



**Australian Workforce
and Productivity Agency**

ICT Workforce Issues Paper

JANUARY 2013

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Introduction

Information and Communications Technology (ICT) is a key enabler of innovation and productivity. ICT services have contributed substantially to productivity growth and business improvements in recent decades, and this contribution is expected to increase in coming decades as the implementation of the National Broadband Network (NBN) proceeds, and businesses and consumers continue to demand a range of customised, sophisticated ICT services.

The availability of a skilled ICT workforce is central to realising the benefits of ICT services. However, businesses in the ICT sector, and businesses across the economy, are experiencing a range of challenges in relation to ICT skills supply and workforce development. These challenges include reported shortages of experienced and highly-skilled ICT professionals, concerns that graduates are ill-equipped to join the workforce, and the need to diversify and broaden the existing and potential workforce, in particular, through encouraging more women into the ICT workforce and by attracting, upskilling and retaining experienced workers.

The Australian Workforce and Productivity Agency (AWPA) ICT workforce study

To address some of these challenges and identify innovative, replicable workforce development solutions, AWPA is undertaking a study on ICT workforce issues. This study forms parts of AWPA's broader focus on the Professional, Scientific and Technical (PST) services industry division. The key objectives for the ICT workforce study are to:

- examine current and proposed future developments in the ICT industry including the implementation of the NBN, the prominence of cloud computing and the increasing complexity of ICT services to assess the impact on demand for skilled ICT professionals, managers and support technicians
- analyse the expected supply of skilled labour from all sources and any resulting skills shortages and/or skills gaps
- identify key issues related to skills demand and supply for the sector including improving ICT education in schools and pathways to ICT careers, increasing the participation of mature age and female workers in the industry, and enabling graduates to develop a range of complementary skills to improve their work readiness
- consider current initiatives to address these issues and identify methods to replicate best practice in workforce development across the industry.

The Issues Paper

This Issues Paper is the first output for the study, and is structured as follows:

- **part one provides an environmental scan of the ICT industry**, identifying key trends in ICT services provision and noting the implications of the key trends for the workforce
- **part two presents a snapshot of skills demand and supply data for the ICT workforce**
- **part three assesses key challenges for ICT skills demand and supply** and includes questions for discussion to guide feedback on the Issues Paper
- **part four invites interested parties to submit examples of success stories** and explores the concept of workforce development for the ICT workforce.

This Issues Paper is informed by the discussions that took place at the Australian Government ICT Skills in the Workplace Forum in November 2012. The forum, which was chaired by Senator the Hon Chris Evans, Minister for Tertiary Education, Skills, Science and Research, and facilitated by Mr Philip Bullock, Chair of AWPA, explored challenges facing organisations in relation to the acquisition of ICT skills, and provided examples of innovative approaches being adopted by organisations to attract, retain and develop ICT skills.

The AWPA ICT workforce study will also complement a number of existing Government policy initiatives, including the National Digital Economy Strategy, and the Australian Government's upcoming Digital White Paper (due early 2013). AWPA will consider the contribution of Australian Government funding programs to meeting ICT skills needs, including the National Workforce Development Fund (which has provided approximately \$1.4 million of ICT skills training alongside an industry contribution of approximately \$700,000), the Research Skills for an Innovative Future Strategy, and the NBN-Enabled Education and Skills Services Initiative.

Methodology

The ICT sector crosses into every industry across the Australian economy. Therefore, it is difficult to identify workforce strategies and quantify skills demand and supply for the ICT sector. To overcome these difficulties, AWPA examines the ICT workforce in this study, drawing on the Department of Education, Employment and Workplace Relations (DEEWR) identification of 18 ICT occupations at Australia and New Zealand Standard Classification of Occupations (ANZSCO) four-digit level, across the spectrum of ICT professionals, managers and service technicians.

AWPA acknowledges that many of these occupations are quite different and varying techniques are applied to measure workforce numbers. However, this approach enables the development of a broad, holistic coverage of workers that engage directly with ICT services in the course of their work. This approach also includes workers who work outside the ICT sector, to account for the diffusion of ICT workers throughout all sectors of the economy in recent years.

What happens next?

This Issues Paper has been distributed to participants in the November 2012 ICT Skills in the Workplace Forum and other interested parties.

AWPA invites comments on the issues paper and proposals for case studies that feature innovative approaches to workforce development.

Please submit responses to the questions for discussion and case studies to the AWPA Secretariat at ictstudy@awpa.gov.au by **8 February 2013**.

Template forms for both the questions for discussion and case studies are available on the ICT workforce study reference group extranet. Please refer to the email that was sent by AWPA on 18 January for log-in details.

In late February 2013, AWPA will convene consultations to discuss the Issues Paper and the responses and case studies received, and to discuss possible workforce strategies. These discussions will help shape the final report which is planned for release in mid 2013.

Part one: Environmental scan

Introduction

The purpose of this environmental scan is to highlight the current state of play in ICT, and to examine what this means for the Australian ICT workforce. By reviewing key research on the Australian ICT sector, this section will consider the contribution of the Australian ICT sector to productivity, review current trends in Australian ICT, and relate these trends to employment and skills development.

The contribution of ICT to productivity

A robust ICT services sector is a major driver of current and future economic growth. Across all parts of the economy, the usage of innovative digital technologies and services has transformed business and household practices, from the comprehensive usage of smart phones and personal computing devices, to the streamlining and automation of business processes by tailored applications and software.

Economic consulting firm ACIL Tasman claims that ICT developments have a considerable impact on productivity. For service industries, it is estimated that ICT-related technology factors are responsible for 33 to 65 per cent of multi-factor productivity growth, and this figure increases to 45 to 75 per cent for the manufacturing industries.¹

ICT is also a key driver of innovation and productivity at the firm level and 'confers informational, strategic, transactional and transformational benefits'.²

However, the integration of ICT technologies and services into business processes does not guarantee benefits in itself – ICT is fundamentally an enabler and must be accompanied by 'consistent organisational and ICT strategies, effective internal and external communication and careful risk assessment' for benefits to be realised.³

As Australia moves to a digital economy, the relationship between ICT, economic growth and productivity will only strengthen. The support of technological development and investments in the NBN will enhance growth in all sectors of the economy. The rollout and uptake of the NBN will enable a range of innovative opportunities across our economy including e-learning, e-health and teleworking.

Research quoted by IBISWorld claims that, for every ten percentage point increase in broadband penetration in the community, GDP increases by 1 per cent. In addition, if broadband speeds were to double, it is estimated that GDP would increase by 0.3 percentage points.⁴

Current trends in the Australian ICT industry

At the same time as the usage of ICT services across the economy has increased, the industry has changed significantly. Technological advances and increased demand for tailored, specialised ICT services have significantly increased the complexity of ICT.

In particular, the emergence of cloud computing as an alternative to on-premises ICT infrastructure has increased the affordability and scale of ICT services for many businesses. The benefits of cloud computing for business applications are summarised by the US National Institute of Standards and Technology:

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.⁵

Cloud computing enables businesses to exercise increasing mobility and flexibility in relation to a range of business practices. Services and products can be networked and delivered online, and the use of smartphones, tablets and the availability of less expensive data plans allows businesses to utilise the virtual environment as never before.

1. ACIL Tasman (2009), ICT as a Driver of Productivity. A White paper prepared for Telstra, http://www2.telstraenterprise.com/SiteCollectionDocuments/Whitepapers/Productivity_Whitepaper.pdf, viewed 26 November 2012, p 4.

2. ACIL Tasman (2009), ICT as a Driver of Productivity. A White paper prepared for Telstra, http://www2.telstraenterprise.com/SiteCollectionDocuments/Whitepapers/Productivity_Whitepaper.pdf, viewed 26 November 2012, p 4.

3. ACIL Tasman (2009), ICT as a Driver of Productivity. A White paper prepared for Telstra, http://www2.telstraenterprise.com/SiteCollectionDocuments/Whitepapers/Productivity_Whitepaper.pdf, viewed 26 November 2012, p 4.

4. IBISWorld (2012), Telecommunications Services in Australia, IBISWorld Industry Report J7100, <http://www.ibisworld.com.au/industry/default.aspx?indid=1730>, viewed 26 November 2012, p 9

5. National Institute of Standards and Technology (NIST) (2011), The NIST Definition of Cloud Computing, United States Department of Commerce, Special Publication 800-145, <http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>, viewed 3 December 2012, p 2

At the same time, Innovation and Business Skills Australia (IBSA) points out that the standardisation of hardware and software over the past five years has reduced business demand for traditional forms of ICT service provision.⁶

Analytics and big data are becoming increasingly important as businesses try to manage all of this information. Analytics enables the analysis of very large volumes of structured and unstructured data, and serves as an important productivity tool by enabling businesses to derive and extract insight from the enormous amounts of data collected by new applications, and consider this in relation to data already held in the enterprise.

The increased complexity of ICT has encouraged enterprises to source ICT expertise from external resources. The International Data Corporation (IDC) estimates that by 2015 companies will source 25 to 40 per cent of ICT and related business expertise from external service providers, depending on the industry and enterprise size. In this environment, enterprises will be required to identify and nurture niche ICT capabilities that can be kept in house, and develop a range of strategic and business management capabilities to ensure that outsourced services are cost effective and meet enterprise demands.⁷

Trends in the ICT workforce and employment

The trends described above have different implications for different sections of the ICT workforce. In its work on the ICT workforce, DEEWR identifies three core ICT occupational groups:

- **ICT professionals**, who comprise the majority of the workforce, and include highly specialised workers in software and applications programming, electronics engineering, ICT business and systems analysis, web development and a range of other activities. Most workers in this category hold higher education qualifications.
- **ICT support technicians**, who provide support for the deployment and maintenance of computer infrastructure and web technology and the diagnosis and resolution of technical problems, and hold a range of qualifications including trade-level certificates.
- **ICT managers**, who plan, organise, direct, control and coordinate the acquisition, development, maintenance and use of computer and telecommunication systems within organisations, and hold a range of qualifications.⁸

Workers in these occupational groups are employed across a broad range of industries and enterprises. ANZSCO includes 18 ICT occupations at the four-digit level, including people working in call centres and on help desks, with many other occupations including elements of ICT related skills and tasks.

