

ICT Skills Snapshot

The State of ICT Skills in Victoria

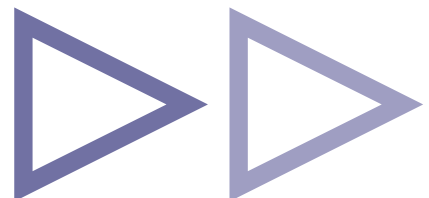
June 2003



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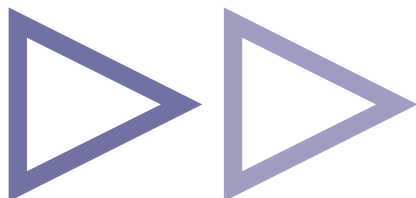
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Minister's Foreword



I am pleased to release the *ICT Skills Snapshot* for June 2003, the third of the Victorian Government's biannual assessments of the supply and demand of ICT skills in Victoria.

The *ICT Skills Snapshot* shows that the Victorian

ICT jobs market continues to stabilise, with a slight upturn in the number of job vacancies being recorded earlier this year.

This continues a trend identified in the *ICT Skills Snapshot* released in November 2002, which confirmed that Victoria's ICT industry was stabilising after a significant downturn in 2001.

The *ICT Skills Snapshot* also identifies a trend towards successful job applicants possessing multiple skills. The challenge for ICT professionals and graduates will be to have the right mix of professional and interpersonal skills to meet market expectations.

Significantly, Victoria maintains its position as the nation's largest provider of university ICT education. Last year Victorian universities produced 36 per cent of the nation's ICT graduates, and were home to a third of the country's ICT enrolments.

Most pleasingly, Victoria has the highest percentage of female ICT university students of any Australian state.

Figures from the Australian Bureau of Statistics (ABS) show that women now make up 24 per cent of the Victorian ICT workforce, up from 15 per cent recorded in May 2002.

Through our *New Realities* program, the Bracks Government is working hard to promote ICT as a great career option for young people and in particular for young women, and we will continue to

work towards increasing the ratio of females to males in the ICT industry.

The June 2003 report has incorporated new data made available by the Information Technology Contract and Recruitment Association (ITCRA). This data has added further depth and clarity to information gained by the Victorian Government's ICT Skills Tracking and Monitoring System.

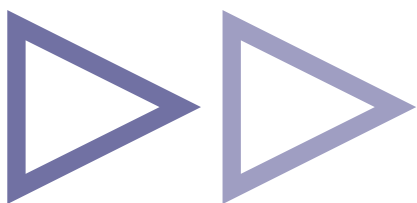
Some of the other key findings of the June 2003 report are that:

- Victoria held its position as the nation's second-largest employer of ICT-skilled people, with just over 30 per cent of the national total.
- Victorian regional ICT employment grew 47 per cent in the year to February 2003.
- ICT workers already resident in Victoria fill 87 per cent of Victorian jobs placed.
- Strong new areas of skill demand are emerging, including wireless technologies, instant messaging, web services and open source (Linux).

The *ICT Skills Snapshot* is an initiative of *skills x knowledge = growth*, the Victorian Government's framework for building the State's ICT skills and knowledge base.

The June 2003 *ICT Skills Snapshot* provides both retrospective and forward views of the Victorian ICT industry's growth and associated employment opportunities, and I commend it to you.

MARSHA THOMSON MP
Minister for Information and
Communication Technology





Executive Summary

This report is a snapshot of the Victorian market for information and communication technology (ICT) skills as at June 2003. The report has been prepared for the Victorian Government using a range of data sources to highlight the demand for and supply of ICT skills in Victoria.

Methodology

The *ICT Skills Snapshot* is generated from data stored in the ICT Skills Tracking and Monitoring System developed for the Victorian Government to identify and track the quantity and type of ICT skills and qualifications required by industry and the expected supply of these skills. The database is continually updated as new information comes to hand and the latest data available has been used in this report.

Qualitative and anecdotal data was obtained through workshops and interviews to augment the ICT Skills Tracking and Monitoring System. These were conducted in April and May 2003 with the purpose of obtaining up-to-date qualitative data on future projections of skills requirements. The workshops were attended by senior representatives of organisations active in using, supplying and brokering ICT skills in Victoria. Representatives were drawn from industry, government departments, education providers, industry associations, recruitment agencies, hardware, software and service providers and users of ICT skills in both Melbourne and regional Victoria.

Trends and Emerging Skills

After a steep decline in demand for ICT jobs in 2001, the market appears to have levelled off in 2002, with a very slight upturn appearing in the first few months of 2003. Job vacancies have stabilised at about 13% of the numbers recorded back in January 2000. This is expected to become the norm for the near future.

In general, it appears that it is still a buyer's market and employers are expecting more for less from their ICT staff. There is an expectation that the package that ICT professionals bring with them will include multiple skills – not just technical skills, but interpersonal skills and in certain instances business skills as well. The challenge for ICT professionals and graduates will be to have the right mix of skills, with an ongoing need for reskilling and upskilling as times change.

Likely areas of demand over the next 12 months are:

Wireless technologies – still emerging skills, but certain of these such as GSM and broadband CDMA are already proving difficult to fill.

Web Platforms and Distributed Systems – Java, J2EE, ColdFusion, MS.Net and XML are continuing to be strongly demanded.

Security and risk management – not just the technical skills to support system, transaction and data security, but the business skills to support risk management and corporate governance initiatives.

Business process re-engineering, testing and quality – as businesses continue to improve the performance of their existing systems rather than embarking on major projects.

Open Source (Linux) – major IT vendors are now supporting Linux and it is becoming accepted in user organisations.

Business intelligence, storage – as companies retain more and more data they are looking for ways to store and extract it in meaningful, efficient ways to improve their business. This is another example of the marriage of business and technical skills and a reliance on existing infrastructure.

Instant messaging – some industry analysts predict instant messaging to overtake e-mail as a communication tool by 2005.



Web Services – a technology still in its infancy, but one in which there is a lot of research and development occurring, which should stimulate demand in the medium term.

Business skills and ‘smartsourcing’ – the ability to align IT deliverables with the business needs, plus a trend to ‘smartsourcing’ – outsourcing or insourcing specific business functions, means that relationship management skills will be in demand.

CRM/ERP (mid-tier) – implementation of Customer Relationship Management and Enterprise Resource Planning applications by mid-tier companies is expected to increase demand for these skills.

Demand for Skills

Victoria provides 25% of the nationwide demand for ICT professionals as measured by advertisements.

Employers seem to be expecting more for less. There are now more skills advertised per position and employers are becoming more specific about the skills they really want. Contractors and new recruits looking for new positions appear to be having their salaries forced down; while those in existing positions are becoming slightly more confident.

The average salary for an ICT professional in Victoria in December 2002 was \$74,468, which is just under the national average and 7.8% lower than the first half of 2002.

Demand for certain positions such as Project Manager and Pre Sales Consultant has decreased, but the key skills associated with the positions (project management and sales respectively) now appear in advertisements for other positions. Once again, the trend is towards multi-skilling.

Supply of Skills

Victoria continues its position as the largest provider of university ICT education with 34% of the national

total of ICT enrolments. Overall university enrolments are up – more than 25,000 – but commencements in 2002 were 18% lower than 2001 for undergraduate enrolments and 36% lower for post-graduate enrolments. In Victoria, 28% of university ICT students are female; this is the highest percentage of any of the states.

In 2002, Victoria produced 36% of the nation’s ICT university graduates.

In 2002, there were over 10,000 students enrolled in vocational and education training in Victoria. 36% of these students are female, with the TAFE institutes providing the majority of training with 77% of students. 37% of students are based in regional Victoria and 8% based overseas or interstate.

Feedback from industry workshops indicates that an upside from the downturn in the industry has been TAFE’s ability to recruit from a broader field of quality ICT professionals for teaching and other roles in colleges.

Job Placement and Skills Shortages

New data made available by members of ITCRA (Information Technology Contract & Recruitment Association) has shown that 87% of jobs placed are filled by people already resident in Victoria and that in the majority of cases the successful candidate has a higher academic qualification than that requested by the employer.

