



ICT Skills Snapshot

The State of ICT Skills in Victoria

June 2002





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Minister's Foreword



The Victorian Government is pleased to release the first *ICT Skills Snapshot*.

The *ICT Skills Snapshot* is designed to provide the state's ICT industry, people working in the industry and students wanting to

move into the industry with an update on the supply and demand of high-tech skills in Australia.

Its release represents the first time an Australian Government has seriously attempted to identify specific gaps in the supply and demand of ICT skills.

Significantly, the first *ICT Skills Snapshot* reveals that Victoria is Australia's ICT skills heartland, with more than a third of the country's students enrolled in ICT university courses located in Victoria.

But the *ICT Skills Snapshot* does more than simply position Victoria as the skills leader.

It provides an insight into the direction of Victoria's high-tech industry by forecasting where demand is expected and where opportunities might exist for people with technology skills.

This alone will be invaluable intelligence for the ICT industry, but particularly for people wanting to enter or re-enter the industry.

Some of the other key findings of the first *ICT Skills Snapshot* are that:

- Industry predicts a period of strong growth in the ICT sector following a significant downturn in 2001, with some organisations already recruiting and training in anticipation of an upturn;
- Business-to-business Internet development, enterprise application integration, broadband, telecommunications, security, customer relationship management, mobile computing, supply chains, Linux and open source, network planning, project management, and interactive TV and Internet are areas in which demand is expected to be high over the coming year; and
- Victoria's ICT industry continues to be male dominated, with men accounting for 85 per cent of the workforce.

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

This *ICT Skills Snapshot* is the first of what will be a bi-annual report, which will ensure that the ICT industry is provided with current trends about skills issues.

A handwritten signature in blue ink that reads "Marsha Thomson". The signature is fluid and cursive.

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 2002. The report has been prepared for the Victorian Government from a range of data sources to highlight the demand for and supply of ICT skills in Victoria.

The *ICT Skills Snapshot* is the first time an Australian government has developed a system to identify gaps in the demand of ICT skills.

The ubiquitous application of ICT and the ongoing growth of technology requires the gap between skills supply and skills demand to be continuously addressed to enable strong business growth — in all industry sectors.

Methodology

This report is generated from 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 system collates all known sources of ICT skills intelligence. The system will be continuously updated as new information arises. The most recent data has been used to produce this report.

Qualitative data obtained through workshops and interviews supported the ICT Skills Tracking and Monitoring System. The purpose of these sessions is to provide up-to-date qualitative data on future projections of skills requirements. For input into this report, workshops were held in March 2002. The workshops were attended by 55 senior representatives from small and medium enterprises (SMEs), government organisations, education

providers and industry leaders in ICT. The workshop participants collectively employ 70,000 people in Australia. References to the views of the industry in this report are based on comments and opinions expressed in the workshops.

Major Findings

Before 2001, the speed and rate of technological change in the ICT industry was unprecedented. Y2K, GST and false expectations of the dot-com boom generated growth and recruitment demand that could not be sustained.

The downturn in the ICT industry has changed all that. There was a 105 per cent decrease in the demand for IT positions in 2001 compared to 2000 (Gottlieb Research, *Icon Index*, 2002). The national average salary increase across over 40 IT jobs surveyed was 4 per cent for the calendar year (TMP, *IT&T Salary Levels and Skills Availability Index*, Q1, 2002). This was the lowest salary increase recorded since 1997.

With revenues down, the ICT industry is currently focused on short-term benefits, cost efficiencies and risk reduction. ICT expenditure is under greater scrutiny and a lack of confidence has meant little investment in new projects. Projects that do proceed must be underpinned by a robust business case and offer a low risk and high rate of return to the company or investors.

Collective industry opinion indicates that the worst of the ICT downturn has passed and that strong signs of growth are starting to emerge. With a buoyant share market and economic growth anticipated to be 4 per cent over the coming two years, this growth is expected to flow back to the ICT, accounting, banking and finance sectors late in the second quarter of 2002 (Gottlieb Research, *Icon Index*, 2002).

The experience of the downturn, the lessons learned, and the greater focus on due diligence and business processes, have meant that different skills are in demand. Deep expertise in technology areas is still required, but people who combine that with strong functional knowledge and business experience are consistently highly sought after.

The highest demand increase in 2001 was for Windows 2000 skills, with outsourcing, wireless and advanced business application programming (ABAP) skills also experiencing demand growth.