The increasing complexity of ICT services has stimulated demand for highly specialised ICT professionals. Often, these specialists are required to continually update their repertoire of skills and are encouraged to pursue postgraduate qualifications. In a recent, unpublished paper on ICT skills needs, the Australian Government Information Management Office (AGIMO) identifies that:

New technology, more complex work, greater global competition and inter-connected, sophisticated supply chains of goods and services have resulted in increased demand for workers with higher levels of qualifications and skills.⁹

These demands carry implications for ICT support technicians, as ICT professionals move to streamline and automate some ICT processes, and outsource or offshore others.

The consumerisation of ICT services, where enterprises increasingly demand tailored, specialised services, also has implications for the types of skills held by ICT professionals and managers. Technical skills remain vital to service provision, but the business and communications skills required to identify opportunities for business improvements related to ICT, and integrating these into organisational practice are increasingly important. For service providers, communication and business skills are also vital to explain and market niche services to enterprises. This two-way exchange of expertise has led some commentators to discuss the importance of business partnerships between lead organisations and technology vendors.

The global competition for ICT services has turned the sector towards contract work and outsourcing. This has increased fluidity between jobs and workforce mobility. As a result, ICT recruitment is more intensive than recruitment in most other sectors. DEEWR estimates that, over the past five years, recruitment activity for ICT professionals has been 3 to 5 times greater than the all occupation average.¹⁰

6. Innovation and Business Skills Australia (IBSA) (2010), Scoping study – Identifying Digital Literacy Skills: cybercitizen and e-employee in the 21st century, <http://www.ibsa.org.au/training-packages/by-industry/information-and-communications-technology/scoping-study-investigating-digital-literacy-skill.aspx>, viewed 27 November 2012, p 7

7. International Data Corporation (IDC) (2012), ICT Skills in the Workplace Forum: Market Overview, unpublished presentation for the ICT Skills in the Workplace Forum, 21 November 2012.

8. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 4.

9. Australian Government Information Management Office (AGIMO), Department of Finance and Deregulation (2012), ICT Skills Issues Paper, p 9

10. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 3.

Despite the demand for high-level ICT skills, the surge in ICT complexity and the resulting need for ongoing skills development, and the increased importance of 'soft' skills related to the communication of ICT service benefits, industry investment in training is declining. IDC reports that spending on ICT training in Australia in 2012 represented just 0.57 per cent of total ICT spend (US\$408 million of US\$71,830 million), and it forecasts that training expenditure will drop to 0.55 per cent of ICT spend by 2015 (US\$435 million of US\$79,601 million).

Therefore, spending on ICT education lags behind the market average, and falls well behind spending on software. IDC argues that ensuring a return on investment is difficult to achieve if staff are not adequately trained in implementation, management and use of software.

Conclusion

In a complex ICT environment marked by peaks and troughs in recruitment activity, increased outsourcing, and the provision of complex, consumerised services, employment and career pathways in ICT have become increasingly diverse. Many high-skilled ICT workers source education from a variety of non-formal sources including specialist camps focusing on recent technological developments to ensure that they remain competitive in the employment market. Conversely, ICT workers with low-to-medium skills and qualifications are often required to undertake contract work that is vulnerable to outsourcing and offshoring.

For prospective employees, including school-age students and adults already in the labour force, it is difficult to identify with certainty how to access a stable, secure ICT career pathway. This is particularly the case for the female workforce, and for mature-age workers. The next section sheds some light on these issues by examining trends in demand for ICT workers, and identifying the key sources of labour for the workforce.

Part two: Skills supply and demand analysis

Introduction

This section provides an overview of current data and analysis of ICT skills supply and demand. As mentioned earlier, industry frequently reports difficulty in accessing ICT skills, particularly high-level ICT skills. This section will consider current data on ICT skills demand and supply to provide a context for these claims.

The cyclical nature of the ICT industry presents challenges for skills development. Following the 2000 Dotcom crash and the more recent global financial crisis, demand for ICT workers dipped and, in response, the engagement of domestic students in ICT courses at universities and vocational education and training (VET) institutions also declined. There are some indications that domestic student engagement in tertiary ICT courses is improving as employment prospects in the industry become more positive.¹¹

Over the past decade, skilled migration figures for ICT professionals have increased substantially, as have the numbers of overseas students enrolling in ICT degrees. The statistics indicate that, in the short to medium term, overseas students are likely to meet the majority of industry demand for ICT graduates.¹²

The evidence on the level of ICT skill shortages is inconclusive. The cyclical nature of the industry and high proportion of contracted employment lead to high levels of recruitment activity. While businesses frequently report difficulty recruiting ICT skills, it is not clear whether these difficulties arise from genuine mismatches between skills demand and supply, or from tight project timeframes and/or unrealistic expectations of the experience held by job candidates. To inform its final report, AWPA will work with DEEWR to assess the incidence of skills shortages in key ICT occupations.

One of the key findings emerging from the data is the low level of female workforce participation in ICT. Less than 20 per cent of the Australian ICT workforce is female, compared to around 45 per cent of the total Australian workforce.¹³

This issue, and other key issues related to ICT skills supply and demand, is addressed in Part three of this Issues Paper.

Defining the ICT workforce

The demand for ICT skills is not limited to the ICT industry, but is dispersed over a broad range of occupations and industries, making it difficult to obtain an accurate picture of skills demand and supply. AWPA adopts a broad view of the ICT workforce for this study, which takes into account ICT workers across these industries.

ICT workers are important to every sector of the economy. There are ICT workers employed in each of the 19 industry divisions identified by the Australian Bureau of Statistics. The majority of these workers (56 per cent) are classified in either the Professional, Scientific and Technical Services industry division, or the Information Media and Telecommunications industry division.

The employment picture is also complex. DEEWR identifies 18 different ICT occupations at the ANZSCO four-digit level. As mentioned earlier, we can identify three core ICT 'occupational strata' across these occupations. ICT professionals are clearly the biggest of these occupational strata, representing around two thirds of total ICT employment:

- ICT managers (53 100 employed in August 2012)
- ICT professionals (233 300 employed in August 2012) and
- ICT support technicians (57 000 employed in August 2012).

11. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 12.

12. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 16.

13. ACS (2012b), 2012 Australian ICT Statistical Compendium, http://www.acs.org.au/_data/assets/pdf_file/0014/13541/2012_Statcompendium_final_web.pdf, viewed 26 November 2012, p 25

ICT skills shortages

There are a range of different views on skill shortages in the ICT workforce.

AGIMO reports that there is greater demand for specialist skills due to new technology, increasing complexity of work, global competition, and sophisticated supply chains. Firms are hiring high-skilled ICT workers to streamline and automate systems and applications. This trend has contributed to the reduction in demand for lower-level ICT jobs.¹⁴

AGIMO adds that the shortage of ICT skills is exacerbated by poor planning for staffing needs which leads industry to adopt a short term approach to staffing.¹⁵

In addition, specialist ICT skills are in demand across several industry sectors, which often leads to intense competition for highly skilled workers. The long lead times for the education of specialised ICT workers creates lag times between industry demand and student supply for key occupations.

DEEWR notes increasing demand for high level ICT skills, which coincides with decreased demand for lower level ICT skills.¹⁶

This also coincides with a drop in entry-level positions for ICT graduates indicating that industry is demanding higher level experience and specialist skills. DEEWR's overall finding is that the number of ICT specialisations in shortage fell over the 2007 to 2009 period, responding to economic changes, from 16 in 2007 to two in 2009. DEEWR's consultations reveal that skills shortages emerge and change quickly in the ICT sector, indicating that they might relate to specific types of ICT projects rather than all ICT employment.¹⁷

DEEWR's analysis suggests that a number of factors influence skills shortages issues in the ICT sector. Employers requiring specific expertise and experience for ICT projects with short time frames are more likely to experience skills shortages than those who are able to provide on the job training for ICT graduates with the appropriate qualifications.¹⁸

In addition, the rapidly evolving nature of the ICT sector and the resulting demand for new skills can also contribute to firms experiencing skills gaps and skills shortages.

November 2012 data sourced from the Information Technology Contract and Recruitment Association indicates that the occupations most difficult to fill are those requiring specialist skills and high level experience, including roles of Chief Information Officer, Chief Technology Officer and ICT Manager. Data indicates that these positions take 50.8 days to fill despite an average of 7.2 candidates being available for each placement in these occupational categories. Similarly, the data for Security Specialist placements indicate that it takes 35.9 days to fill these positions despite the fact that each placement has an average of 12.2 candidates available.¹⁹

This data suggests that organisations are demanding candidates with a high level of specialised experience to fill these roles.

IBSA identifies several ICT occupations as being in demand based on its consultations with industry.²⁰

These include:

- Broadband Technician
- ICT Business and System Analyst
- Chief Information Officer
- ICT Manager
- ICT Security Specialist
- ICT Business and System Analyst
- ICT Helpdesk Officer
- Multimedia Specialist and Web Developer
- Telecommunications Rigger/Installer
- Professional-virtual Database Administrator.

14. Australian Government Information Management Office (AGIMO), Department of Finance and Deregulation (2012), ICT Skills Issues Paper, pp 9-10

15. Australian Government Information Management Office (AGIMO), Department of Finance and Deregulation (2012), ICT Skills Issues Paper, pp 9-10

16. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 20.

17. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 20.

18. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 20.

