the Arts, DCITA), analysing the Australian Software Industry, an industry and sector mapping analysis structure tailored for ICT, and especially for software and services, was developed. That research underpins this study and lays the foundation for our analysis.⁵

To map ICT industry activities, we developed a framework for analysing the ICT industry and ICT value chain and a schema for presenting the actors and activities involved in the ICT industry. These *analytical* and *presentational* frameworks are described in turn.

Mapping the ICT product system (the analytical framework)

The ICT product system analytical framework was developed by Dr John Houghton, of the Centre for Strategic and Economic Studies at Victoria University, and extended with other CIIER researchers.

As was noted in the DCITA study, there are many possible approaches to mapping ICT industry activities and markets, ranging from various forms of cluster analysis to value chain/value system, product and innovation systems analysis. Each provides a particular perspective that is more or less suitable to a particular type of study or enquiry.

Within these approaches there are many overlapping and cross cutting dimensions. One basic distinction is that between those studies using clusters in a statistical sense (i.e. a grouping of entities according to some specific characteristic) and those intending to imply actual relationships between the objects (i.e. networks, value or product systems). When clustering is studied it can be in terms of any number of characteristics (e.g. location, activity or product field, firm strategy, behaviour, innovative or competitive performance, size, technology or science base) and involve a range of methodological approaches (e.g. factor analysis, cluster analysis, multi-dimensional scaling, etc.).

Network, value chain or product system relationships include linkages of various kinds (e.g. supply chain, user–producer relations, supplier–producer relations, innovation linkages, information and/or knowledge flows) and study typically involves more qualitative methods (e.g. case studies or representative sampling).⁶ One such approach, the product system approach, was pioneered by the United Kingdom’s Complex Product Systems Innovation Centre.⁷ It is a technique that focuses on linkages between actors in a complex system that affects the transformation of activities and materials into goods and services through the processes of creation, production and distribution. Hobday, Rush and Tidd (2000) suggested that: because each new product tends to be different, and because development and production involves feedback loops from later to early stages and other unpredictable, ‘emerging’ properties, innovative organisational structures are required to coordinate production, particularly where there are uncertain and changing user requirements and technological possibilities. There is often high production and innovation complexity, not only because a wide variety of distinct components, skills and knowledge inputs are involved, but also because large numbers of firms or different organisations often have to work together in production (e.g. prime contractors and systems integrators, users, buyers, other suppliers, small and medium sized enterprises, government agencies and regulators).⁸ Such a characterisation fits the ICT industry.

⁵ CIIER report “ Software Industry in Australia, Globally Competitive, Domestically Undervalued” , 2005

⁶ Vock, P. (1997) ‘Swiss Position Paper on Mapping Innovative Clusters,’ OECD Workshop, Amsterdam, October 1997.

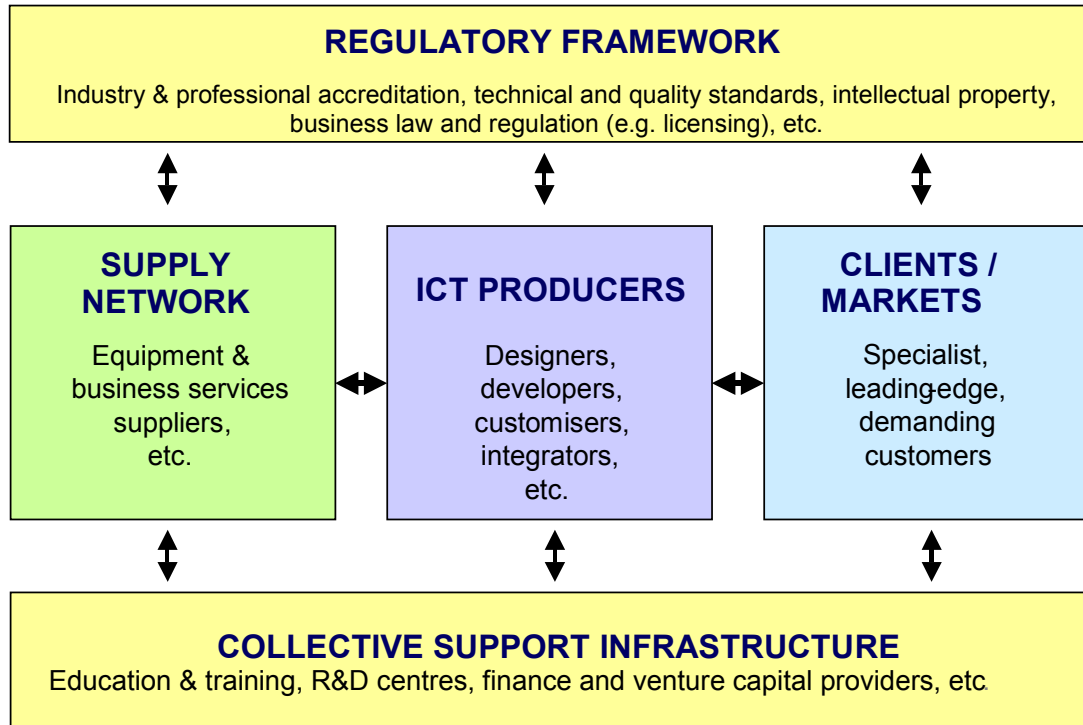
⁷ See Hobday, M., Rush, H. and Tidd, J. (2000) ‘Innovation in complex products and system’, *Research Policy* 29(2000), pp793-804 and related papers in that special issue of *Research Policy* for an overview and introduction.