Information from the Department of Employment and Workplace Relations (DEWR) has not identified any skill shortages, but skills in certain areas of security (technical and business), communications, data warehousing and CRM/ERP applications are proving difficult to fill.



The State of the State

The state of Victoria's ICT employment and student levels has been assessed using employment estimates from the Australian Bureau of Statistics (ABS), vacancy and salary data from online advertisements and student enrolment data from government education departments.

Employment

Estimates from ABS show that Victoria continued its trend as the second largest employer of ICT skills in Australia with 85,700 employed in February this year, just over 30% of the national total of 283,800. This number is a return to the employment levels of May 2001, prior to the slump that saw 15% of ICT jobs in Victoria disappear in 2001, to a low point of 73,300 in August 2001.

87% of these jobs are in greater metropolitan Melbourne, but the actual number has declined in the year to February, while the number of regional jobs has increased by almost 50%. Similarly, the number of males employed has declined in the year to February, but the number of females has increased by 25%. In February females made up 24% of the Victorian ICT workforce, up from a low of 15% in May 2002.

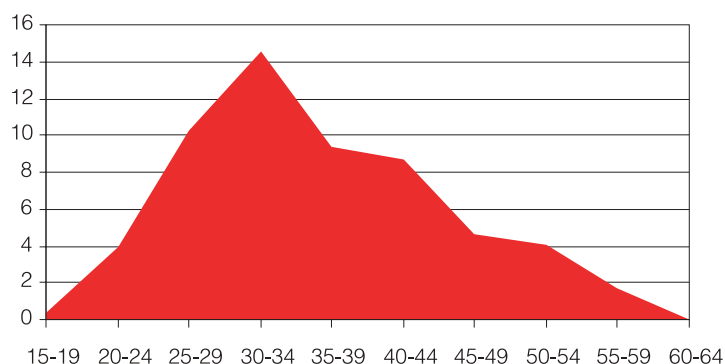
There are more jobs in the ICT user community than in the ICT industry itself where the Telecommunication Services and Computer Services industries collectively employ 42.1% of ICT professionals. The remaining 57.9% are employed across many industries, with the major employers being Finance and Insurance (7.3%), Manufacturing (7.0%) and Government, Administration and Defence (4.5%).

75% of ICT professionals are between 25 and 44 years of age, with only 7% (4,300) under 25. With nearly 5,000 undergraduate university completions in 2000 and 2001¹, this suggests that not all students

completing ICT courses have actually taken up ICT positions.

Background data for this section can be found in Appendix 2 – ABS Employment Estimates.

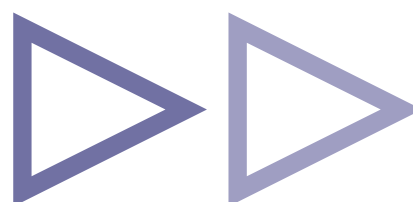
Persons Employed ('000) in ICT by 5-year age group, Victoria, February 2003



Source: Australian Bureau of Statistics, Quarterly Labour Force Survey, 2003

The average salary for an ICT professional in Victoria in the last half of 2002 was \$74,468, only slightly under the Australian average of \$74,560. This represented a decrease of 7.8% from the first half of 2002. The average hourly contracting rate was \$45 per hour, compared to the Australian average of \$46 per hour. In the last half of 2002, contract jobs made up 17.1% of ICT job advertisements in Victoria, similar to the Australian average. This compares to 22% of advertisements in the first half of 2002.

¹ Calculated as 70% of all IT university completions, which has been the trend for several years.

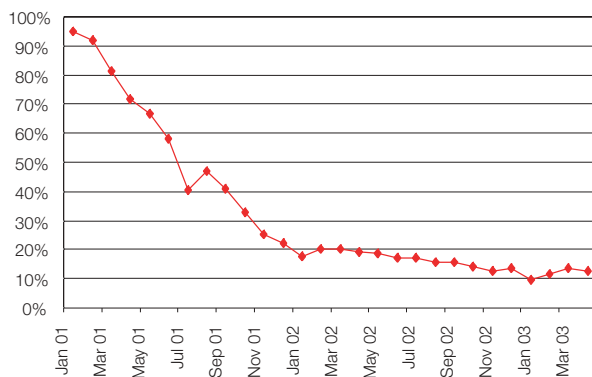




Vacancies

The slight upturn in employment is reflected in the levelling out of ICT vacancies. After the dramatic drop in 2001, the number of vacancies on the DEWR ICT Vacancy Index appears to have steadied in the six months to April 2003.

DEWR ICT Vacancy Index for Victoria (January 2000=100)

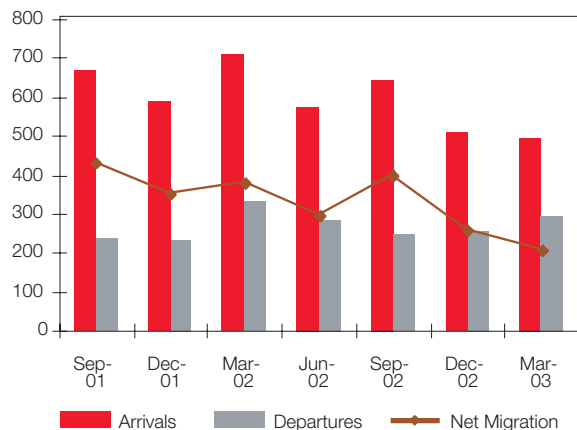


Source: DEWR, ICT Vacancy Index, 2001, 2002, 2003

Migration

Net migration in the December quarter of 2002 was lower than in 2001, but still positive. A net total of 1458 ICT professionals moved to Victoria in 2002.

Net Migration of ICT Professionals to Victoria



Source: Department of Immigration, Multicultural and Indigenous Affairs, 2001, 2002

Data provided from ITCRA (Information Technology Contract & Recruitment Association) shows that of 283 ICT positions filled in Victoria in the first five months of 2003, 87% were filled by people already resident in Victoria.

Education

University Enrolments

Victoria continues to be the state with the largest number of ICT students enrolled at university, with 25,496 students - almost 34% of the national total. The overall number of students enrolled is 9% higher than in 2001, despite the fact that commencements in 2002 were 18% lower than 2001 for undergraduate courses and 36% lower for post-graduate courses.

For 2002, the breakdown between male and female university students shows that in percentage terms there are slightly more females studying ICT than employed in ICT, with 28% of students being female.

In 2002, there were 10,080 overseas students enrolled in ICT courses, up 5% from 2001.

VET Enrolments

In 2002 there were 10,639 students enrolled in the Information Technology Qualification programs delivered by Registered Training Organisations. Of these, 34% were female, 56% were metropolitan based, 37% regionally based and 7% based overseas or interstate.



Skills in Demand

Approach

For the purposes of this report, the demand for skills was assessed using two main tools. The first of these is quantitative analysis, using detailed statistics on positions and skills advertised on online job sites, provided by the Department of Employment and Workplace Relations (DEWR) ICT Vacancy Index and by the IT Skills Hub's Market Monitor.

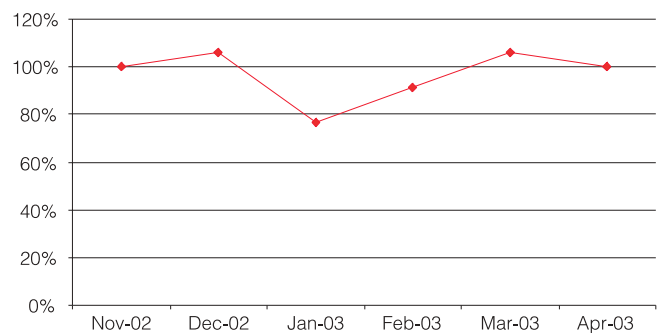
The second tool is a series of workshops and interviews, using the quantitative data as a starting point, in which industry participants offer qualitative and anecdotal evidence of the state of the ICT skills marketplace in Victoria. A list of participating organisations can be found in Appendix 1.