The number of persons employed in the Victorian ICT industry in Victoria has almost returned to the levels of twelve to fifteen months ago. The dip in August–November 2001 is associated with worldwide security fears and the dot-com collapse. Some organisations are starting to recruit and train employees for the expected upturn in demand, and have equipped themselves with the lessons learned from the past two years to ensure the same mistakes are not made again.

Areas in which the industry expects demand to be high over the coming year are business-to-business Internet development, enterprise application integration, broadband, telecommunications, security, customer relationship management, mobile computing, supply chains, Linux and open source, network planning, project management, and interactive TV and Internet.

Female participation in the industry remains relatively low. Eighty-five per cent of the ICT workforce in Victoria is male. While there was an increase in female participation in February 2002, the current numbers are well below what they were in May 2001.

The National Office for the Information Economy predicts that by 2004–05, increased business involvement in the information economy will lift GDP by up to 3 per cent; create an additional 110,000

jobs nationally; and generate higher incomes (*Australia's Information Economy: The Big Picture*, April 2002).

However, the National Office for the Information Economy also believes that a shortage of ICT skills is one of the three main barriers to growth in the ICT sector. Victoria currently accounts for 35 per cent of the students enrolled in ICT university courses in Australia, and therefore has an opportunity to take a lead in growing the skills required and gaining the rewards that will follow.

Underlying Trends and Areas of Focus — Industry Views

The industry workshops identified a number of influences that are likely to shape the nature of the next business cycle and make it different than the past one. Expected key areas of focus were also identified.

Underlying Trends

- In the early days of the ICT industry, participants made up standards as they went along. However, there is now a strong trend to global standards and open systems within both the ICT industry and user organisations. This will reduce product flexibility, but is essential for more efficient communication between systems.
- ICT expertise and investment is mobile and Victoria has experienced some wins and losses. The reduction of local content requirements by some organisations has led some international suppliers to reduce local development work dramatically.
- Corporate management is becoming more ICT-literate and this is supporting a more critical approach to ICT investment. ICT professionals must communicate more with people from different



professions, notably the accountants and lawyers who play a key role in business decision-making.

- The massive cuts in ICT development budgets have also led to deferral of some ICT projects that have a very good business basis. As technology has continued to improve and the demand for improved services and reduced costs remain, the pent-up demand for ICT investment is growing and will help drive recovery.
- Many workers are looking for a more balanced lifestyle and will resist the long hours expected during the past boom. Growth in the ICT sector will compel employers to focus on retention strategies in the competition for talent.

Areas of Current and Future Industry Focus

The industry is focusing on:

- the core business — which means there is more interest in off-the-shelf solutions and outsourcing to other organisations that can deliver quicker and cheaper than in-house ICT groups
- system integration — rationalising systems and re-using technology enterprise-wide to get better efficiencies and benefits
- security — the expansion of e-commerce, customer concerns, legal obligations and the emergence of global standards are creating strong pressure for better data security
- the convergence of IT and telecommunications, including wireless technologies and the marriage of the Internet and digital TV
- customer management for routine and repeat sales using online technologies (as distinct from winning new customers)
- recruiting and nurturing individuals who can align ICT with business objectives, and understand the business context in which they are working.



Demand for Skills

Since the downturn in the ICT industry, the demand for ICT skills has shifted from quantity to quality.

The recent decline in ICT investment has heightened industry demand for people who can turn technology into profits. Industry is seeking individuals with business experience, functional knowledge and experience in the lifecycle of a project (not just a component of it). Deep expertise in technology areas such as network security and enterprise architecture is still highly sought-after, but people with more general programming skills and those with vendor-specific skills are currently having difficulty finding employment.

The strong focus on reducing costs, finding off-the-shelf-solutions and making more efficient use of existing technology has meant that people who can deliver a robust solution to a specific business problem are preferred over those offering more sophisticated solutions that are more expensive and may involve greater risk. Recruitment companies are experiencing strong demand for individuals who have the functional knowledge as well as the technical expertise — for example, accountants who know their way around the popular financial and business administration software produced by SAP.

Perversely, many of the people who might have acquired these skills in large companies were lured into contracting by the high fees on offer during the boom. As sole contractors, they were not given training and personal development opportunities to build management and organisational capabilities and few invested in increasing their own skills. Consequently, the divide between functional and technical skills grew and there is now an acute shortage of people who can traverse the two.

The pace of technical change means that skills rapidly become redundant, so employers value staff who are adaptable and flexible. The ability to solve problems, to innovate, to adopt new ways, to learn, to be flexible, to understand users, and to communicate clearly — are of increasing importance in the ICT environment.