⁸ Hobday, M., Rush, H. and Tidd, J. (2000) ‘Innovation in complex products and system’, *Research Policy* 29(2000) pp793-804.

A typical schematic product system includes five major elements, with three groups of key actors and activities forming the core value chain. Figure 1 illustrates a basic schematic product system:

- At the centre are the *ICT firms* engaged in the development of ICT and ICT based solutions;
- To their left, the *supply network*, which includes all the providers of specialist equipment and financial, business and other services to ICT producers; and
- To their right, the *distribution network*, which includes all the clients of ICT firms (be they intermediaries or final customers).
- Their activities of these groups are supported by a collective support infrastructure and operate within an overarching regulatory framework.
- The *collective support infrastructure* includes R&D centres, education and training institutions, professional associations, specialist consulting firms, finance and venture capital providers, etc.; and
- The *regulatory framework* includes a wide range of industry and professional accreditation, technical and quality standards, intellectual property, licensing, etc.

A schematic product system



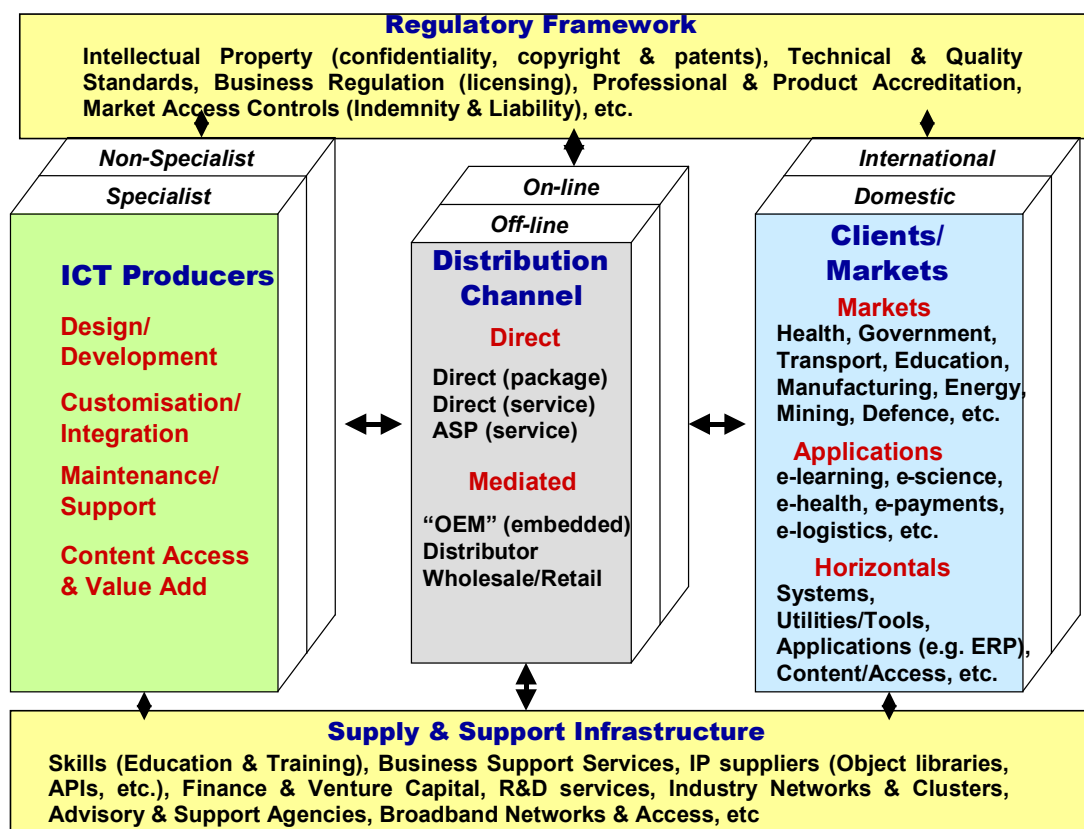
Source: CSES Analysis.