Levels of Demand

DEWR's ICT Vacancy Index shows a levelling out of demand for ICT positions in 2002 after a sharp decline in 2001. This levelling out is continuing in 2003, after the cyclical slowdown over the December/January period.

In November 2002 DEWR re-baselined the Index to reflect activity going forward after the decline in 2001. The chart shows the normal cyclical slowdown in December/January with a return to the November level in April this year.

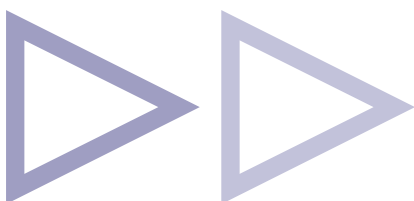
**DEWR ICT Vacancy Index for Victoria
(November 2002=100)**



Source: DEWR, ICT Vacancy Index, 2002, 2003

The DEWR ICT Vacancy Index is based on a weekly count of ICT vacancies advertised on four sites: Jobnet.com.au; Seek; Fairfax IT Jobs; and Monster.com.au. Employment.com.au is no longer counted as the site has now merged with CareerOne.

The composite series commences from January 2000 and a four-weekly average has been applied to smooth volatility in the data. The series includes only those vacancies lodged within the 14 days prior to counting. Some ICT vacancies are duplicated and a small number relate to overseas vacancies. Many ICT vacancies are advertised on more than one site and, consequently, the number of advertisements should not be viewed as a measure of the number of ICT jobs available. These sites are quite dynamic and operate in a sector with very high vacancy turnover. Consequently, the ICT Vacancy Index should be viewed as a broad indicator of trends in the demand for ICT skills.





Comments regarding ICT Vacancy Index in April 2003

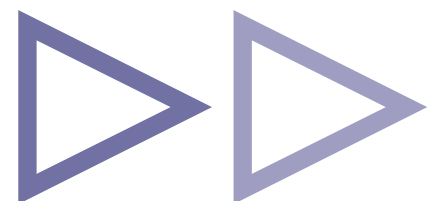
The DEWR ICT Vacancy Index rose by 1.2% over the four weeks to mid April 2003 to 94.0 (November 2002 = 100). The index is down 24.3% over the last year. The four Australian Information and Communication Technology (ICT) online recruiting sites included in the ICT Vacancy Index averaged around 7400 advertisements in the four weeks to mid April 2003. ICT positions may be advertised on more than one site. The number of advertisements is an indicator of demand for ICT skills and not a measure of the number of ICT jobs available.

In April, Victoria had 24.5% (around 1700) of ICT online vacancies.

There is anecdotal evidence of increased churn in positions in the first few months of 2003 and of improved confidence of professionals, especially contractors already in positions looking to renegotiate their contracts. Similarly, full-time professionals who may have been riding out the downturn in their current positions or waiting for redundancy packages have now started proactively seeking new positions.

The above notwithstanding, industry reports that it is still a buyer's market, with employers being able to drive salaries down. This has led to lower salary expectations for contractors and new recruits as they seek new positions.

In summary, both statistics and anecdotal evidence indicate a slight upturn in 2003.





Demand for Skills

Unless stated otherwise, statistics relating to job advertisements refer to Australia-wide data for the second half of 2002, and comparisons are with the first half of 2002. At the end of this report is a Glossary that contains technical terms and acronyms used throughout this and following sections.

Technical Skills in Demand

- The number of skills being advertised for each position is increasing. The number of technical skills advertised per position rose to

12.2 from 10.9. When combined with the lower salaries being paid, this suggests that ICT professionals are being expected to do more for less.

- The five most in-demand programming languages were Java, SQL, C++, Visual Basic and C, in that order. All of these registered a decrease in demand during 2002.
- The top ten skills in Victoria (measured by volume and listed in the following table) all experienced decreases in demand. This can be explained by the flatness in the market and the decline in number of jobs being advertised.

Highest Volume of Skills in ICT Advertisements, Victoria, July - December 2002

Skill	Victoria	Victoria	Australia	Australia	% Victorian Ads to Australian Ads
	No. of Ads	% Increase	No. of Ads	% Increase	
Technical	5,242	-35.4	22,318	28.6	23.5
Support	4,525	-21.5	19,716	-22.0	23.0
Software	3,737	-36.5	18,315	-36.0	20.4
Implementation	3,704	-44.2	16,241	-26.8	22.8
Design	3,407	-46.3	16,481	-31.2	20.7
Communications	3,077	-54.3	13,701	-46.8	22.5
Sales	2,699	-63.3	11,087	-38.3	24.3
Analysis	2,626	-28.3	11,518	-17.6	22.8
Maintenance	2,401	-11.7	10,795	-22.3	22.2
Network	2,243	-52.6	9,907	-37.1	22.6
Finance	2,127	-29.4	9,354	-22.9	22.7
Integration	2,097	-39.7	7,853	-24.5	26.7
Consulting	2,078	-19.9	6,715	-0.9	30.9
Documentation	1,972	-16.9	9,401	-24.9	21.0
UNIX	1,913	-31.9	8,435	-48.8	22.7
Training	1,910	-17.3	8,163	-32.6	23.4
Reporting	1,793	-26.4	7,589	-17.4	23.6
MS Windows NT	1,725	-25.5	7,383	-44.4	23.4
World Wide Web	1,699	-40.3	7,746	-29.2	21.9
Qualification	1,680	-29.5	8,001	-31.3	21.0

Source: Gottliebsen Research, 2003



- Management positions saw skills such as 'budget control' and 'cost benefit analysis' increase in demand. This reflects the continued pressure on costs and budgets and the growing accountability being required from IT managers and projects. Cost control and return on investment from projects will continue to be key KPIs for management, as organisations look for more, and quantifiable, value from IT projects.
- Technical skills that saw the highest increase in demand in Victoria are listed in the following table. Microsoft was the vendor with the most in-demand skills.
- Of the top 248 most-advertised skills in Victoria, only 29 of these recorded an increase in demand. The following table shows those skills recording an increase greater than 20%.

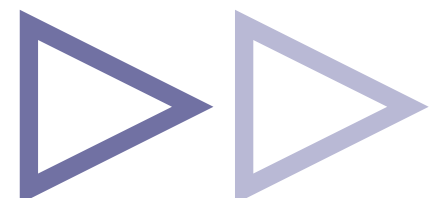
Interpersonal Skills in Demand

- In addition to technical skills, there is a continuing increase in the number of 'soft skills', or interpersonal skills, being requested for positions. Nearly 50% of jobs advertised requested interpersonal skills.
- Industry participants agreed that the demand for interpersonal skills was growing, but felt that the ICT industry was behind other industries in using objective measurements of these.
- Of more than 500 interpersonal skills that are tracked, the top five in volume were: Working in a Team/Team Player, Management, Communication Skills, Leadership and Confident.

Skills Recording an Increase in Demand, Victoria, July – December 2002

Skill	Victoria	Victoria	Australia	Australia	% Victorian Ads to Australian Ads
	No. of Ads	% Increase	No. of Ads	% Increase	
MS Windows NT	1,725	-25.5	7,383	-44.4	23.4
SQL Server 2000	220	58.8	951	12.3	23.1
Portal	168	36.6	745	19.1	22.6
MS.Net	302	28.8	1,897	42.3	15.9
SAP SD	246	27.8	823	-8.4	29.9
IIS	206	26.4	1,234	-9.9	16.7
Help Desk	517	24.8	2,351	-6.8	22.0
Testing - Test Planning	235	23.8	990	-1.2	23.7
PABX	159	20.8	752	-61.1	21.1

Source: Gottlieb Research, 2003





Demand for Positions

The number of advertisements in Victoria was down 40.7% in the second half of 2002 when compared to the first half, indicating less churn in the industry. As seen earlier in the DEWR ICT Vacancy Index, with respect to positions advertised, Victoria generally has about 25% of the national advertisements for specific skills.