19. Information Technology Contract and Recruitment Association Ltd. (ITCRA), SkillsMatch, November 2012

20. Innovation and Business Skills Australia (IBSA) (2010), Scoping study – Identifying Digital Literacy Skills: cybercitizen and e-employee in the 21st century, <http://www.ibsa.org.au/training-packages/by-industry/information-and-communications-technology/scoping-study-investigating-digital-literacy-skill.aspx>, viewed 27 November 2012, pp 9-10

Skills demand

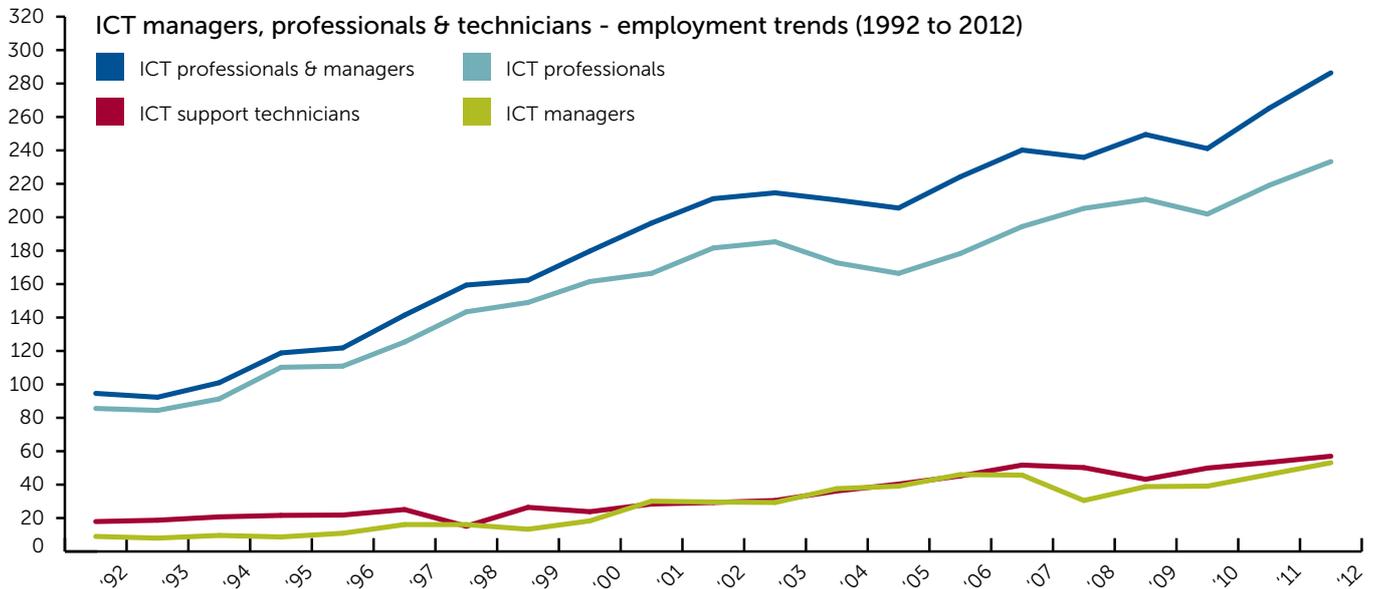
Patterns in ICT skills demand

Figure 1 details employment trends from 1990 to 2012 for the three key ICT occupational strata. The graph demonstrates that ICT employment is cyclical, and reflects broader economic trends.

The employment of ICT professionals and managers trended up strongly over the period from 1994 to 2004, and subsequently fell over 2004 and the first half of 2005, as a result of a downturn in the ICT industry. Since then, employment has recovered and has grown over most of the period from 2005 onward, with some fluctuations.

While the economic downturn in 2008 and early 2009 resulted in a dramatic decline in the number of ICT vacancies, this did not have an immediate negative impact on employment for ICT Support Technicians. Employment for ICT Support Technicians remained fairly stable over 2009 and 2012.

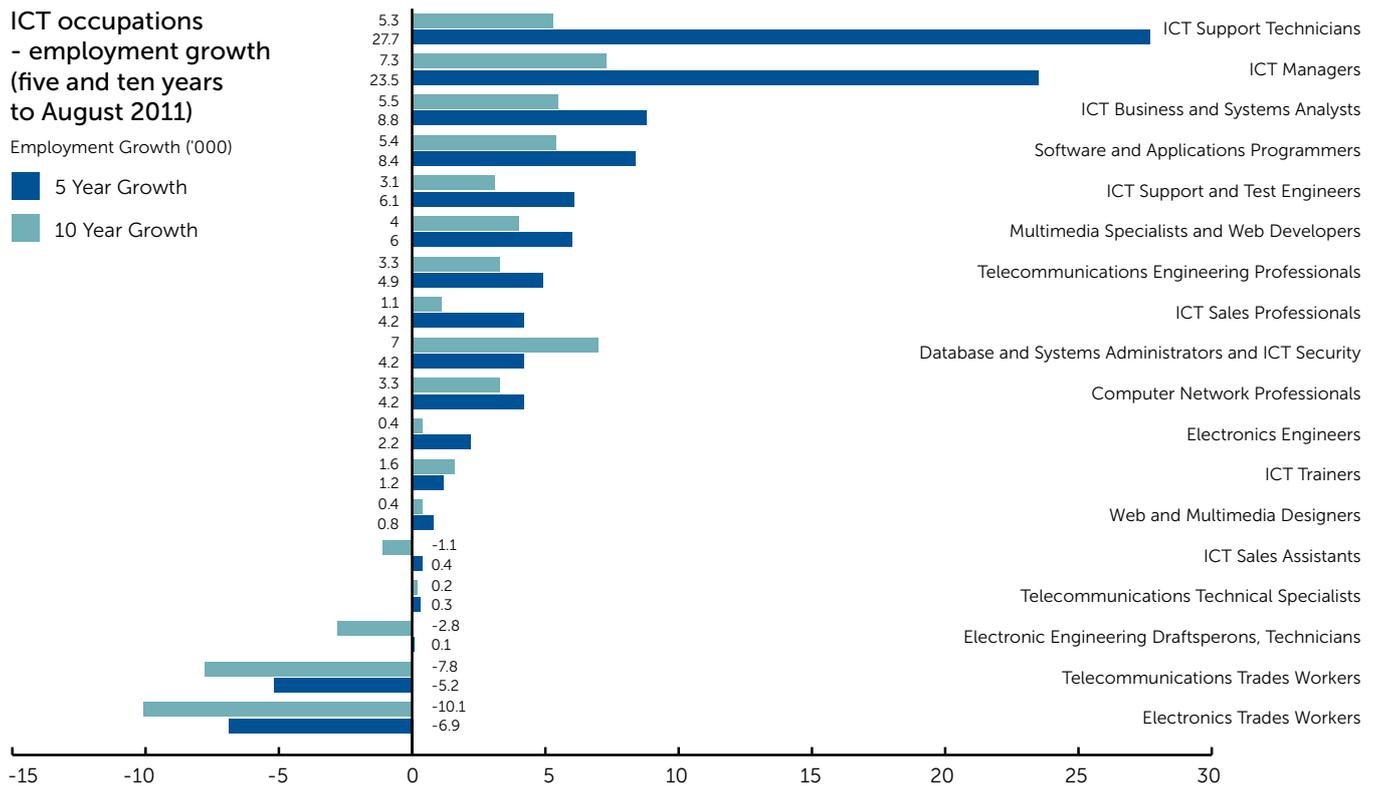
Figure 1: Employment trends across ICT employment strata



Source: DEEWR, ICT trend data based on ABS Labour Force Survey.

Figure 2 breaks down employment growth across specific ICT occupations. Demand for ICT professionals including programmers, systems analysts and computer network specialists has grown strongly over the past decade, as has the demand for ICT managers. Demand for some ICT trades has declined over this period, including Telecommunications Trades Workers, Electronics Trades Workers and Electronic Engineering Draftspersons and Technicians. The notable exception is demand for ICT Support Technicians, which grew strongly over the decade, tapering off slightly over the past five years.

Figure 2: Employment trends for specific ICT occupations



Source: DEEWR, ICT Trend data based on ABS Labour Force Survey.

Future employment projections

As the implementation of the NBN proceeds and demand increases for specialised ICT services, the demand for ICT workers is likely to continue to increase.

In its 2012 employment projections, DEEWR projects employment growth over the next five years in the two key industry sectors for the ICT workforce – the Professional, Scientific and Technical Services industry division, and the Information Media and Telecommunications industry division. However, the story is quite different for the two sectors:

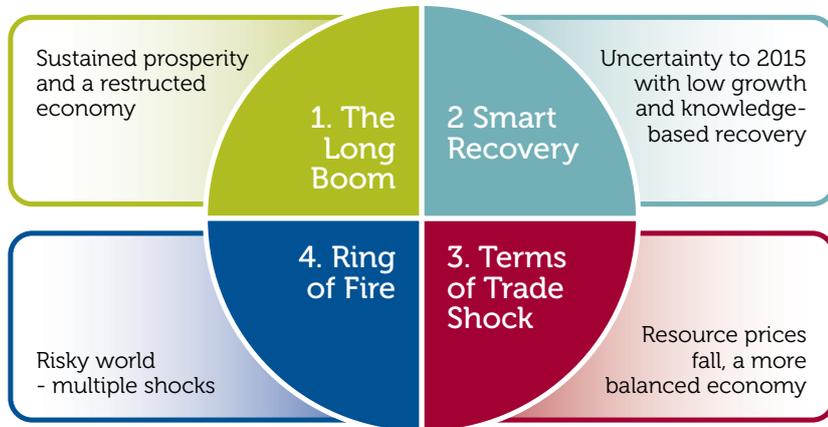
- strong growth of 2.4 per cent per annum is projected for the Professional, Scientific and Technical Services industry division, equating to 108 200 jobs to 2016-17. The Computer System Design and Related Services sector, which forms part of this division, is expected to be a key driver for this anticipated growth rate.²¹
- the Information Media and Telecommunications industry division is projected to grow at a more modest rate of 0.5 per cent per year to 2016-17, totalling 4 600 new jobs. The NBN rollout is expected to promote employment growth, but it is expected that this growth will be offset by continuing technological change and productivity gains in the industry.²²

The long-term prospects for ICT employment are also positive. To underpin its next National Workforce Development Strategy, AWPA has developed a set of four scenarios for Australia to 2025. These scenarios are illustrated in Figure 3.

21. Department of Employment Education and Workplace Relations (DEEWR) (2012), Industry Employment Projections – 2012 report, <http://www.deewr.gov.au/lmip/default.aspx?LMIP/Publications/IndustryEmploymentProjections>, viewed 26 November 2012, p. 4.

22. Department of Employment Education and Workplace Relations (DEEWR) (2012), Industry Employment Projections – 2012 report, <http://www.deewr.gov.au/lmip/default.aspx?LMIP/Publications/IndustryEmploymentProjections>, viewed 26 November 2012, p. 4.

Figure 3: AWPA Scenarios



Source: AWPA, *Future Focus discussion paper, 2012*.

Each of these scenarios emphasise the continued and expanding need for technology and innovation in the years to 2025. Depending on the scenario, AWPA estimates annual employment growth of between 2 to 4 per cent in the Professional, Scientific and Technical Services industry division between 2012 and 2025. The final report will include a detailed analysis of ICT workforce projections against these scenarios.

Skills supply

Key sources of skills supply for the ICT sector

The key sources of ICT skills include graduates from higher education courses in ICT, graduates from VET courses drawn from the two Training Packages most relevant to ICT, and skilled migrants. After a consistent decline in domestic student numbers over the past decade, some improvement is evident over the past couple of years, particularly in higher education. Overseas enrolments in domestic ICT higher education courses have dropped slightly in recent years, but still represent the majority of commencements and completions. The number of ICT professional positions filled by overseas workers on employer-sponsored migration visas increased throughout the decade.