Implications for Small and Medium Enterprises

Many specialist ICT small and medium enterprises (SMEs) have been affected by the downturn in demand from the larger companies who form their main client base. In general, multitasking, customer focus and whole-of-project lifecycle analysis are critical requirements for SMEs because they need to be flexible and adaptable, yet have a clear vision and understanding of what they have to offer the marketplace. Recruiting specialist skills can be a mistake if the market shifts and different needs emerge. This has affected many SMEs in the downturn, because their businesses can no longer generate the revenue to justify full-time employees in highly specialist fields.

Other SMEs have been exposed for not developing their skills sufficiently. Many employees left larger corporations during the boom years and established small contracting firms that sold services back to their former employer or simply took on a succession of contracts that were little different to employment. However, their employers no longer provided training and some of these people did not invest in keeping their skills up-to-date or in acquiring new skills as the market shifted. They have suffered in the downturn and significant re-skilling will be needed as the industry recovers.



Skills in Demand

While there has been a large decline in demand across the ICT sector, some skills went against the trend and recorded an increase in demand over the last twelve months (Gottliebsen Research, *Icon Index*, 2002). These include:

- auditing
- CCIE
- Citrix
- GAP analysis
- JES2
- outsourcing
- risk assessment
- SAP security
- storage
- user testing
- Weblogic
- Windows 2000
- wireless
- Bluetooth
- Checkpoint
- EAI
- Java servlets
- network security
- radio frequency
- risk management
- SQL 2000
- Tibco
- Voice-over-IP
- Websphere
- Windows CE

Emerging Skills

The industry workshops identified a number of skills which will be in demand over the coming twelve months, including:

- security
- mobile computing
- business process reengineering and enterprise application integration
- project management
- customer relationship management and data warehousing
- interactive TV and Internet

- online services
- network planning
- Linux and open source
- supply chains.

Security

Increasingly, security is being seen as an element of risk management, rather than simply building a big e-wall or firewall. Global protocols on ICT security between international banks will shape the management of ICT security in e-commerce and, in turn, determine the security skills in demand.

Mobile Computing

There is a growing demand for mobile, generally wireless, access to core systems, databases, services and applications. The demand covers business applications and consumer applications including entertainment and personal services.

Business Process Reengineering and Enterprise Application Integration

Individuals who have both technical and business skills and can work across all aspects of an enterprises' activities are difficult to find. ICT plans are not just technology reports. They need to have clear business objectives, costings, rates of return, risk and competitor analyses, and due diligence. Increasingly, professionals are needing to develop plans, methods and tools that modernise and consolidate computer applications in a business.

Project Management

Cost overruns and a high level of uncompleted projects were common during the boom, so strong project managers were in high demand. Most were borrowed from traditional engineering project management disciplines. The drop in new investment has tended to reduce demand, but this has been

more than offset by the focus on reducing costs and rationalising business. Many organisations are using the downturn as an opportunity to increase people's skills in project management.

Customer Relationship Management and Data Mining

Some organisations believe the benefits of their customer relationship management systems have not been fully realised. The systems are collecting information but many organisations don't know how to use it effectively, partly because it accumulates in information silos in different parts of the organisation. The data warehousing and data mining skills are in demand to break down information silos, collate their contents, and make the accessible to those who need them.

Interactive TV and Internet

Digital and interactive technology is advancing and will have a major impact on the structure of mass consumer markets. The convergence of TV and the Internet is inevitable, although it is not yet clear which will absorb the other. Additional skilled people will be needed in content creation and management, customer relationship management, online ordering, data publishing, interactive system design and other technical and business support areas. Business skills in this area are equally as important, since new business models will be required to make it work.

Online Services

Organisations, especially consumer-oriented businesses and government, are continuing to roll out online services, albeit at a less frantic pace than previously. They are achieving genuine efficiencies to be gained from putting services online and reducing the need for data handling and human interaction in customer service and back-office processes. Skills associated with placing services online remain in

demand and can be expected to increase as investment picks up.

Telecommunications

The growing interest in mobile computing and remote access to home networks is producing a demand for skills that span mobile and data networks. However, there is a training lag and employers are already experiencing difficulty in finding qualified people.

Broadband Services

Broadband has not been taken up at the rate originally expected, although growth in uptake is steady. The value of broadband has not been well understood or well communicated, and there is still insufficient content to make it attractive on a mass scale — a classic chicken and egg situation. The steady growth of broadband and the convergence of digital TV and the Internet will increase demand for skills in this area over time, especially as available content increases. Specific skills in demand will be in the areas of interactive content, linkages and management, and interactive systems hosting.