- There was a positive move in the number of Testing and Quality positions being advertised. This suggests that organisations are still focussed on upgrading and improving existing systems in an effort to get more from them, as well as improving the quality of the system development life cycle.
- There is limited evidence of major projects starting, primarily in the telecommunication and finance sectors. There appears to be a turnaround in IT spend, users having done about as much cost-cutting as they can need to start investing again, even if only on incremental changes to existing systems.
- There was a marked decline in the number of advertisements for Sales Executives in 2002, however there has been a slight upturn in 2003. Industry observers suggest that Sales roles are often a leading indicator of the state of the industry – the first to be cut in tough times, but the first to return as times improve.
- In keeping with the overall decline in job advertisements, there was a decline of 28.3% in advertisements for graduates. As with other positions, a broader range of skills is being required of graduates - with the chief technical skills being software development and support, and the dominant interpersonal ones being working in a team and communications.
- The top 10 advertised positions in Victoria account for nearly 60% of advertisements. All

of these saw a decline in demand in the second half of 2002.

- In keeping with trends for other positions, the position of Project Manager decreased in demand by 24%, but demand for the skill of 'project management' increased in many other positions. Similarly, the position of Pre Sales Consultant declined by 89.3% in the second half, but the demand for 'Sales' as a skill increased for positions such as Support Engineer. These are further examples of the need for professionals to do more for less and to bring a broader skill set to positions.
- The highest increases in demand were for lower volume positions such as Senior Business Analyst, Test Engineer/Analyst, Data Analyst/Modeller and Test Manager. This continues to support the trend to quality, testing and better business value.

Trends - Emerging Skills

The increase in demand for technical and interpersonal skills for each position means that professionals are being expected to have a broader skills base. Industry participants agree that employers are looking for a more complete package from professionals – especially in the area of personal attributes. There is an expectation that upskilling and reskilling, in technical, interpersonal and business skills, are the real challenges for these professionals into the future.

Open Source (Linux)

The Open Source environment is becoming increasingly prevalent in the IT economy, with the skill attribute of Open Source increasing in demand by 71.4% Australia-wide.



Web Platforms and Distributed Systems

It is expected Java, and in particular J2EE, will continue to be strongly demanded. Other languages/systems that will remain strong are ColdFusion, MS.Net and XML.

Wireless Technologies (Wi-Fi & WLAN)

Wireless skill attributes of Wi-Fi incorporating the 802.11a, b and g standards, and WLAN (Wireless LAN) are forecast to emerge over the next year. This expectation is based on continued industry investment in wireless R&D. Specific skills such as GSM and CDMA broadband are currently proving difficult to find.

Business Process Re-engineering (BPR)

The skill of BPR, sometimes also called Business Process Improvement (BPI) or Business Process Management (BPM), is expected to remain strong. This sits well with the no-customisation strategies being recommended by software vendors and adopted by some of the largest implementers. Instead of modifying software to support business processes, the processes are adapted and honed to take maximum benefit from the system. It is consistent with maximising the value of IT systems.

Testing, Quality and Multiple Skills

The increased demand for Testing and Quality positions is expected to continue. Along with many other positions, these will require multiple skills – such as analysis, some programming, some project management and the ability to work on multiple projects.

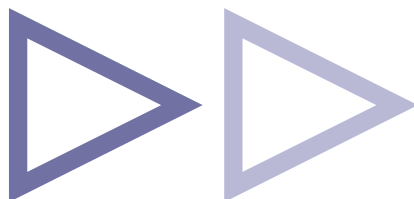
Security and Risk Management

Security skills will continue to be in demand. These skills range from technical skills for systems, such as implementation of firewalls, secure messaging and new encryption standards through to the more business-focussed risk management. With the recent focus on corporate governance, security is as much about internal protection and compliance as protection from the outside.

Business Skills and 'Smartsourcing'

Demand for ICT professionals who can transcend the technical and understand the business needs and communicate in business terms is expected to increase. The continuing pressures on proving the business value of IT will drive this.

The trend to 'smartsourcing' – outsourcing or insourcing particular business functions, but generally not core business functions – means there will be higher demand for business skills such as contract management, plus vendor and client relationship management.





Business Intelligence

Business Intelligence and the supporting data warehouses enable the interfacing of all types of systems, without the need to necessarily purchase one integrated system. Products such as Cognos, Impromptu, PowerPlay and Crystal Reports are proving popular in addressing these information issues. This is even more critical in an environment where companies have to make do with their existing IT infrastructure in getting more with less.

CRM/ERP (mid-tier)

Both the skills of CRM (Customer Relationship Management) and ERP (Enterprise Resource Planning) recorded large decreases in demand. The skill demand is stagnating at the moment, possibly because the development life cycle to implement a fully functional ERP/CRM system is long and costly because it is currently pitched at the top end of businesses. It is suggested that the entry of CRM into the small to mid-tier companies will increase the skill demand. All the key IT vendors are committed to CRM/ERP, and are investing heavily in both business streams.

Instant Messaging (IM)

The skill attribute of IM not only recorded a high volume of advertisements Australia-wide but also increased in demand by 73.7%. Despite concerns over security, IM is moving from the hands of teenagers and into the corporate enterprise at an increasingly rapid rate. IM will continue to grow throughout the business community with some analysts predicting that IM will surpass e-mail as a communication tool by 2005.

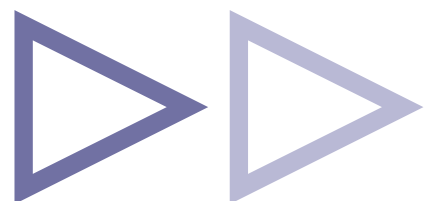
Storage

Although the demand for Storage skills decreased by 27.8% Australia-wide, it is still considered an area of ICT that will continue to grow in the coming years. There is now a significant increase in data being stored by companies, largely driven by ERP and Business Intelligence needs that will continue to grow. This data needs to be stored, managed, researched and reported upon, all in real time. Skills are required to support this.

Web Services

Web Services technology is still in its infancy, but continues to be a dominant technology. Although there is a lot of background research and development activity, much of it has not translated into widespread adoption of the technology. Many companies appear to be taking a "wait and see" view with this evolving technology.

Although the skill of Web Services increased in demand by 30.2%, many of the surrounding Web Services technical skills did not follow this same trend. The technology will continue to evolve, but will take time to fully reach one of its main objectives of providing software as a service.





Skills in Short Supply

In DEWR's most recent Victorian survey in October 2002, there were a number of skills classified as being "difficult to fill". All of these skills are in areas of ICT that are included in the earlier Emerging Skills section.

Six of these skills relate to security and risk management. As has been shown earlier, this is an area of continued focus for most organisations; driven by the need for transaction security, data security and/or corporate governance. In this environment, both technical skills and business skills are proving difficult to find.

The Communications skills are all related to Wireless - a technology that has been clearly identified as an emerging technology.

The difficulty in finding PeopleSoft and Siebel skills may well be linked to the move by mid-tier companies to implement ERP and CRM packages.

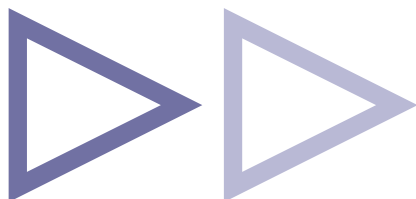
Data warehousing is a key component of Business Intelligence, another area expected to continue with strong growth due to the need for organisations to store and extract (in meaningful terms) their data.

Department of Employment and Workplace Relations - ICT Skills Shortages, Victoria, October 2002

Skill	Supply
General Application Development/Software Engineering	
Firewall/Internet Security	D
Java Security and e-commerce	D
Client/Server Applications	
PeopleSoft	D
Siebel	D
System Software Support	
Data Warehousing	D
Communications	
Radio	D
GSM	D
Broadband CDMA	D
Satellite Design	D
E-Commerce	
E-commerce security (non-programming)	D
Security	
Risk Management	D
CISSP	D
PKI	D

Source: DEWR, State Skills Shortage Lists Victoria, 2002, from research undertaken by the Victorian Labour Economics Office of DEWR.