This basic schema was modified to draw out particular insights, taking into account that ICT-related capabilities can cut across applications and markets. For example, digital image manipulation capabilities can be an essential ingredient in the development of computer games, medical scanning and imaging, film and video special effects, production and editing, etc.

In the DCITA study, we identified the role of key actors in the value chain – as, for example, developers, distributors, integrators and/or value-added services providers. Given the importance of the distribution channel and distribution business models in the

ICT industry, as well as the limited requirements of ICT firms for specialist inputs, we modified the traditional schematic product system structure outlined above – with the supply network included within the support infrastructure, and the distribution channel separated from clients/markets. This formulation reflects both the importance of the distribution channel in the ICT industry, and the focus of ICT sectoral studies on overall sectoral activities.

The ICT product system



Source: CSES/CIER Analysis.

Taking these considerations into account, we developed an ICT product system map (Figure 2) which includes:

- *ICT producers*, including specialist firms and major non-specialist developers and producers, defined by their main activities – i.e. design, development, customisation, integration, support, etc.;
- *The distribution channel*, defined by major channels of direct and mediated ICT distribution – i.e. direct (package or service) and mediated (embedded, wholesale/retail), be they on-line or off-line, etc.;
- *Their clients and markets*, defined by industry/market or application and ICT industry linkages – i.e. market verticals (e.g. health, government, transport, education, etc.), application verticals (e.g. e-learning, e-logistics, e-payments, etc.) and horizontals (e.g. systems, utilities, tools, ERP applications, etc.), be they domestic or export;

- The collective *supply and support infrastructure*, defined by activity and contribution – i.e. education and training, business support services, R&D centres, finance and venture capital providers, industry networks and clusters, etc.; and
- The overarching *regulatory framework*, defined by scope and area of activity – e.g. intellectual property, business law (e.g. licensing), technical and quality standards, product and professional accreditation, etc.

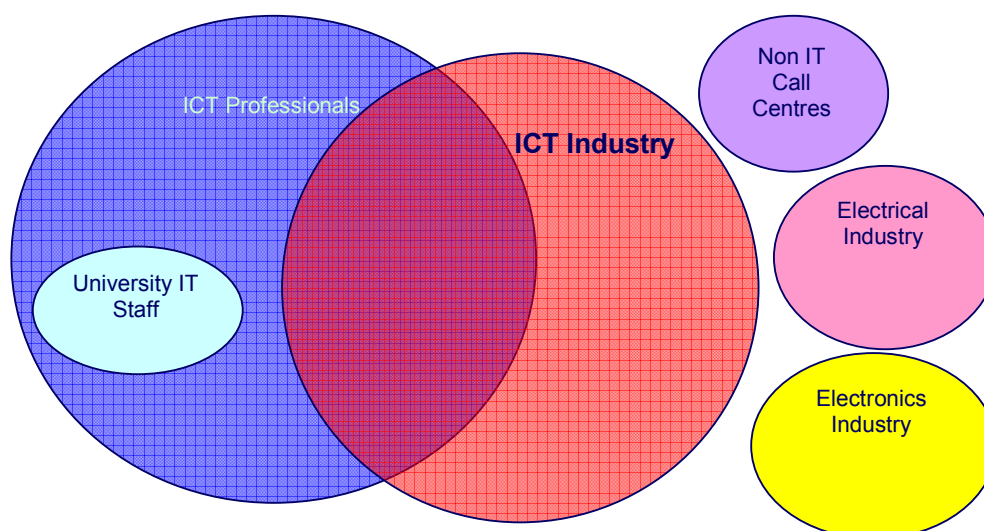
The map provides a framework for thinking and analysis, which focuses on ICT production, distribution and market applications. This report addresses the ICT producers and distributors, defined as the Tasmanian ICT Industry. Further scheduled reports in this series will address aspects of the Tasmanian ICT Supply and Support Infrastructure.