Network Planning

Companies want to improve the quality, speed, range and efficiency of their services. The key is to make better use of technologies by improving the design of networks and the planning of operations.

Linux and Open Source

The Linux operating system is expected to emerge as a platform on which a raft of new products will be built. Expertise in Linux is currently in patchy supply worldwide.



Supply Chains

Application of online technologies to supply chains is one of the growth areas of e-commerce and many companies are making significant gains by integrating their suppliers' business systems. This blurs the boundaries of companies and creates not only technical issues, but also corporate risk and administrative issues. This is an area where skills development is urgently needed, as there are currently few signposts for others to follow.

Data Sources

The data sources are listed below.

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

The number of people currently employed in the ICT Industry in Victoria has almost returned to the levels of twelve to fifteen months ago. Factors that may have affected the dip in August–November 2001 include worldwide security fears and the resultant business uncertainty.

	Feb-01	May-01	Aug-01	Nov-01	Feb-02	May-02
<i>Information technology managers</i>	8.2	10.6	6.8	8.9	8.0	9.6
<i>Computing professionals</i>	55.5	54.2	47.1	49.5	60.5	59.4
<i>Electronic engineering associate professionals</i>	5.0	3.8*	5.6	3.0*	3.8*	2.6
<i>Computing support technicians</i>	9.8	8.8	7.4	6.8	8.8	5.8
<i>Communications tradespersons</i>	7.6	8.4	6.4	5.2	5.0	5.0
Total ICT group	86.1	85.8	73.3	73.4	86.1	82.5

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

Eighty-five per cent of the ICT workforce in Victoria is male (70,000 of 82,500). While there was an increase in the female numbers in February 2002, the current numbers are well below what they were in May 2001.

	Feb-01	May-01	Aug-01	Nov-01	Feb-02	May-02
Males						
<i>Information technology managers</i>	6.7	7.2	4.5*	6.4	5.4	7.9
<i>Computing professionals</i>	42.1	42.8	37.1	40.8	48.8	49.7
<i>Electronic engineering associate professionals</i>	5.0	3.5*	5.3	3.0*	3.8*	2.6
<i>Computing support technicians</i>	6.8	7.0	6.2	4.6	6.8	4.7
<i>Communications tradespersons</i>	7.6	8.4	6.4	5.2	5.0	5.0
Total ICT group	68.2	68.9	59.5	60.0	69.8	70.0
Females						
<i>Information technology managers</i>	1.4*	3.5*	2.3*	2.5*	2.6*	1.7
<i>Computing professionals</i>	13.4	11.4	10.0	8.7	11.6	9.7
<i>Electronic engineering associate professionals</i>	0.0	0.3	0.3	0.0	0.0	0.0
<i>Computing support technicians</i>	2.9	1.8	1.2	2.2	2.0	1.1
<i>Communications tradespersons</i>	0.0	0.0	0.0	0.0	0.0	0.0
Total ICT group	17.7	17.0	13.8	13.4	16.2	12.5

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

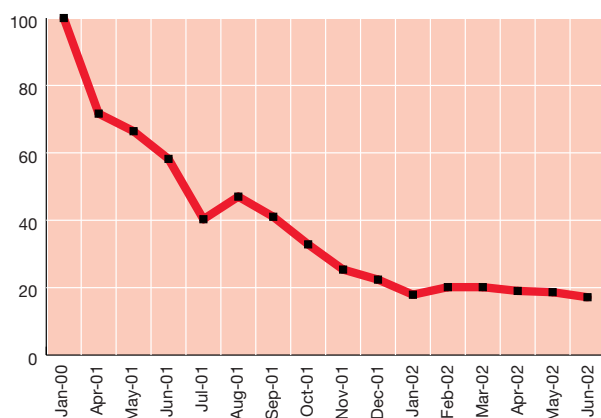
Department of Employment and Workplace Relations ICT Vacancy Index

The Department of Employment and Workplace Relations ICT Vacancy Index is based on a weekly count of ICT vacancies on six online sites — Jobnet.com.au, CareerOne, Seek, Fairfax IT Jobs, Employment.com.au and Monster.com.au. The composite series commences in January 2000 and a four-weekly average has been applied to smooth volatility in the data. 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, and care should be exercised in using the following figures.

The ICT Vacancy Index increased by 1.9 per cent over the four weeks to mid-June 2002 to 26.9 (January 2000 = 100). The five Australian ICT recruiting sites included in the index averaged around 10,000 vacancies in the four weeks to mid-June 2002.