Note: Recruitment difficulties (D) occur when employers have some difficulty in filling vacancies for an occupation. There may be an adequate supply of skilled workers, but employers are still unable to attract and recruit sufficient suitable employees.





Salary Movements

The average salary for an ICT professional in Victoria in the last half of 2002 was \$74,468, only slightly under the Australian average of \$74,560. This represented a decrease of 7.8% from the first half of 2002.

Of the 59 positions tracked in the IT Skills Hub Market Monitor, a slight majority saw salaries decline from the first half to the second half of 2002. Positions that suffered a decrease of more than 10% were Hardware Engineer, Management Consultant, Project Planner, Project Engineer, Communications Specialist, Data Analyst, Senior Software Engineer, System Integrator and Trainer.

The only positions experiencing an increase greater than 5% were Development Manager, Quality Engineer, Co-ordinator and Support Officer.

Except for the few positions highlighted above, the salary movements do not appear to have been as severe as expected. Industry indicates that it is those people applying for new positions who seem to have to take a lower salary than that expected.

The following table shows the average salaries for the 20 most-advertised positions. It also shows how the Victorian average compares to the Australian average and the increase/decrease from the first half of 2002 to the second half.

Position	Victoria Avg Sal	Australia Avg Sal	% Difference Vic/Aus	Difference 2nd/1st half	Victoria Hourly Rate
Developer/Programmer	\$66,481	\$69,789	-4.7%	-0.4%	\$43
Consultant/Specialist	\$91,866	\$91,694	0.2%	-5.0%	\$56
Systems Engineer/Architect	\$92,552	\$92,379	0.2%	3.2%	\$56
Sales Executive	\$113,067	\$116,764	-3.2%	-4.9%	\$71
Business Development Manager	\$141,107	\$145,721	-3.2%	1.1%	\$89
Analyst Programmer	\$68,068	\$70,804	-3.9%	2.0%	\$43
Business Analyst/Consultant	\$74,937	\$75,002	-0.1%	-1.1%	\$46
Support Officer	\$51,142	\$54,606	-6.3%	9.6%	\$33
Manager	\$94,770	\$93,802	1.0%	n/a	\$57
Functional/Application Specialist	\$88,168	\$88,244	-0.1%	-2.1%	\$54
Project Manager	\$97,069	\$98,519	-1.5%	-8.1%	\$60
Systems Administrator	\$65,934	\$66,880	-1.4%	-4.2%	\$41
Software Engineer	\$76,539	\$79,161	-3.3%	0.3%	\$48
Database Administrator	\$76,261	\$77,354	-1.4%	-1.0%	\$47
Team Leader/Supervisor	\$84,370	\$87,903	-4.0%	1.3%	\$54
Tester	\$64,248	\$63,859	0.6%	-2.2%	\$39
Account Manager/CRM	\$103,904	\$108,426	-4.2%	1.4%	\$66
Network Engineer/Analyst	\$71,317	\$74,930	-4.8%	1.5%	\$46
Help Desk Officer	\$42,825	\$44,445	-3.6%	3.4%	\$27
Test Engineer/Analyst	\$64,110	\$67,075	-4.4%	n/a	\$41

Source: IT Skills Hub, Market Monitor, 2002, 2003



Supply of Skills

Approach

Data on the supply of skills comes from two main sources. The first are the government departments who provide quantifiable data on the number of commencements, completions and enrolments in universities, TAFE colleges and private providers. The second are the industry participants, particularly recruitment agencies, who can assess the availability of skills when attempting to fill positions.

Supply Issues

In a buyer's market for employers the challenge for those on the supply side, whether newly graduated students or seasoned professionals, is to have the right skills.

There are differing opinions on the suitability of recent graduates for the workplace. A number of industry participants feel that student expectations do not match the realities of the workplace, especially in the areas of the latest technology. For example, students may learn Windows XP, but the reality is that a large number of sites still use Windows 2000 or NT.

There is also ongoing debate on what skills new graduates should have – generic thinking skills or specific technical skills. As has already been shown,

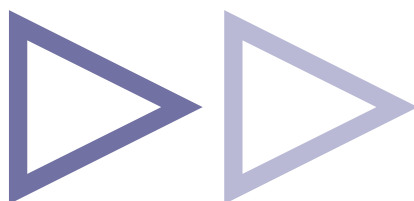
employers are looking for a broader set of skills – in many instances including business and interpersonal skills. Feedback from educational institutions suggests that employers can sometimes send mixed messages – requesting university graduates (with a broader skill set), but in reality wanting (technical) skills generally provided by TAFE courses.

Anecdotal evidence suggests that upskilling and reskilling for existing professionals is a key challenge. With the increased demand for more skills per position, technical professionals may no longer find expertise in one particular discipline is sufficient. For example, a position may require "Java developer with Visual Basic and C++ skills". Many of these skills can be attained from short courses provided by TAFEs and private providers.

Feedback from industry workshops indicates that an upside from the downturn is the industry has been TAFE's ability to recruit from a broader field of quality ICT professionals for teaching and other roles in colleges.

Higher Education

Victoria continues the trend of being the largest source of ICT university enrolments in Australia, with 34% of the total number of students. Victoria also has the highest percentage of female enrolments at 28%.





Department of Education, Science and Training – Australian University ICT Enrolments by State, 2002

State	Males	Females	Total	% of Australian Total	Male %	Female %
New South Wales	14,928	4,713	19,641	26.1%	76.0%	24.0%
Victoria	18,415	7,081	25,496	33.9%	72.2%	27.8%
Queensland	12,685	3,620	16,305	21.7%	77.8%	22.2%
Western Australia	4,695	1,174	5,869	7.8%	80.0%	20.0%
South Australia	2,778	842	3,620	4.8%	76.7%	23.3%
Tasmania	932	239	1,171	1.6%	79.6%	20.4%
Northern Territory	232	77	309	0.4%	75.1%	24.9%
Australian Capital Territory	1,788	474	2,262	3.0%	79.0%	21.0%
Multi-state	471	131	602	0.8%	78.2%	21.8%
Total Australia	56,924	18,351	75,275	100%		

The total number of enrolments for 2002 is a 9.3% increase over the number in 2001. What this does not show, however, is the steep decline in commencements for 2002. The total number of commencements of ICT university courses in 2002 was 8,349, a 25% decrease from 2001. The decline for undergraduate commencements was 18% and for post-graduate commencements 36%.

Department of Education, Science and Training – Victorian University ICT Enrolments by Institution, 2002

University	Commencing Undergrad	Commencing Postgrad	Not Commencing Undergrad	Not Commencing Postgrad	Total
Deakin University	523	117	760	241	1,641
La Trobe University	382	96	728	92	1,298
University of Melbourne	576	66	1,705	88	2,435
Monash University	1,692	976	4,050	1,423	8,141
University of Ballarat	171	220	280	192	863
RMIT University	694	736	1,722	1,513	4,665
Swinburne University of Technology	669	401	1,675	872	3,617
Victoria University	719	311	1,455	351	2,836
Total	5,426	2,923	12,375	4,772	25,496



Appendix 3 shows university enrolments broken down by course at each institution. The majority of enrolments are in broad courses such as Information Systems, Computer Science or Computer Engineering.

Analysis of ICT university completions for 2002, shows the majority of graduates are from broad fields of study such as Information Technology and

Computer Science. There were no completions for fields such as Database Management, Computer Graphics or Security Science – specific skills that are more likely provided from vocational or TAFE training. Victoria produced 36% of the nation's ICT graduates in 2002, with the strongest presence being in Information Technology (not elsewhere classified).