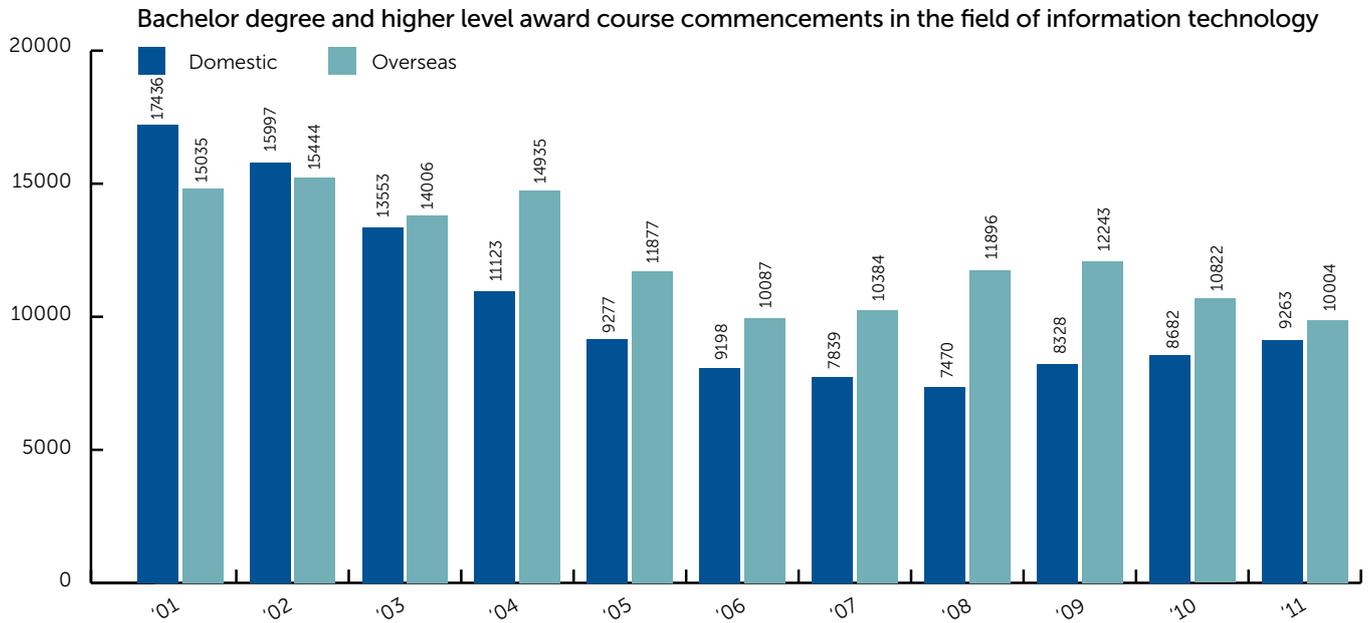
Supply from higher education – commencements

Figure 4 profiles commencements in ICT higher education courses over the past ten years. This dataset gathers information from a range of courses including Computer Science, Information Systems, Conceptual Modelling, Information Technology, Networks and Communications, Security Science, Systems Analysis and Design and Programming.

Commencements of domestic students in Bachelor degree and higher award courses in ICT declined every year from 2001 to 2008. Domestic commencements decreased most rapidly over the 2001 to 2006 period, at an average rate of approximately 14 per cent per annum.

Since 2008, we have seen some improvement in domestic commencements. Nevertheless, in the short to medium term it seems likely that industry demand for recent ICT graduates will be met increasingly by overseas students, who have the potential to enter the Australian ICT labour market through the General Skilled Migration program.

Figure 4: Bachelor degree and higher level award course commencements in ICT



Source: DIISRTE Higher Education Group, Selected Higher Education Statistics Publications

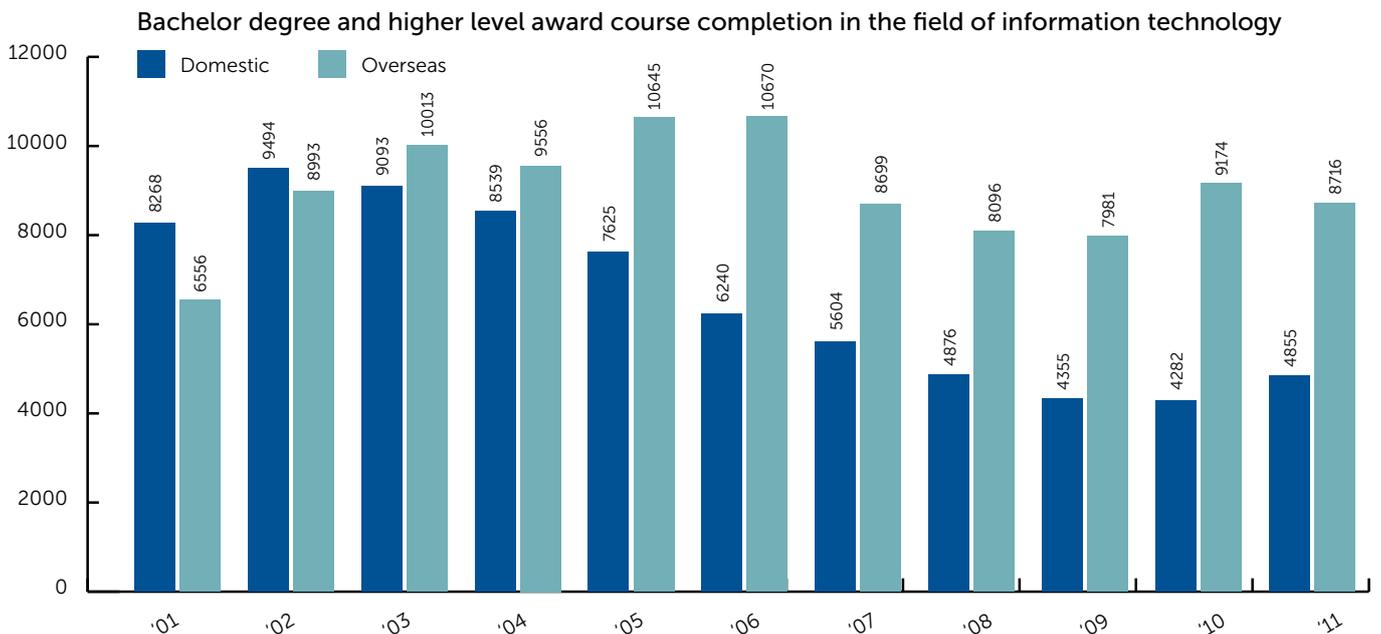
Supply from higher education – completions

Figure 5 profiles completions in ICT higher education courses.

Domestic student completions declined at an average rate of approximately 8 per cent per annum over the 2003 to 2005 period. From 2005 to 2009, domestic student completions declined at a more rapid rate, approximately 14 per cent per annum. There have been some improvements over the past three years.

Over recent years, domestic ICT commencements have steadily increased, and this should have positive implications in future years for completions in these courses.

Figure 5: Bachelor degree and higher level award course completions in ICT



Source: DIISRTE Higher Education Group, Selected Higher Education Statistics Publications.

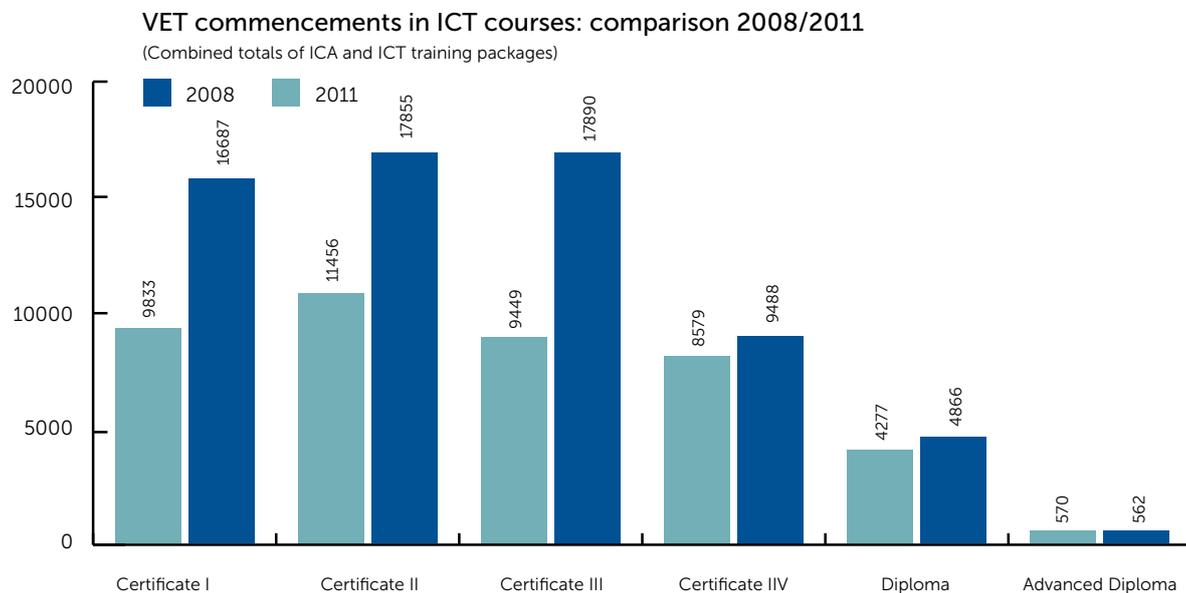
Supply from VET

ICT courses undertaken at VET institutions are drawn from qualifications listed in two nationally endorsed Training Packages:

- The ICA11 Information and Communications Technology Training Package, which includes qualifications and units of competency related to gaming, digital and social media technologies, cloud computing, mobile devices, network security and digital literacy.
- The ICT10 Integrated Telecommunications Training Package, which includes qualifications and units of competency related to telecommunications engineering, technology, infrastructure, installation and networks.

As indicated in Figure 6, commencements in these courses have been declining since 2008. The decline is particularly noticeable at the Certificate III level. In 2008, there were 17 890 commencements in these Training Packages, compared to 9 449 in 2011. This represents a decrease of 47.2 per cent. The percentage decreases are less at the Certificate IV and Diploma level (-9.6 and -12.1 per cent respectively). The only increase in VET commencements has been at the Advanced Diploma level (1.4 per cent) but this is based on low overall numbers (562 in 2008 compared with 570 in 2011).

Figure 6: VET commencements in ICT courses: comparison 2008/2011



Source: DIISRTE trend data based on NCVER VET Provider Collection.