The ICT Vacancy Index declined during 2001 and is now 81.8 per cent down on the peak recorded in September 2000. In June, Victoria had 25 per cent of ICT online vacancies (around 2,300). Compared with January 2000 (when the Victoria ICT Vacancy Index was set at 100 per cent), Victoria has a current vacancy index of 19 per cent.

ICT Vacancy Index for Victoria



Gottlieb Research Icon Index — Skills Recording an Increase in Demand, Australia 2001

The highest demand increase in 2001 was for Windows 2000 skills, with outsourcing, wireless and advanced business application programming (ABAP) skills also experiencing strong demand growth.

Skill	No. of ads
Windows 2000	2,587
Outsourcing	1,954
Wireless	1,762
ABAP	1,674
Electronic engineering	1,211
Radio frequency	1,207
Weblogic	1,122
Websphere	1,114
Network security	743
Debugging	659
Auditing	648
CCIE	448
SQL 2000	412
Peripherals	403
Tuxedo	402
User testing	392



Gottlieb Research Icon Index — Highest Volume of ICT Advertisements, Australia 2001

Demand for all of the highest-volume skills decreased in 2001.

Skill	No. of ads
Software	28,244
Support	24,499
Implementation	15,958
World Wide Web	14,838
Unix	14,535
C++	11,935
Windows NT	11,649
Oracle	11,616
Database	11,312
Java	10,520
SQL	9,366
Telecommunications	8,626
Integration	8,575
C++	8,198
Visual Basic	8,064
Internet	7,830
SAP	7,267
Hardware	6,774

Skill	No. of ads
Security	6,640
Maintenance	5,862
Configuring	5,684
Infrastructure	5,420
SQL Server	5,366
Windows NT	4,836
eCommerce	4,815
IP	4,745
Installation	4,667
Object-oriented	4,502
HTML	4,424
ASP	4,381
MS Access	4,360
Standards	4,219
Enterprise	4,114
XML	3,870
Electronics	3,604
CRM	3,506



Australian Computer Society Remuneration Survey 2001

The remuneration of computer professionals continues to rise according to the latest survey of members of the Australian Computer Society.

The 2001 Australian Computer Society Remuneration Survey, conducted by the Association of Professional Engineers, Scientists and Managers, Australia, showed that average packages paid to employee IT professionals rose by 5 per cent in the twelve months to May 2001. The increase was higher in the private sector (6 per cent) than in the public sector (4 per cent), and lowest in the education sector (3 per cent).

By comparison, the Australian Bureau of Statistics recorded an annual increase of 5 per cent in average weekly earnings for the twelve months to February 2001, while the GST-affected Consumer Price Index rose by 6 per cent in the twelve months to March 2001.

The table shows that remuneration for higher-end jobs such as general manager and IT manager fell in 2001 compared to 2000. Remuneration for middle-level and specialist ICT jobs generally increased.

Job	2001	2000
Sales and marketing	\$162,203	\$164,263
General management	\$126,911	\$142,125
Consulting	\$107,284	\$102,453
Project management	\$104,400	\$103,486
IT management	\$103,109	\$110,462
Database administrator	\$87,077	\$84,558
Project leader	\$86,400	\$79,723
Systems management	\$82,998	\$84,559
Research and teaching	\$80,727	\$79,599
Research and development	\$78,840	\$78,019
LAN manager	\$76,656	\$62,354
Analysis and testing	\$70,841	\$72,076
Programmer and analyst	\$68,394	\$65,436
Teaching and training only	\$65,655	\$61,408
Computer support	\$64,240	\$61,105





Supply of Skills

If Victoria is to achieve the growth rates expected in the ICT industry, the labour force must keep pace with industry needs. We often assume people will acquire skills that are in demand because they are generally rewarded with higher wages. However, skill gaps can persist over many years and for many different reasons.

Lifelong learning and continuous skill development have been the catch-cries of the information age, but translating this into practical corporate human resource strategies and individual skill development paths has proved more difficult, especially in the ICT sector.

A major issue is that the distinctions between universities and vocational education and training (VET), and between public and private responsibilities for education and training, have been blurred by the concept of lifelong learning. Graduation from a course no longer marks the end of study and the start of applying the skills acquired. Universities, TAFE institutes and private training providers are also now in competition for the available training dollars, especially in corporate training.

Employers are sending mixed messages. Some prefer university graduates, but then require specific skills that are better sourced from the VET system. Indeed, many university graduates subsequently enter the VET system to acquire specific skills.

The demand for vendor-accredited skills is increasing, with Lotus, Cisco and Oracle accreditation particularly sought-after (Gottlieb Research, *Icon Index*, 2002).