Department of Education, Science and Training – Victorian University ICT Completions by IT Field of Study and Gender, 2002

Field of Study	Males	Females	Total	% Australian Total	Male%	Female%
Computer Engineering	187	41	228	31%	82%	18%
Computer Graphics	0	0	0	-	-	-
Computer Science	777	151	928	35%	84%	16%
Computer Science nec	5	2	7	1%	71%	29%
Database Management	0	0	0	-	-	-
Information Systems	396	249	645	42%	61%	39%
Information Systems nec	270	158	428	46%	63%	37%
Information Technology	31	11	42	5%	74%	26%
Information Technology nec	663	254	917	77%	72%	28%
Networks and Communications	0	0	0	-	-	-
Other Information Technology	90	36	126	38%	71%	29%
Programming	0	0	0	-	-	-
Security Science	0	0	0	-	-	-
Systems Analysis and Design	0	0	0	-	-	-
Victorian total*	2,387	899	3,286	36%	73%	27%

* The data takes into account the coding of Combined Courses to two fields of education. As a consequence, counting both fields of education for Combined Courses means that the totals may be more than the sum of all broad fields of education. nec = not elsewhere classified.



Vocational Education and Training

In Victoria in 2002 there were a total of 10,639 students enrolled in Qualification Programs as part of the Information Technology National Training Package. Of these, 77% were studying at TAFE Institutes, 37% of all students were based in regional Victoria and a further 8% based overseas or interstate.

The percentage of females taking VET programs is higher than university programs with 36% of students being female.

Victorian participation in the Information Technology National Training Package in 2002 – Qualification Programs delivered by Registered Training Organisations.

Gender	Qualification	Enrolled
TAFE Institutes		
Metropolitan		
Female	AQF Certificate II	314
Male	AQF Certificate II	365
Female	AQF Certificate III	405
Male	AQF Certificate III	844
Female	AQF Certificate IV	129
Male	AQF Certificate IV	663
Female	AQF Diploma	284
Male	AQF Diploma	1,085

Gender	Qualification	Enrolled
Non-metropolitan		
Female	AQF Certificate I	290
Male	AQF Certificate I	378
Female	AQF Certificate II	582
Male	AQF Certificate II	852
Female	AQF Certificate III	175
Male	AQF Certificate III	615
Female	AQF Certificate IV	63
Male	AQF Certificate IV	302
Female	AQF Diploma	3
Male	AQF Diploma	8

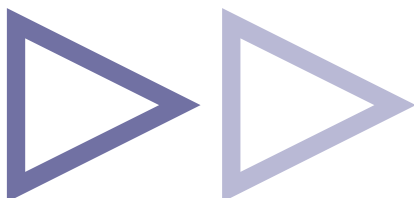
Interstate / Overseas

Male	AQF Certificate I	92
Female	AQF Certificate II	20
Male	AQF Certificate II	143
Female	AQF Certificate III	1
Male	AQF Certificate III	22
Female	AQF Certificate IV	103
Male	AQF Certificate IV	103
Female	AQF Diploma	119
Male	AQF Diploma	200
TAFE	total	8,160

Private providers

Metropolitan

Female	AQF Certificate II	204
Male	AQF Certificate II	136
Female	AQF Certificate III	534
Male	AQF Certificate III	382
Female	AQF Certificate IV	37
Male	AQF Certificate IV	50
Female	AQF Diploma	2
Male	AQF Diploma	4





Gender	Qualification	Enrolled
Non-metropolitan		
Female	AQF Certificate II	44
Male	AQF Certificate II	56
Female	AQF Certificate III	86
Male	AQF Certificate III	138
Not stated	AQF Certificate IV	1
Female	AQF Certificate IV	7
Male	AQF Certificate IV	19
Female	AQF Diploma	4
Male	AQF Diploma	12

Interstate / Overseas

Female	AQF Certificate II	1
Male	AQF Certificate II	7
Female	AQF Certificate III	1
Male	AQF Certificate III	8
Private provider	total	1,733

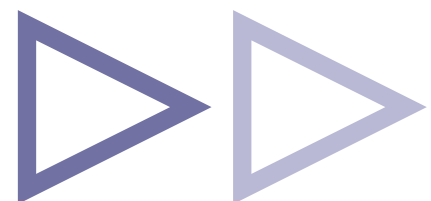
ACE Organisations

Metropolitan

Female	AQF Certificate I	49
Male	AQF Certificate I	60
Female	AQF Certificate II	200
Male	AQF Certificate II	61
Female	AQF Certificate III	15
Male	AQF Certificate III	50
Female	AQF Certificate IV	11
Male	AQF Certificate IV	34

Gender	Qualification	Enrolled
Non-metropolitan		
Female	AQF Certificate I	1
Female	AQF Certificate II	98
Male	AQF Certificate II	50
Female	AQF Certificate III	45
Male	AQF Certificate III	66
Female	AQF Certificate IV	2
Male	AQF Certificate IV	4
ACE organisations	total	746

Source: Victorian Department of Education and Training, 2003





Job Placement and Skills Shortages

Approach

The Information Technology Contract & Recruitment Association (ITCRA) is the peak body for ICT recruitment and contracting firms. Through its representative membership, ITCRA aims to enhance the ICT industry through improved recruitment and contracting standards, education and training, and increased professionalism.

A number of ITCRA members have commenced collecting data about their ICT placements for inclusion in the ICT Skills Tracking and Monitoring System. This involves tracking job placements against job vacancies, to analyse the match of supply and demand at an individual job level.

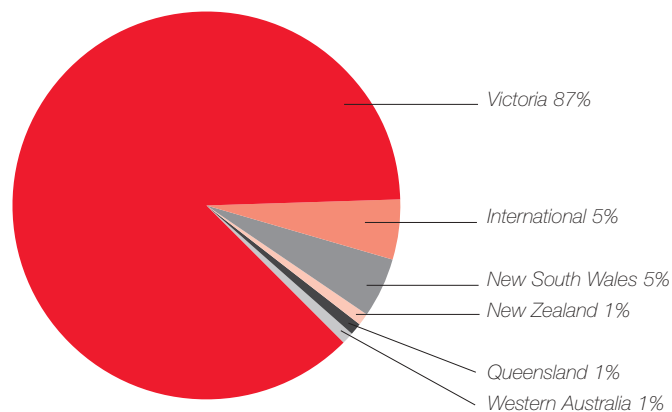
Job Placement in Victoria

Job placement data from IT recruitment agencies provides an interesting insight at the point where supply meets demand. The data collected this year up until May shows that of 283 jobs placed by participating recruitment agencies in Victoria, 88 were full-time or part-time positions while 195 were contract positions. This data supports the anecdotal evidence of an increase in churn this year.

Anecdotal evidence from industry participants supports the demand for more skills in each position, but also the fact that employers are being more specific in specifying the skills they are seeking. They are also taking longer to fill positions. The approval process is becoming more involved and they are prepared to wait longer to get the right candidate.

Other anecdotal evidence suggests that recruitment from overseas is declining due to the availability of talent in Australia. As the chart shows, international candidates filled only 5% of the 283 positions.

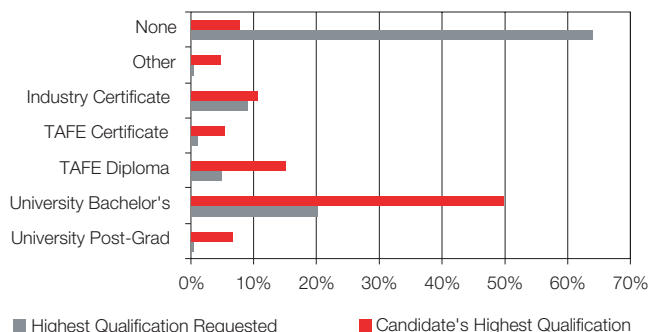
Candidate Origin for IT Job Placement in Victoria



Source: Information Technology Contract & Recruitment Association, 2003

The ITCRA data has enabled the match between qualifications requested by employers and those provided by candidates. The majority of IT job positions (over 60%) did not carry a requirement for a qualification, but interrogation of the skills requested suggests that a qualification is implicitly required. Analysis of the candidates shows that only 7% of successful candidates had no qualifications. At the other end of the spectrum, some 7% of candidates had a post-graduate qualification.

IT Job Placement in Victoria - Qualifications by percentage



Source: Information Technology Contract & Recruitment Association, 2003

To Find Out More

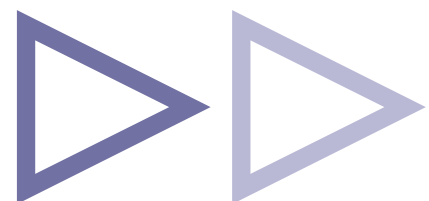
For more information on the Victorian Government's ICT skills initiatives, visit www.mmv.vic.gov.au.