The decline in VET enrolments could be in response to the increased demand for specialised and higher skills in the ICT industry. DEEWR analysis indicates that only 8 per cent of ICT support technicians identify Certificate IV and Advanced Diploma as their highest level of qualification and nearly 40 per cent have attained a Bachelor degree or higher qualification.²⁴

The industry demand for specialised and higher skills is also reflected in the entry level difficulties faced by new graduates and is discussed in Part three of this report. There have been concerns about job losses at lower skills levels due to outsourcing and offshoring and this could also have consequences on student choices of VET courses as a pathway into the ICT industry.

23. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 15

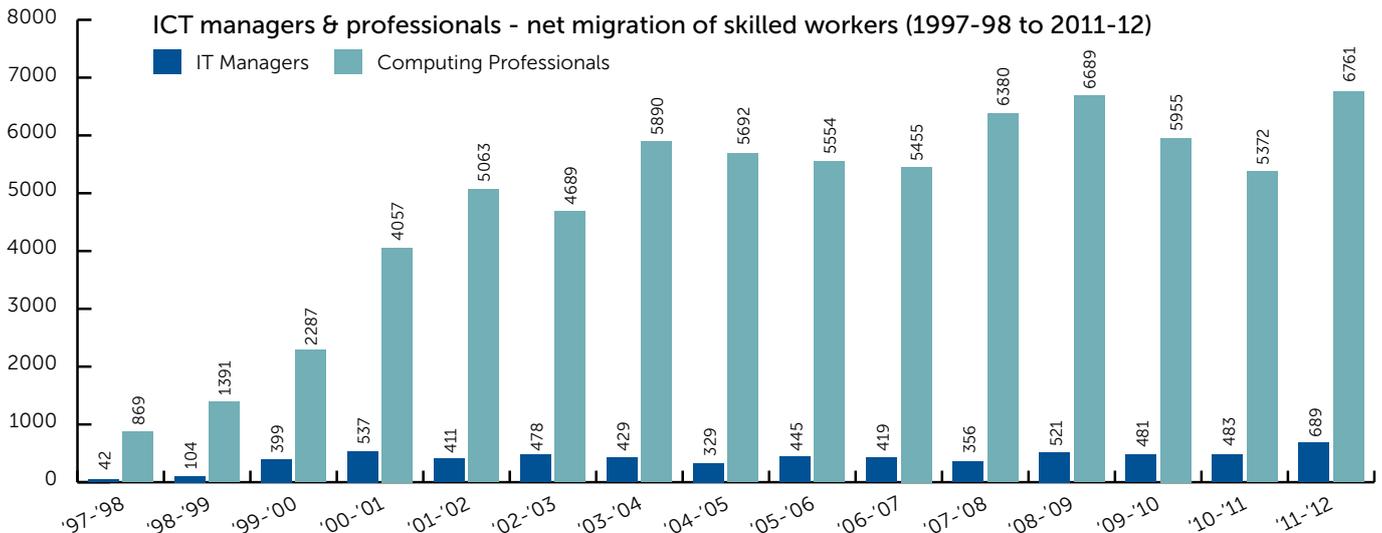
24. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 15

Supply from skilled migration

As demonstrated in Figure 7, skilled migration is an increasingly significant source of skills supply for the ICT sector. This figure demonstrates the substantial increase in the net overseas migration of ICT professionals and managers over the past decade.

We saw a big increase from 1997-98 to 2001-02, a slight decrease from 2003-04 to 2006-07, followed by increases in 2007-08 and 2008-09. Decreases in 2009-10 and 2010-11 were then followed by a significant increase for the year 2011-12.

Figure 7: Net overseas migration for ICT occupations 1997-98 to 2011-12



Source: DEEWR trend data based on DIAC migration data.

Conclusion

Demand for ICT skills is increasing across the economy, and in this context it is important that ICT skills are provided from a range of sources. Recent improvements in domestic student engagement in higher education are encouraging, but there is some way to go until these numbers recover to 2001 levels. It is apparent that skilled migration will continue to play a significant role in meeting ICT skills needs in the future.

The next section of this Issues Paper looks at some of the implications of the data trends identified in this section.

Questions for discussion

- Are there any gaps in the definition of the ICT workforce provided in this Issues Paper?
- How can government, industry, professional associations and the training sector collaborate to collect and share data on ICT skills demand and supply?

Part three: Key issues for supply and demand

Introduction

As mentioned earlier in this Issues Paper, ICT services will be at the forefront of economic development over coming decades, as business and consumers continue to embrace digital technologies. However, this contribution can only be activated if an appropriately skilled ICT workforce can be sourced, and if the broader workforce and population can be encouraged to develop a broad array of digital interests, skills and capabilities.

This section outlines the priority challenges related to demand and supply of ICT skills. These issues are signalled earlier in this paper, and were also addressed in the November 2012 ICT Skills in the Workplace Forum. These include:

- the establishment of effective pathways from schools to further education and employment in ICT as vital for building the supply of ICT skills
- the provision of effective, transparent and accessible communication on career pathways into the ICT sector, and in relation to career progression within the sector
- strategies for enhancing skills supply from education and training providers, including higher education and VET providers
- the potential to broaden the ICT workforce by engaging non-traditional sources of labour for the industry, including women and mature aged workers
- the importance of continuous learning and development for the ICT workforce, and organisational commitment to skills utilisation
- building digital literacy across the broad workforce and community to ensure that Australia reaps the benefits of the digital economy.

Ensuring an effective ICT Skills pipeline from schools

Foundational support to develop skills relevant to ICT, particularly Science, Technology, Engineering and Mathematics (STEM) capabilities, at school level is critical for supporting the development of ICT skills. Across the board, ICT stakeholders and experts have called for strengthening the focus on ICT at school level by building capacity for teachers and students to access curriculum material that is relevant to careers in ICT and by engaging with ICT in a creative and inspiring manner.

The Office of the Chief Scientist has identified the development of STEM education and capacity as critical to Australia's future skills needs and this has been reflected in a range of policy responses from the Government. ICT skills are an integral part of the STEM agenda. The integration of ICT skills into STEM studies at high school levels will benefit from industry collaboration and expertise, particularly in relation to resources and support for teachers to deliver cross disciplinary and relevant content that is engaging and represents the diversity of the ICT sector.

School career counsellors and parents have a critical role to play in promoting the ICT sector to students. The view of some industry commentators is that career advice about ICT does not represent the ICT sector appropriately at the present time.

The Australian Council of Deans of ICT identified key 'primary learning locations', including schools, as spaces where industry can transform experiences and perceptions about ICT.²⁵

This was supported by National ICT Australia (NICTA) which identified an 'acute' perception problem that misrepresented the ICT industry as solely dealing with programming.²⁶

In reality, ICT spans a diversity of occupational profiles including mobile apps, interfaces for community engagement, publishing, green energy, banking and exploration, and involves a wide range of skills, talents and interests.

The Education and Skills Working Group of the Information Technology Industry Innovation Council (ITIIC) has identified ongoing professional development of ICT teachers, the potential of eLearning to deliver technology based curriculum and the matching of the ICT curriculum to industry needs and developments as ways of addressing ICT skills issues at foundational levels.²⁷

25. Australian Council of Deans of ICT (ACDICT) (2012), Submission to AWPA Skills and Workforce Development Policy discussion paper, <http://www.acdict.edu.au/documents/ACDICTletterAWPA210812.pdf>, viewed 26 November 2012.

26. Durrant Whyte, H. and Kaplan, S. (2012), 'A Strategy for Building Skills and Capacity in Australian ICT', National ICT Australia (NICTA) submission to the ICT Skills in the Workplace Forum, 21 November 2012, p 3

27. Information Technology Industry Innovation Council (ITIIC) (2012), ITIIC response to the Australian Workforce and Productivity Agency discussion paper 'Australia's skills and workforce development needs'.

ICT camps akin to band camps have been held up as examples of projects which address some of the issues identified above. NICTA has highlighted the outcomes of the Group X project in Queensland which may have contributed to an increase in the number of students applying for tertiary ICT courses in Queensland by 50 per cent. NICTA adds that it is important to expand the focus of these camps to include those who do not have pre existing ICT skills as this has the potential to attract more women.²⁸

ITIIC notes that 40 per cent of primary school students have already made decisions about their future careers.²⁹ The role of schools as primary locations for informed career education about ICT is thus integral to enhancing the ICT skills pipeline from schools.

Questions for discussion

- How can industry partner with schools to improve the provision of ICT education and career pathways?
- What is working well in relation to partnerships between industry and schools?

Effective communication and structuring of career pathways into the ICT workforce

Given that the ICT workforce has a relatively young median age, it is of concern that there seems to be limited entry level positions available in the sector. An analysis of the supply and demand dynamics at this level is rendered complex by the fact there are multiple entry pathways into ICT. For example, the fields of education of graduates employed as ICT professionals are diverse and include Engineering and Related Technologies, and Management and Commerce.

The ICT workforce clusters in the 25-44 years age bracket. 65.1 per cent of the ICT workforce is in this demographic when compared to 44.7 per cent for all occupations.³⁰

In 2009, the median age of the ICT workforce was 36.8 years compared with 39 years for all occupations. However the proportion of ICT professionals in the 20 to 24 years age group is only 5.6 per cent compared to 10.4 per cent for all occupations. This could indicate either a shortage in the supply of ICT graduates, or a lack of entry level positions in the ICT labour market. In either case, the community perception that it is difficult to get a foothold in the ICT industry can act as a barrier to increasing enrolments into ICT courses. A comparison of the number of persons who completed degrees in Information Technology with available places in the labour market for the period 2005 to 2008 suggests that there was a shortage of 2 913 entry level positions for persons in the 20 to 24 years age group.³¹

Several industry bodies have undertaken a range of programs to address entry level issues through cadetships and scholarships. Microsoft has a unique full year internship program for university students which is fully paid and allows students to work full time during breaks and part time during semester. Cadetships and scholarships are discussed further under work integrated learning in the next section.

In addition to the complexity of educational entry pathways, ICT career pathways within the industry are not transparent. ICT is a rapidly evolving sector with new occupations emerging in response to restructuring and technological developments. The challenge for the industry is to communicate the current models and benefits of ICT careers and pathways in accessible ways to attract new and diverse people into the sector.

Questions for discussion

- How can education and training providers produce 'work ready' graduates?
- How can industry make career pathways to specialised ICT careers more transparent to prospective workers?
- How can small to medium enterprises (SMEs) be supported to provide entry level opportunities?