Online Learning and Knowledge Management

Online learning is potentially a very low-cost way of imparting general skills to mass audiences. It will be a critical technology for making lifelong and continuous learning both accessible and affordable. The returns from finding and marketing an effective online learning tool to mass markets will be immense.

Online learning will also facilitate the emergence of knowledge communities through web conferencing, group discussions, involvement of experts, and online training courses. These communities will be especially important for up-skilling ICT professionals.

Corporations are already establishing in-house online training programs which are proving more effective, cheaper and more convenient for participants than offline programs.

Training Budgets

Organisations have cut back on training budgets during the current downturn. This has constrained long-term skill development and resource planning. The depth of the cuts will harm long-term organisational capabilities and are in danger of putting the sector into a boom-bust cycle — the cuts mean that when the upturn comes, organisations are unprepared and then struggle to take emerging opportunities. The result is that they face another skills bottleneck.

Some companies have found innovative ways to maintain their skills base — for example, encouraging staff to take sabbaticals, enrol in higher education and engage in external work while remaining employees. These measures set the benchmark for human resource management and could presage a future in which skills and people are valued in company accounts as assets, just as intellectual property currently is.

Higher Education

Feedback from the industry workshops indicates there is strong support in the industry for improving the links between universities and ICT businesses.

The challenge for universities is to strike a balance between nurturing strategic capabilities — fundamental knowledge, critical thinking, innovation, problem-solving — and imparting practical skills. Practical skills, however, tend to come with experience, and this is difficult for students to acquire. The usual solution is work experience during higher education, but this tends to be superficial as employers are not set up to take people on for very short periods. The experience can be unsatisfactory for both student and employer.

Some companies are taking a more strategic approach by offering extended traineeships which are really more like professional cadetships. The trainee combines study with part-time work during semester and full-time work during vacations. This enables them to acquire a deeper understanding of the company. The industry would benefit from the availability of more traineeships along these lines.

Industry comments that tight university budgets are an ongoing challenge to delivering effective ICT education. The learning environment should include the latest technologies if students are to be effective in industry after graduation, but some universities can only offer students antiquated infrastructure and applications.

Universities need better means of tracking the needs and attitudes of industry and need to develop more combined degree options for ICT students. Teaching staff need to be up-to-date with industry practice and professional development opportunities should be put in place to help them maintain and extend their skills. Ideally, industry practitioners should be involved in teaching university programs; however, universities cannot match industry salaries.

Vocational Education and Training

VET is dominated by TAFE institutes, but the number of private providers is growing strongly. Many university graduates are taking TAFE courses to get specific skills, yet some industry groups still perceive TAFE as offering lower-level training. TAFE institutes planning to enter areas such as professional development for graduates could benefit from communication with the marketplace.

The industry perception is that TAFE institutes are underfunded and spread themselves too thinly. This raises doubts about the quality of training they offer. The industry recognises that its desire for quality control sometimes clashes with its desire for innovation, but believes that minimum quality standards should at least be set.



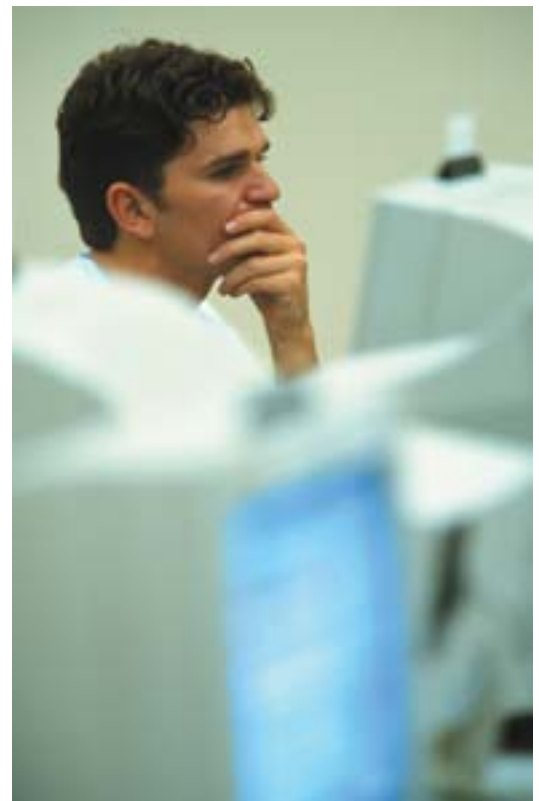
Data Sources

Department of Education, Science and Training — Australian University IT Enrolments by State, 2001

Victoria has 35 per cent of the total number of students enrolled in ICT university courses in Australia. The table refers to courses in computer science, information systems, practical computing skills, programming, computational theory, computer engineering, conceptual modelling, systems analysis and design.