Appendix 1 – Participating Organisations

The following organisations participated in the industry workshops and interviews:

7-Eleven	ITCRA
Adacel Technologies Limited	Kangan Batman Institute of TAFE
Alcatel Australia	KPMG
Ambit IT&T Recruitment	Lucent Technologies
ANZ Banking Group Limited	Microsoft
BML	Monash University
Building Commission	National Australia Bank
Candle Australia Ltd	NECA
Chisholm Institute	Nortel Networks
Department of Employment & Workplace Relations	Novell
CPT Global Limited	Oracle Corporation
Deloitte Touche Tohmatsu	Persuade Communications
Diversiti	Pragmatek
DMR Consulting Pty Ltd	Siemens Ltd
Dougall Consulting	SMS Management and Technology
Ericsson	Spherion
Eurolink Global	Sun Microsystems
Fujitsu Australia	South West TAFE
Global Pacific Group	TATE
Hewlett Packard	Telstra Corporation
IBM Australia	Westpac Banking Corporation
IBM GSA	Yellow Edge



Appendix 1 – continued

Participating Information Technology Contract & Recruitment Association (ITCRA) Members

ADAPS

Affinity IT Recruitment

Ambit IT&T Recruitment

Apex Consulting

Candle

ConnectNet

Diversiti

Elan IT

Eurolink Global

Icon Recruitment

ccs index Technology Recruiters

Infocraft Technology

Infopeople Recruiters

I.T. Matters

Mantech International

Paragon Recruitment Services

Patriot Alliance

Paxus

Robert Walters

Russell MacDonald and Associates

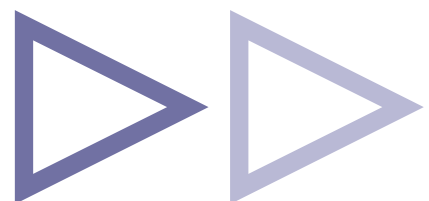
Sapphire Technologies

Spherion

TMP / Hudson Global Resources

VTR Consulting

Wizard Information Services



Appendix 2 – ABS Employment Estimates

Australian Bureau of Statistics Quarterly Labour Force Survey – Persons Employed in ICT, Victoria (000s)

	May-01	Aug-01	Nov-01	Feb-02	May-02	Aug-02	Nov-02	Feb-03
Information technology manager	10.6	6.8	8.9	8.0	9.6	9.7	9.8	9.7
Computing professionals	54.2	47.1	49.5	60.5	59.4	55.5	56.8	57.5
Electronic engineering associate professionals	3.8*	5.6	3.0*	3.8*	2.6*	2.4*	4.6*	4.3*
Computing support technicians	8.8	7.4	6.8	8.8	5.8	5.9	8.6	9.1
Communications tradespersons	8.4	6.4	5.2	5.0	5.0	6.2	2.7*	5.1
Total	85.8	73.3	73.4	86.1	82.4	79.7	82.5	85.7

* As this estimate has a Relative Standard Error (RSE) of greater than 25 per cent, care should be exercised in using it.

Australian Bureau of Statistics Quarterly Labour Force Survey – Persons Employed in ICT by Industry, Victoria (000s)

Industry	Feb-02	May-02	Aug-02	Nov-02	Feb-03
Computer Services	30.4	33.9	31.0	28.4	28.7
Telecommunication Services	10.8	8.1	11.0	10.9	13.4
Agriculture, Forestry and Fishing	*0.3	*0.0	*0.0	*0.0	*0.3
Mining	*0.0	*0.0	*0.0	*0.0	*0.0
Manufacturing	5.3	7.0	6.2	6.5	7.0
Electricity, Gas and Water Supply	*1.2	*1.5	*2.4	*2.4	*1.2
Construction	*1.5	*1.2	*1.4	*0.3	*0.3
Wholesale Trade	*2.5	*2.7	*3.3	*3.2	5.0
Retail Trade	*3.2	*1.1	*1.2	*3.1	*3.0
Accommodation, Cafes and Restaurants	*0.0	*0.7	*0.0	*0.0	*0.3
Transport and Storage	*0.0	*0.6	*0.9	*0.9	*1.2
Communication Services	11.4	9.0	11.0	11.2	13.7
- Telecommunication Services	10.8	9.0	0.0	11.2	13.7
- Other	0.6	0.0	11.0	0.0	0.0
Finance and Insurance	9.3	8.0	8.5	6.8	7.3
Property and Business Services	36.9	41.4	37.9	34.9	34.6
- Computer Services	30.4	33.0	0.0	34.9	34.6
- Other	6.5	8.4	37.9	0.0	0.0
Government Administration and Defence	*1.5	2.1	*2.6	*4.6	*4.5
Education	5.8	4.4	*2.4	5.6	*3.7
Health and Community Services	*3.8	1.4	*1.8	*1.9	*2.0
Cultural and Recreational Services	*2.7	1.9	*0.0	*0.3	*0.3
Personal and Other Services	*0.6	0.6	*0.0	*0.6	*1.2
Total	86.0	82.5	79.6	82.4	85.7

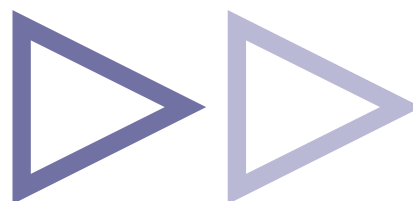
* As this estimate has a Relative Standard Error (RSE) of greater than 25 per cent, care should be exercised in using it.

Appendix 2 – continued

Australian Bureau of Statistics Quarterly Labour Force Survey – Persons Employed in ICT by Sex, Victoria (000s)

	May-01	Aug-01	Nov-01	Feb-02	May-02	Aug-02	Nov-02	Feb-03
Males								
Information technology manager	7.2	4.5*	6.4	5.4	7.9	8.0	7.4	7.6
Computing professionals	42.8	37.1	40.8	48.8	49.7	45.6	46.5	43.0
Electronic engineering associate professionals	3.5*	5.3	3.0*	3.8*	2.6	2.4	4.3*	4.0*
Computing support technicians	7.0	6.2	4.6	6.8	4.7	3.5	5.3	6.1
Communications tradespersons	8.4	6.4	5.2	5.0	5.0	6.2	2.7*	4.8
Total ICT group - Male	68.9	59.5	60.0	69.8	69.9	65.6	66.2	65.5
Total	80%	81%	82%	81%	85%	83%	80%	76%
Females								
Information technology manager	3.5*	2.3*	2.5*	2.6*	1.7	1.7	2.4*	2.1*
Computing professionals	11.4	10.0	8.7	11.6	9.7	9.9	10.3	14.5
Electronic engineering associate professionals	0.3*	0.3*	0.0	0.0*	0.0	0.0	0.3*	0.3*
Computing support technicians	1.8*	1.2*	2.2*	2.0*	1.1	2.4	3.3*	3.0*
Communications tradespersons	0.0*	0.0	0.0	0.0	0.0	0.0	-*	0.3*
Total ICT group - Female	17.0	13.8	13.4	16.2	12.5	14.0	16.3	20.2
Total	20%	19%	18%	19%	15%	18%	20%	24%

* As this estimate has a Relative Standard Error (RSE) of greater than 25 per cent, care should be exercised in using it.