CIIER "ICT Worker" Model

One of the other 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 worked 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



This "bubble" diagram illustrates some of these elements.

There is a significant percentage of ICT professionals in the ICT industry, but ICT industry employment includes not only those professionals but also many ICT non-professional technical, sales, logistical and administrative staff.

The "ICT Industry"

The term "ICT Industry" is also often used in the press, or by other commentators, for a confusing range of different things, ranging from the "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.

We consider that the "broad" definition is best described by the term "ICT Worker", whereas the term "ICT Industry" is better reserved for the "tight" definition above, as defined by the Australian Bureau of Statistics⁹, but perhaps "loosened" to embrace the other ICT goods and services covered by the more globally accepted OECD (2003 and 2004) definition, in order that international comparisons be made more meaningfully.¹⁰

Whilst these overlaps and distinctions have been known for some time, to date there has not been an attempt to reconcile, and, more importantly, to quantify, the various components within a single employment model.

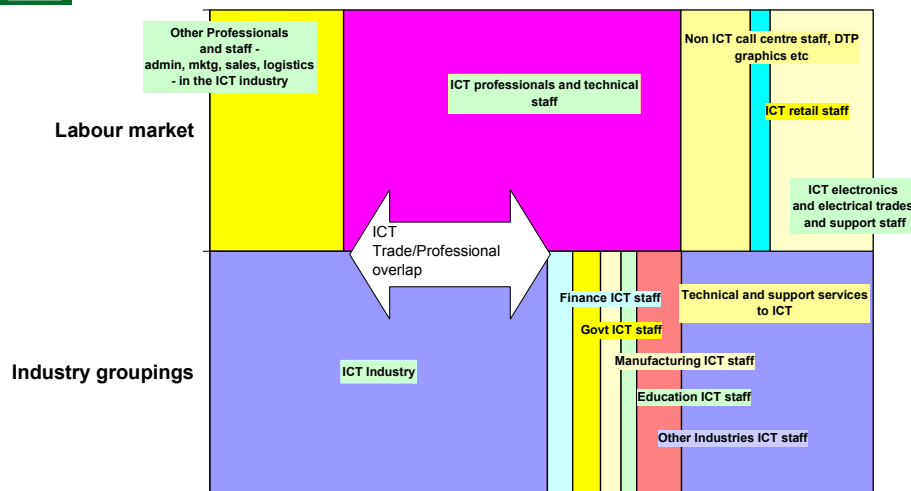
The diagram below illustrates a Model, developed by CIIER and Whitehorse, which allows us to reconcile these differences, regardless of the employment and classification paradigm selected, and to calculate the relative proportion of ICT employment that makes up the Australian ICT employment structure, by both Labour market and industry sector measures.

Perhaps as significantly, the Model also demonstrates the significant 65% overlap between ICT industry employment (using the "tight" ABS definition), 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. (CIIER and Whitehorse include communications and engineering professional and technical staff within this definition of ICT professionals and technical staff)



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



This new model also allows us to model ICT technical and professional employment, and therefore potential work-force demand, by industry sector. This can help in analysing, and quantifying skills needs, since each industry has some more specific ICT skill-sets among the more generic needs of every industry.

⁹ ABS 8126-0

¹⁰ A Proposed Classification of ICT goods, OECD, Paris, 2003; Classifying Information and Communication Technology services, OECD, Paris, 2004