State	Male	Female	Total
New South Wales	12,943	4,283	17,226
Victoria	16,725	6,600	23,325
Queensland	10,405	3,005	13,410
Western Australia	4,101	1,072	5,173
South Australia	2,516	800	3,316
Tasmania	782	204	986
Northern Territory	237	81	318
Australian Capital Territory	1,551	451	2,002
Multi-State	329	87	416
Australia	49,589	16,583	66,172

Note: 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 less than the sum of all fields of education.



Department of Education, Science and Training — Victorian University IT Enrolments by Institution, 2001

	Male	Female	Total
Deakin University			
020100 Computer Science	297	72	369
020199 Computer Science nec	116	45	161
020300 Information Systems	274	131	405
029900 Other Information Technology	279	94	373
029999 Information Technology nec	23	5	28
031305 Computer Engineering	39	1	40
University total	1,028	348	1,376
La Trobe University			
020000 Information Technology	21	1	22
020100 Computer Science	472	146	618
020103 Programming	11	1	12
020113 Networks and Communications	40	7	47
020300 Information Systems	204	77	281
031305 Computer Engineering	117	12	129
University total	865	244	1,109
Monash University			
020103 Programming	10	3	13
020199 Computer Science nec	2	0	2
020399 Information Systems nec	1,834	1,137	2,971
029999 Information Technology nec	2,845	1,219	4,064
University total	4,691	2,359	7,050
RMIT University			
020100 Computer Science	2,299	687	2,986
020115 Computer Graphics	15	14	29
020300 Information Systems	783	527	1,310
020399 Information Systems nec	7	7	14
029901 Security Science	30	1	31
031305 Computer Engineering	710	78	788
University total	3,636	1,299	4,935

	Male	Female	Total
Swinburne University of Technology			
020000 Information Technology	118	61	179
020100 Computer Science	1,131	293	1,424
020300 Information Systems	586	273	859
029900 Other Information Technology	255	91	346
031305 Computer Engineering	482	203	685
University total	2,533	913	3,446
University of Melbourne			
020100 Computer Science	615	137	752
020300 Information Systems	811	596	1,407
031305 Computer Engineering	23	6	29
University total	1,449	739	2,188
University of Ballarat			
029901 Security Science	68	9	77
029999 Information Technology nec	419	99	518
University total	487	108	595
Victoria University			
020000 Information Technology	0	1	1
020100 Computer Science	864	134	998
020199 Computer Science nec	69	12	81
020300 Information Systems	824	342	1,166
020399 Information Systems nec	56	71	127
031305 Computer Engineering	223	30	253
University total	2,036	590	2,626
Victorian total	16,725	6,600	23,325

Note: 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 less than the sum of all fields of education. nec = not elsewhere classified.



Victorian TAFE and VET IT Enrolments, 2001

TAFE institutes have a larger share of VET enrolments than private providers, especially in regional Victoria. The following tables outline the Victorian participation in National Training Package Information Technology Qualification Programs in 2001.



Gender	Qualification	Enrolled
TAFE institutes		
<i>Metropolitan</i>		
Female	AQF Certificate II	214
Male	AQF Certificate II	378
Female	AQF Certificate III	245
Male	AQF Certificate III	488
Female	AQF Certificate IV	178
Male	AQF Certificate IV	666
<i>Non-metropolitan</i>		
Female	AQF Certificate II	840
Male	AQF Certificate II	1,031
Female	AQF Certificate III	256
Male	AQF Certificate III	543
Female	AQF Certificate IV	25
Male	AQF Certificate IV	154
Female	AQF Diploma	10
Male	AQF Diploma	25
TAFE total		5,053
Private providers		
<i>Metropolitan</i>		
Female	AQF Certificate II	213
Male	AQF Certificate II	120
Female	AQF Certificate III	123
Male	AQF Certificate III	134
Female	AQF Certificate IV	15
Male	AQF Certificate IV	101
<i>Non-metropolitan</i>		
Female	AQF Certificate II	38
Male	AQF Certificate II	41
Female	AQF Certificate III	51
Male	AQF Certificate III	52
Female	AQF Certificate IV	8
Male	AQF Certificate IV	38
Private provider total		934

Gap Analysis

While Victoria has a significantly higher number of students enrolled in university ICT courses than other States, it is critical that courses and skills evolve as the industry and the market require. There are a number of emerging skill areas that need to be incorporated into TAFE, VET and university courses, and professional development activities.