28. Durrant Whyte, H. and Kaplan, S. (2012), 'A Strategy for Building Skills and Capacity in Australian ICT', National ICT Australia (NICTA) submission to the ICT Skills in the Workplace Forum, 21 November 2012, p 3

29. Information Technology Industry Innovation Council (ITIIC) (2012), ITIIC response to the Australian Workforce and Productivity Agency discussion paper 'Australia's skills and workforce development needs'.

30. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 13

31. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 13

Strategies to enhance quality of skills supply from universities and VET institutions

DEEWR data indicates that skills shortages for particular ICT specialisations coexist with adequate supply of ICT job candidates.³² The same report also highlights significant levels of occupation and occupational wastage for ICT graduates aged between 20-29 years. In 2006, 51 per cent of ICT graduates in that age group were employed in other occupations.³³

The cyclical nature of the industry creates cycles of demand for specific ICT occupations and types of ICT projects. IDC highlights a range of issues with regard to skills demand which are relevant in this context. They include:

- an increasing demand for specialist knowledge in the ICT sector in relation to cloud computing and big data. Cloud computing links enterprises with Service Providers and thus shifts the skills needs of the enterprises. In these situations, enterprises need skills in evaluating and managing services in addition to technical skills
- Service Providers will seek specialist and technical skills, but will also require additional capacity in areas such as asset management and budgeting
- both Service Providers and enterprises will need workers with expanded sets of capabilities beyond ICT knowledge including skills in communication and business, the so called 'soft skills', as workers will need to be effective in selling services that meet customer needs.³⁴

As a result of these trends, the ICT industry increasingly demands 'T-shaped' ICT professionals, which refers to skill sets that combine high level technical skills with soft skills. Enterprises seek workers who can self manage and enable 'self organized work relationships'.³⁵

Therefore managerial and entrepreneurial skills are highly valued by the industry.

Industry partnerships with tertiary education providers can address skills gaps, including the reported deficit in soft skills, in constructive ways to ensure that graduates are work ready. NICTA suggests the introduction of relevant courses in areas such as data science, networks and software engineering which are focused on current and future industry and business needs and which could also reduce attrition rates. NICTA also proposes that ICT courses should better reflect the skills demands of the current ICT industry which include capabilities in design thinking, creativity and strategic analysis.³⁶

The less specialised ICT occupations face particular challenges in relation to changes within the industry as well as issues such as offshoring. The National Institute of Economic and Industry Research study for the Australian Services Union identifies key ICT occupations which have been offshored or have the potential to be lost, many of which are in the less specialised categories.³⁷ IBSA has identified that there needs to be a better alignment of VET qualifications to industry demands.³⁸

Work integrated learning is an important way of matching skills demand to skills supply. The Australian Computer Society (ACS) has noted that on the job training is essential in emerging areas of specialisation such as big data and cloud services which are not supported by the current university courses.³⁹

Work integrated learning can also address the issue of low numbers of entry level positions by setting up structured opportunities for students to combine work with study as part of their assessments. There are several examples where enterprises and industry bodies (ACS, Westpac, Microsoft, IBM) have developed projects to increase employability of graduates and to expose them to current industry content and services.⁴⁰

In addition enterprises also offer cadetships and scholarships to attract workers. For example, Paypal, Oracle, Google, IBM and Honeywell have activities and scholarships to attract more women into the ICT sector.⁴¹

Skilled migration continues to be an important source of ICT skills supply, particularly for the more specialised ICT occupations.

32. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 19

33. Department of Employment Education and Workplace Relations (DEEWR) (2011), ICT Labour Market Indicators, November 2011, <http://www.skillsinfo.gov.au/documents/ict-labour-market-powerpoint-presentation>, viewed 26 November 2012, Slide 25

34. International Data Corporation (IDC) (2012), ICT Skills in the Workplace Forum: Market Overview, unpublished presentation for the ICT Skills in the Workplace Forum, 21 November 2012.

35. Dörhöfer, S. (2012), 'Knowledge- Based HRM: An Integrative Approach', European Journal of Social Sciences, Vol 28, No 4: 473-488, http://www.europeanjournalofsocialsciences.com/ISSUES/EJSS_28_4_05.pdf, viewed 23 November 2012, p 274

36. Durrant Whyte, H. and Kaplan, S. (2012), 'A Strategy for Building Skills and Capacity in Australian ICT', National ICT Australia (NICTA) submission to the ICT Skills in the Workplace Forum, 21 November 2012, p 5

37. National Institute of Economic and Industry Research report for Australian Services and the Finance Sector Union (ASU) (2012) Off-shore and off work: The future of Australia's service industries in a global economy: An update, http://www.fsunion.org.au/Upload/Campaigns/Offshoring/NIEIR_2012_report_SPE004_SSU_offshoring_update_final_011012.pdf, viewed 26 November 2012.

38. Innovation and Business Skills Australia (IBSA) (2012), Information and Communications Technologies Industry Environmental Scan - 2012, <http://www.ibsa.org.au/Portals/ibsa.org.au/docs/Research%20&%20Discussion%20Papers/EScan/EScan2012/IBSA%20EScan%202012%20-%20Principal.pdf>, viewed 26 November 2012, p 15

39. Australian Computer Society (ACS) (2012a), ACS response to the Australian Workplace and Productivity Agency discussion paper 'Australia's skills and workforce development needs', http://www.acs.org.au/_data/assets/pdf_file/0004/10948/ACS-Response-to-the-NWPA-discussion-paper.pdf, viewed 26 November 2012.

40. Information based on unpublished submissions to the ICT Skills in the Workplace Forum on 21 November 2012 and on feedback received from participants at the forum.

41. Durrant Whyte, H. and Kaplan, S. (2012), 'A Strategy for Building Skills and Capacity in Australian ICT', National ICT Australia (NICTA) submission to the ICT Skills in the Workplace Forum, 21 November 2012, p 4

Balancing domestic skills development with international skills supply in order to maintain and enhance Australian ICT capabilities is a key challenge. In addition, optimum skills utilisation of skilled migrants and support for them to participate fully in the ICT workforce is important in order to maximise the value of skilled migration in relation to ICT skills supply.

Questions for discussion

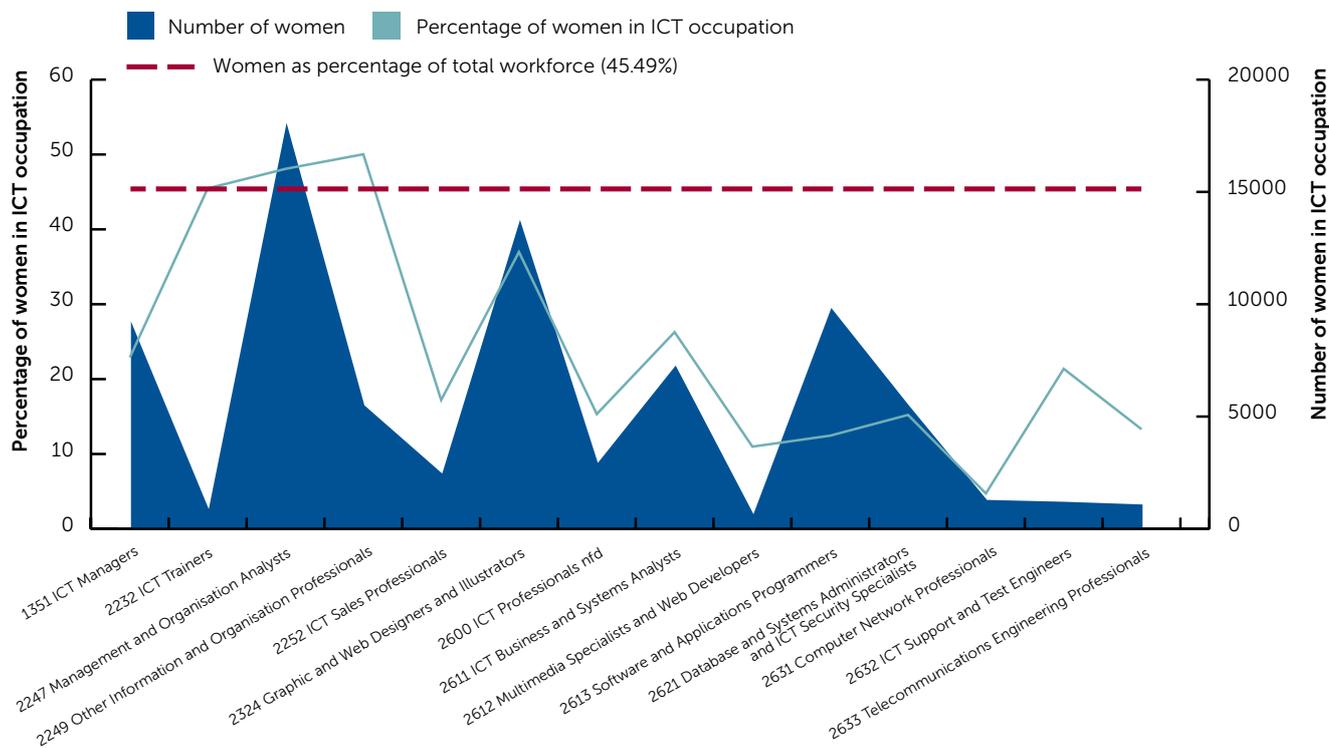
- What can be done to boost engagement in ICT apprenticeships and traineeships and to create more entry-level opportunities?
- Which existing training courses, across higher education and VET, are successful in creating 'T-shaped' graduates with both technical and 'soft skills'?
- How important is skilled migration to meeting the needs of the ICT sector?

Broadening the mix of workers in the ICT workforce by improving participation and diversity

In order to expand the current supply of ICT skills, it is necessary to look beyond the skills pipeline from vocational and tertiary education and consider the broader workforce including women and mature aged workers. The ICT sector lags well behind other sectors in relation to participation of women in the workforce.