Appendix 2 – continued

Australian Bureau of Statistics Quarterly Labour Force Survey – Persons Employed in ICT by Industry, Victoria (000s)

	May-01	Aug-01	Nov-01	Feb-02	May-02	Aug-02	Nov-02	Feb-03
Melbourne								
Information technology managers	9.1	6.2	8.1	7.4	9.0	8.4	8.8	8.0
Computing professionals	49.9	43.2	45.2	55.4	55.7	51.0	47.3	50.6
Electronic engineering associate professionals	*3.2	4.8	*2.7	*3.2	*2.6	*2.4	*4.3	*4.0
Computing support technicians	6.8	6.2	6.5	8.5	5.0	5.4	8.0	8.5
Communications tradespersons	6.6	5.3	*4.3	*3.9	*4.2	5.4	*2.7	*3.6
Total ICT group - Melbourne	75.6	65.7	66.8	78.4	76.5	72.6	71.1	74.7
% of Victorian Total	88%	90%	91%	91%	93%	91%	86%	87%
Balance of Victoria								
Information technology managers	*1.5	*0.6	*0.8	*0.5	*0.6	*1.3	*1.1	*1.7
Computing professionals	4.3	*3.9	*4.3	5.0	*3.7	4.5	9.4	6.9
Electronic engineering associate professionals	*0.6	*0.8	*0.3	*0.5	*0.0	*0.0	*0.3	*0.3
Computing support technicians	*2.0	*1.2	*0.3	*0.3	*0.8	*0.5	*0.6	*0.6
Communications tradespersons	*1.8	*1.1	*0.9	*1.2	*0.9	*0.8	*0.0	*1.5
Total ICT group – Balance of Victoria	10.2	7.6	6.6	7.5	6.0	7.1	11.4	11.0
% of Victorian Total	12%	10%	9%	9%	7%	9%	14%	13%

* As this estimate has a Relative Standard Error (RSE) of greater than 25 per cent, care should be exercised in using it.



Appendix 3 – ICT University Enrolments by Course

Department of Education, Science and Training – Victorian University ICT Enrolments by IT Course, Institution and Gender, 2002

	Male	Female	Total
Deakin University			
020100 Computer Science	632	127	759
020199 Computer Science nec	107	41	148
020300 Information Systems	366	164	530
029900 Other Information Technology	261	109	370
029999 Information Technology nec	31	8	39
031305 Computer Engineering	27	0	27
University total*	1,424	449	1,873

La Trobe University			
020000 Information Technology	108	13	121
020100 Computer Science	582	161	743
020103 Programming	13	3	16
020113 Networks and Communications	63	6	69
020300 Information Systems	239	91	330
029900 Other Information Technology	1	0	1
031305 Computer Engineering	123	14	137
University total*	1,129	288	1,417

Monash University			
020103 Programming	2	2	4
020399 Information Systems nec	2,655	1,600	4,255
029999 Information Technology nec	3,456	1,467	4,923
University total*	6,113	3,069	9,182

Royal Melbourne Institute of Technology			
020100 Computer Science	2,102	593	2,695
020115 Computer Graphics	51	31	82
020199 Computer Science nec	12	2	14
020300 Information Systems	919	589	1,508

	Male	Female	Total
Royal Melbourne Institute of Technology cont.			
029900 Other Information Technology	373	103	476
031305 Computer Engineering	681	57	738
University total*	3,919	1,365	5,284

Swinburne University of Technology			
020000 Information Technology	128	52	180
020100 Computer Science	1,446	354	1,800
020300 Information Systems	645	312	957
029900 Other Information Technology	297	112	409
031305 Computer Engineering	630	286	916
University total*	3,104	1,106	4,210

The University of Melbourne			
020100 Computer Science	679	133	812
020300 Information Systems	912	692	1,604
031305 Computer Engineering	94	15	109
University total*	1,685	840	2,525

University of Ballarat			
029999 Information Technology nec	835	200	1,035
University total*	835	200	1,035

Victoria University of Technology			
020100 Computer Science	1,168	163	1,331
020199 Computer Science nec	48	4	52
020300 Information Systems	1,017	390	1,407
020399 Information Systems nec	38	40	78
031305 Computer Engineering	270	24	294
University total*	2,541	621	3,162
Victorian total*	20,750	7,938	28,688

Includes all enrolments from 1 September 2001 to 31 August 2002.

* The data takes into account the coding of Combined Courses to two fields of education. As a consequence, counting both fields of education for Combined Courses means that the totals may be more than the sum of all broad fields of education. nec = not elsewhere classified.



Glossary

ACE	Adult Community Education – government-funded providers of VET
BPR/BPM/BPI	Business Process Re-engineering, Management or Improvement – the reshaping of an organisations internal processes and procedures
Broadband CDMA	Is also known as Wideband CDMA (WCDMA) which is a third-generation (3G) mobile wireless technology offering much higher data speeds to mobile and portable wireless devices than commonly offered in today's market
C	A structured programming language
C++	An object-oriented programming language based on C, designed for much larger applications
CDMA	Code Division Multiple Access – a digital cellular technology which refers to any of several protocols used in so-called second-generation (2G) and third-generation (3G) wireless communications
CISSP	Certified Information Systems Security Professional – an internationally recognised certification for individuals handling computer security for companies
Cognos	A reporting platform developed by Cognos to allow partners, suppliers and customers access to customised data from a company
ColdFusion	A development tool developed by Allaire for building Web sites and serving pages to users
CRM	Customer Relationship Management – software that supports management of customer relationship; alternatively the interpersonal skills used to manage customer relationships
Crystal Reports	A Windows report writer developed by Seagate
ERP	Enterprise Resource Planning – software that supports integration of all business functions
GSM	Global System for Mobile (Communications) – a digital, wireless telephone communication technology widely used in Europe and Australasia
ICT	Information and Communications Technology
IIS	Internet Information Server – a server product developed by Microsoft to enhance delivery of web pages
IM	Instant Messaging – a means of detecting if a user is connected to the Internet and then communicating with them using text messages
Impromptu	A database query and reporting tool developed by Cognos
J2EE	Java 2 Platform Enterprise Edition – a platform developed by Sun to support building of Web-based applications
Java	An object-oriented programming language developed by Sun, which can run on most systems and is popular in Web development
KPIs	Key Performance Indicators – measurements used by organisations to determine the effectiveness of staff



Glossary continued

Linux	A freely distributable Unix-like operating system that runs on a number of systems and can be extended by users
MS.Net	Microsoft's latest environment offering aimed at supporting distributed computing
Open Source	In general this is applied to any program whose source code is available for other users or developers to modify as they see fit. It also refers to a certification mark owned by the Open Source Initiative (OSI), which allows software to be freely shared and distributed
PKI	Public Key Infrastructure – allows secure exchange of data by using a set of private and public keys to encrypt the data
Portal	A World Wide Web site that is intended to be an anchor site for users
PowerPlay	A business analysis and reporting solution developed by Cognos
SAP SD	Sales & Distribution module of SAP (ERP software from SAP)
SMEs	Small and Medium Enterprises
SQL	Structured Query Language – language used to communicate with databases
SQL Server 2000	2000 version of Microsoft's database offering – SQL Server
Unix	An operating system for workstations developed by Bell Labs in 1969. It was written in C and became the first standard operating system that could be improved or enhanced by anyone
VET	Vocational Education and Training
Visual Basic	A programming environment developed by Microsoft that allows user-friendly development of programs in the Basic language
Web Services	Services (usually a combination of application and data) that are made available from a business's Web server for users or other Web-connected programs. Web services are increasingly enabled by the use of XML to standardise data formats and exchange
World Wide Web	A technical definition is "all the resources and users on the Internet that are using the Hypertext Transfer Protocol". A broader definition from the organisation that Web inventor Tim Berners-Lee helped found, the World Wide Web Consortium (W3C), is "The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge."
Wi-Fi	Wireless Fidelity – a popular term for a high-frequency wireless LAN (Local Area Network). Wi-Fi is specified using a number of standards
Windows XP	Latest version of Microsoft's Windows operating system; earlier versions are Windows 2000 and Windows NT
WLAN	Wireless Local Area Network – is one in which a mobile user can connect to a LAN through a wireless (radio) connection.
XML	eXtensible Markup Language – a language that allows designers unlimited and self-defining use of tags for use in web pages



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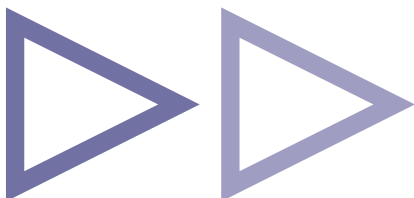
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