The National Office for the Information Economy's report on *Australia's Information Economy: The Big Picture* (2002) says, "a sustained shortage of people with the IT skills required by industry would have a deleterious impact upon the potential increase in output (real GDP) that could be obtained from greater participation in the information economy". Skill shortages may also lead to uncompetitive rises in real wages per employee.

Aggregate Shortage

The number of graduates available in 2002 is expected to be 7,000–8,000 below the industry's needs (IT Skills Hub, *Market for Australian IT&T Skills 2000–2002*, May 2001).

Specific Shortages

The Department of Employment and Workplace Relations has assessed skills shortages in the ICT industry during the second half of 2001. The Department monitors skill shortages by combining industry intelligence with statistical information on demand and supply. The table below shows the Department's assessment of where the current skill shortages (S) and recruitment difficulties (D) are.





Department of Employment and Workplace Relations — ICT Skill Shortages, Victoria

Skill	Supply
Database	
Oracle	D
Sybase SQL Server	S
Application development and software engineering	
Java	D
C++	D
Delphi	S
Progress	S
Internet, networking, LAN, WAN	
ASP	D
Firewall and Internet security	D
XML	S
Java security and e-commerce	D
Multimedia	
SAP	S
PeopleSoft	S
Siebel	S
Communications	
WDM	D
Satellite design	D
Photonics	D
E-commerce	
E-commerce security (non-programming)	D
CISSP	S
PKI	D
Other specialisations not listed above	
ERP	S
B2B	S
CRM	S
Hogan	D
AS400	D

Note: Skill shortages (S) occur when employers are unable to fill or have considerable difficulty in filling vacancies for an occupation, or specialised skill needs within that occupation, at current levels of remuneration and conditions of employment, and reasonably accessible locations. 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.



Conclusion

Victoria's position as Australia's biggest producer of engineering and IT graduates leaves us well placed to fill existing skills gaps and meet future needs before gaps appear.

The significant time lag between when skill shortages are identified and when they can be met is a constant challenge for the industry and some skills will be in short supply in the medium term. Diligent attention to addressing these gaps remains critical.

The findings from the *ICT Skills Snapshot* provide an invaluable tool for the Victorian Government and industry in planning for the future.

To Find Out More

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





Appendix

The following organisations participated in the industry workshops:

- Adacel
- ANTA
- ANZ Banking
- Australian Computer Society
- Benchmark Recruitment
- Building Commission
- Citrus
- Commercial Interactive Media
- Communications and Information Technology Training Company
- Deakin University
- Deloitte
- Department of Education, Science and Training
- Department of Infrastructure
- Department of Justice
- Department of Natural Resources and Environment
- Department of Premier and Cabinet
- Enterprise Career Education Foundation
- Ericsson Australia
- Fujitsu Australia Ltd
- Global Pacific Group Ltd
- Hewlett-Packard
- Holden
- IBM
- ICON Recruitment
- Institute of Engineers
- Leadership Consortium
- Master Builders Association of Victoria
- Microsoft
- National Australia Bank
- NECA
- NETg
- National Office for the Information Economy
- Nortel Networks
- Novell
- Office of Training and Tertiary Education
- Oracle
- Panaseer (a member of the Techniche group)
- Seek.com.au
- Siemens
- Spherion Recruitment Solutions
- Sun
- Telstra
- Telstra Research Laboratories
- Topwheel Consulting.



Glossary

ABAP	Advanced Business Application Programming
ASP	Active Server Pages
B2B	Business to Business
CCIE	Cisco Certified Internetwork Expert
CISSP	Certified Information Systems Security Professional
Citrix	An access portal server
CRM	Customer Relationship Management
EAI	Enterprise Application Integration
ERP	Enterprise Resource Planning
HTML	Hypertext Markup Language
ICT	Information and Communications Technology
JES2	A client-server, object-oriented user interface for managing systems from a personal computer
Photonics	Photo-electronics
PKI	Public Key Infrastructure
SAP	Systems, Applications, Products in Data Processing
SME	Small and Medium Enterprises
Tuxedo	An e-commerce transactions platform
VET	Vocational Education and Training
WDM	Wavelength Division Multiplexing
XML	Extensible Markup Language



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Multimedia Victoria
Department of Innovation, Industry and Regional Development
Level 10, 55 Collins Street
Melbourne Victoria 3000

Phone 9651 9868

Fax 9651 9055

Email queries@mmv.vic.gov.au

Web mmv.vic.gov.au