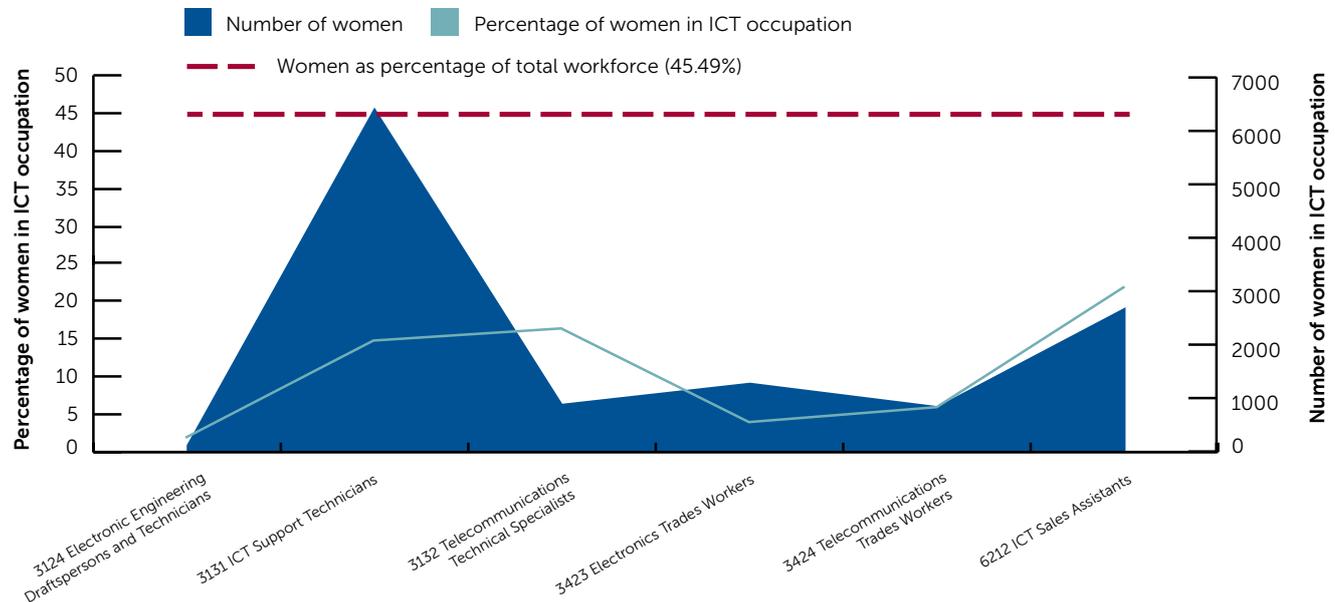
As demonstrated in Figure 8, women's participation is under 10 per cent for most specialised ICT professional occupations including Systems Administrators and ICT Security Specialists. Where it trends above women's participation figures in the general workforce, it relates to the less specialised occupations under the Information and Organisation Professionals and ICT Sales Professionals groupings. The same is true of ICT trades and retail workers (see Figure 9), where women's participation in the ICT workforce is under 20 per cent for all of the occupational groupings, except the ICT Support Professionals grouping.

Figure 8: Female ICT Managers and ICT Professionals February 2012



Source: ACS, 2012 Australian ICT Statistical Compendium

Figure 9: Female ICT technical, trade and retail workers February 2012



Source: ACS, 2012 Australian ICT Statistical Compendium

A recent ACS survey of female professionals in ICT indicated that workforce culture and lack of flexibility were barriers to their participation. There are also challenges at the school level in relation to engaging girls in ICT and in STEM subjects which exacerbates the problem.

Several industry based projects have been implemented to improve female participation in ICT including initiatives by Google, PayPal, IBM, Honeywell and others. The programs include specialised activities or scholarships to encourage and support women. NICTA proposes that women need to be supported to change their perceptions around ICT and one way forward is to create connections with the entrepreneurial aspects of technology. As noted before, at the school level, camps for students with no pre existing ICT skills have been successful in attracting girls. In addition, organisations such as ‘Robogals’ which run projects introducing engineering and science to girls and women at all levels can offer avenues and models for engaging women in the ICT sector.

Australia has an ageing demographic and addressing the mature aged workforce is key to expanding ICT skills. As noted before, currently the ICT workforce has a relatively young age profile. Reskilling and retraining opportunities can support mature aged workers to re-enter the ICT workforce. NICTA has proposed short transition courses in partnership with local and global industry and research organisations. While NICTA intends for these courses to target the upskilling needs of industry practitioners in areas such as data services and modern software engineering, similar transition courses could service the needs of mature-aged workers wishing to join the ICT sector.

It has been noted that emerging workforce trends such as teleworking can enable participation from non-traditional sources of labour for the industry, including women and people with disabilities, as they offer greater flexibility. In addition, in all cases, strategies to attract new sources of labour will not deliver long term benefits unless they are simultaneously supported by strategies to address issues around retention of employees in the ICT workforce. AWPA invites more information about existing programs that combine attraction and retention strategies for its final report.

Questions for discussion

- How can ICT businesses draw on the mature aged workforce to support new and emerging skills demands?
- What methods can be utilised to improve participation in the ICT workforce from women, Indigenous Australians, people with disabilities and retirees? What support is required to enable the increased participation of these groups in the ICT workforce?

Supporting and enabling continuing skills development across careers

Given the fast pace of change in the ICT sector, the capacity to undertake lifelong learning is an essential skill for workers in this sector. In the ICT sector, there is a movement away from the 'front loaded' education, work, retirement life cycle, towards ongoing skills acquisition through on-the-job learning and training. In this context, education and training providers and enterprises have to be able to support ongoing reskilling and upskilling to ensure that they have the adequate skills supply at the appropriate levels to meet emerging and new trends in the industry.

IDC notes that investment in ICT training, staff hiring and development at enterprise level has flatlined as expertise is increasingly outsourced. However, training and skills are critical to the success of projects and to be able to optimise benefits from new technologies and platforms.⁴²

Some of these skilling issues are best addressed at enterprise level through targeted actions such as career planning within organisations and investment in upskilling. Small to medium enterprises (SMEs) have particular challenges in this arena due to their resource limitations.⁴³ Given that 96.9 per cent of the enterprises in the PST sector are SMEs⁴⁴, support for them to undertake training and upskilling activities will be important to address some of the skills development issues in the ICT sector.

It may be useful to consider the regional implications for Australia in relation to developments in the Asian economies. As these economies go up the value chain, they develop high skills in areas that are driving their growth, which includes their ICT industries. The global nature of the ICT sector creates a global market for skills. Australia may be best served by identifying and developing niche skills which can make the sector competitive in the region and globally.

Questions for discussion

- By what mechanisms can government and industry and professional associations encourage and support SMEs to engage with skills development?
- What strategies can be employed to encourage employers to invest in upskilling and lifelong learning for their workforce? How can industry and training providers collaborate to provide these opportunities?
- What can be done to address the ICT industry's concerns regarding the retention of skilled workers?

Enabling Australia's digital economy by building digital literacy capabilities

Digital literacy is increasingly becoming a foundational skill required to participate in and benefit from Australia's digital future. In particular, the roll out of the NBN will bring new products and platforms into the market which will require some level of digital capabilities across the broad population. In this context, it is important to ensure that we do not have digital skills gaps due to factors such as lack of English language skills and lack of access to technology.

In the broader context of building ICT skills in the community, Deakin University highlights the role of networks to connect communities and to facilitate community education, in anticipation of the NBN.⁴⁵ There are international examples of such networks, including the rollout of the Aakash tablet in India which has been subsidised by the Indian Government in order to enable development of ICT skills at the broad community level. This low cost tablet (costing the equivalent of \$US35) will be developed by Datawind with subsidy from the Indian government to enable access to affordable technology for tertiary students of engineering. The aim is to reach all students in the next 5 to 6 years and for the tablet to become available free of cost. Aakash has faced significant challenges in relation to keeping up with demand, the sophistication of its technology and issues around it being made overseas in China rather than in India. However, the Indian Government has continued to support the tablet.⁴⁶

Deakin University suggests that projects such as free 'hot spots' and tele centres can enable community access to and preparation for the networking channels of the NBN future.

Workers across all industry sectors will also need some level of ICT skills as technological changes impact on work processes. In particular, workers in sectors such as health and transport and logistics face the challenge of acquiring ICT skills as their work processes adopt new technological developments.

42. International Data Corporation (IDC) (2012), ICT Skills in the Workplace Forum: Market Overview, unpublished presentation for the ICT Skills in the Workplace Forum, 21 November 2012.

43. View expressed by various speakers at the Prime Minister's Forum on the Digital Economy 2012, Draft Transcript, 5 October 2012.

44. Department of Innovation Industry Science and Research (DIISR) (2011), Key Statistics: Australian Small Business, 2011 <http://www.innovation.gov.au/SmallBusiness/KeyFacts/Documents/SmallBusinessPublication.pdf>, viewed 30 November 2012, p 10.

45. den Hollander, J. (2012), Submission on behalf of Deakin University to the ICT Skills in the Workplace Forum, 21 November 2012

46. Press Trust of India, President Pranab Mukherjee launches low cost Aakash-2 tablet at Rs1,130, Economic Times online, 12 November 2012, <http://economictimes.indiatimes.com/tech/hardware/president-pranab-mukherjee-launches-low-cost-aakash-2-tablet-at-rs-1130/articleshow/17181405.cms>, viewed 27 November 2012.

Questions for discussion

- What are the implications for the Australian ICT sector and workforce of the increasing globalisation of both the ICT sector and the ICT workforce?
- How can government, industry, and the training sector work together to ensure that the Australian ICT workforce is able to adopt and contribute to new technology across all industry sectors?

Conclusion

There is a broad range of issues in relation to skills demand and supply in the ICT sector that require collaborative initiatives by industry, government and the education and training sector.

There are numerous emerging solutions to the issues discussed here. Industry, the education and training sector and government have been developing strategic projects that address skills related issues. The next section will highlight some of the themes of these projects and will invite stakeholders to provide models and suggestions for transferring the learnings from these projects across the ICT sector.

Given the rapid changes in the ICT sector and emerging and new areas such as cloud computing and big data, AWPA invites stakeholders to identify additional priority issues in relation to current and future ICT skills needs, with a view to including these issues in its final report.

Part four: ICT workforce development: What's working?

Overview

In its final report for the ICT workforce study, AWPA will focus on successful approaches to workforce development for the ICT workforce. The key outcome from the study will be a set of workforce development strategies for industry, the tertiary sector and government to boost the supply of specialist ICT skills, improve ongoing skills development for the ICT workforce, and promote the effective utilisation of ICT skills.

These strategies will identify successful initiatives that are currently in place and suggest approaches to replicating these more broadly, and consider new initiatives that could be implemented to address priority workforce development issues for the sector.

This section sets out AWPA's approach to workforce development and invites submissions from interested parties on case studies that document successful approaches to ICT skills development.

AWPA's approach to workforce development

AWPA's primary strategic priority is to support Australian enterprises to build their capacity to develop and use the skills of their workforce to maximum advantage for the benefit of industry and the community. To support this goal, AWPA analyses skills needs in the Australian economy and provides the Australian Government with recommendations on current, emerging and future skills needs and workforce development needs.

AWPA defines workforce development as:

Those policies and practices which support people to participate effectively in the workforce and to develop and apply skills in a workplace context, where learning translates into positive outcomes for enterprises, the wider community and for individuals throughout their working lives.

One way of improving productivity is by maximising the skills and contributions of people in the workplace, a practise which has been shown to optimise organisational performance. Making better use of the skills of the workforce delivers benefits to both employers and employees.⁴⁷

The role of the tertiary sector is critical to meeting these challenges, while organisations – both large and small – can contribute to skills utilisation, and often job satisfaction, through providing opportunities for employees to put new skills and capabilities into practice, and by implementing internal strategies such as job redesign and job rotation.

Any workforce development strategy relies on a partnership approach between industry, the tertiary sector and government and a shared agenda between all of the players responsible for workforce development.

Initiatives to address workforce development in ICT

AWPA's preliminary research and consultation has revealed a range of initiatives aimed at improving ICT skills supply issues and workforce development. A number of successful initiatives were raised by participants at the ICT Skills in the Workplace Forum. These include camps (for example, the Exploring Interests in Technology and Engineering [EXCITE] camps) designed to expose students, and young women in particular, to ICT; Microsoft's work with teachers and schools; the 'Group X' initiative which is supported by the Queensland ICT industry, NICTA, universities, the Queensland Government, the ACS and the Australian Internet Industry Association; IBM's internship programs; and examples of work integrated learning programs offered at Swinburne, Deakin and other universities.⁴⁸

At the Prime Minister's Forum on the Digital Economy in October 2012, Google's Nick Leeder spoke of the need to 'amplify' ICT success stories, of 'celebrating their success more'. There is particular value in highlighting successful approaches to workforce development in ICT. Identifying and disseminating examples of best practice will benefit the entire industry and, by extension, the entire economy given the close link between ICT and productivity.

47. Skills Australia (2012), Better use of skills, better outcomes: A research report on skills utilisation in Australia, <http://www.skillsaustralia.gov.au/publications/documents/Skills-utilisation-research-report-15-May-2012.pdf>, accessed 27 November 2012.

48. Information based on unpublished submissions to the ICT Skills in the Workplace Forum on 21 November 2012 and on feedback received from participants at the forum.

AWPA has identified a range of general (and often overlapping) themes for improving workforce development in the ICT industry. These include:

- Improving the image of ICT as a career, especially for women
- Increasing the diversity, breadth of experience, and quality of ICT graduates
- Upskilling existing workers to meet skills gaps and enhance capability development including the development of higher-level ICT skills to meet the demands of technological change
- Encouraging enterprises to take a strategic, long term view of skills supply to the ICT industry by engaging with education and training providers
- Attracting and retaining specialist skills to the industry, given the high level of skills wastage among ICT graduates
- Enhancing policy drivers and incentives related to skills supply
- Building business and communication skills in the ICT workforce to support the development of well rounded, 'T-shaped' ICT professionals, managers and service technicians
- Building leadership and management capabilities to promote the effective utilisation of ICT skills.

Different approaches to workforce development are appropriate for different types of organisations. Large organisations and SMEs have different needs and different capabilities, and there may be differences in what is required for urban and regional enterprises. AWPA is keen to hear a range of perspectives on workforce development.

A partnership approach to ICT workforce development

Participants at the ICT Skills in the Workplace Forum agreed that ICT organisations need to work collaboratively, including moving beyond company-based initiatives to grow and develop the workforce that all enterprises need to meet future demand. Working in partnership with the training sector and government agencies, the ICT industry (and industry peak groups in particular) can take a lead role in developing and introducing an ICT skills supply and workforce development strategy to suit the present and future needs of the sector.

Industry members identify a need for more engagement between the ICT industry and education and training providers, and the recently announced partnership between the ACS and the Australian Council of Deans of Information and Communication Technology to develop ICT education and programs, including collaborative work on ICT curricula, demonstrates that this is already evolving at an industry level as well as between individual companies and academic institutions. Other examples include IBM's partnership with the University of Ballarat where students are offered opportunities to work for IBM, and senior IBM workers support the delivery of some ICT courses. At a State level, Queensland's 'Group X' initiative, which brings together industry, government, education providers and ICT peak bodies to promote ICT careers to high school students, provides an example of a working partnership approach.⁴⁹

In relation to school education, it is acknowledged that industry has a responsibility to work with schools to develop ICT curricula and enhance teacher skills, to work collaboratively to articulate the range of opportunities and explain the breadth of careers under the ICT banner, and to inspire students to choose ICT as a career.

49. Durrant Whyte, H. and Kaplan, S. (2012), 'A Strategy for Building Skills and Capacity in Australian ICT', National ICT Australia (NICTA) submission to the ICT Skills in the Workplace Forum, 21 November 2012, p 3

Invitation to submit case study examples of successful initiatives

Respondents are invited to submit examples of successful programs or initiatives designed to address ICT skills gaps and shortages, and to encourage and enable workforce development. These case studies will enable AWPA to feature real world examples of successful approaches to ICT skills development in its final report. A template for the case studies can be found at Appendix D.

The case study examples should include as much of the following information as possible:

- concise information about the initiative/program/example, including if it is run in partnership with other enterprises, professional organisations, government agencies, training providers, etc
- some evidence of how the example has boosted participation/improved productivity/made some other impact
- if possible, suggestions on how the example might be expanded and/or translated to other enterprises or jurisdictions.

Please submit case studies, or any other comments on the issues in this paper, to the AWPA Secretariat at ictstudy@awpa.gov.au by 8 February 2013. AWPA will seek the express permission of organisations to include particular case studies in its final report.

Please contact ictstudy@awpa.gov.au if you require any further information.

Template forms for the questions for discussion and the case studies are available on the AWPA ICT Workforce Issues Paper webpage.

Questions for discussion

- Are there any gaps in the definition of the ICT workforce provided in this Issues Paper?
- How can government, industry, professional associations and the training sector collaborate to collect and share data on ICT skills demand and supply?
- How can industry partner with schools to improve the provision of ICT education and career pathways?
- What is working well in relation to partnerships between industry and schools?
- How can education and training providers produce 'work ready' graduates?
- How can industry make career pathways to specialised ICT careers more transparent to prospective workers?
- How can small to medium enterprises (SMEs) be supported to provide entry level opportunities?
- What can be done to boost engagement in ICT apprenticeships and traineeships and to create more entry-level opportunities?
- Which existing training courses, across higher education and VET, are successful in creating 'T-shaped' graduates with both technical and 'soft skills'?
- How important is skilled migration to meeting the needs of the ICT sector?
- How can ICT businesses draw on the mature aged workforce to support new and emerging skills demands?
- What methods can be utilised to improve participation in the ICT workforce from women, Indigenous Australians, people with disabilities and retirees? What support is required to enable the increased participation of these groups in the ICT workforce?
- By what mechanisms can government and industry and professional associations encourage and support SMEs to engage with skills development?
- What strategies can be employed to encourage employers to invest in upskilling and lifelong learning for their workforce? How can industry and training providers collaborate to provide these opportunities?
- What can be done to address the ICT industry's concerns regarding the retention of skilled workers?
- What are the implications for the Australian ICT sector and workforce of the increasing globalisation of both the ICT sector and the ICT workforce?
- How can government, industry, and the training sector work together to ensure that the Australian ICT workforce is able to adopt and contribute to new technology across all industry sectors?

Appendix A: List of acronyms

Acronym	
ABS	Australian Bureau of Statistics
ACS	Australian Computer Society
AGIMO	Australian Government Information Management Office, Department of Finance and Deregulation
ANZSCO	Australian and New Zealand Standard Classification of Occupations
CIO	Chief Information Officer
CTO	Chief Technology Officer
DEEWR	Department of Employment Education and Workplace Relations
IBSA	Innovation and Business Skills Australia
ICT	Information and Communications Technology
IT	Information Technology
ITIIC	Information Technology Industry Innovation Council
NBN	National Broadband Network
NICTA	National ICT Australia
NWDS	National Workforce Development Strategy
PST	Professional, Scientific and Technical services
SME	Small and Medium-sized Enterprises
STEM	Science, Technology, Engineering and Mathematics
TAFE	Technical and Further Education
VET	Vocational Education and Training

Appendix B: Terminology

Term	
Big data	High volume, high speed and diverse information modes that enable cost effectiveness, innovation and facilitate enhanced outcomes.
Cloud computing	Enables on demand and convenient access to computing resources including but not limited to data storage and application services. These services are usually sourced by enterprises from external service providers and are located off premises. Cloud computing can result in savings for enterprises as they enable outsourcing of specialised expertise across a diversity of ICT needs.
Digital economy	The global (or Australian) economic and social interactions and activities enabled by platforms such as the internet, mobile appliances and sensors. In its broadest definition it can include almost all of the activities in which we engage including health services, online retail and education and online government service delivery.
Digital literacy	Is concerned with enabling people and communities to become 'cybercitizens' by acquiring skills to effectively participate in the digital economy. Digital literacy will become more important once the NBN is rolled out.
Security	Refers to technology that detects threats and responds to these appropriately. It also deals with historical analysis of security issues, compliance and investigation. Security demands analytical skills as well as ability to correlate a diverse range of events and information.
Teleworking	Refers to 'working from a distance' and includes a range of modes such as remote access, remote work, mobile work, e-work, telecommuting and working from home. It does not only deal with technology although technology can be a central mode in enabling telework. For enterprises telework means a structure which supports employees working from non traditional locations.
Work integrated learning	Occurs where students combine their formal studies with work in the relevant industry. The work is usually structured and assessed as part of their studies. It provides opportunities for students to practice in their relevant professions and explore career options. Work integrated learning also provides enterprises with opportunities to identify new entrants for entry level positions.

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Appendix D: Invitation to submit case studies

Respondents are invited to submit examples of successful programs or initiatives designed to address ICT skills gaps and shortages, and to encourage and enable workforce development. These case studies will enable AWPA to feature real world examples of successful approaches to ICT skills development in its final report.

Respondents are invited to use the following form, and to provide any additional information and supporting material.

This form is available as a Microsoft Word document via the ICT workforce study reference group extranet. Please refer to the email that was sent by AWPA on 18 January for log-in details.

Please submit the completed form to the AWPA Secretariat at ictstudy@awpa.gov.au by 8 February 2013.

AWPA will seek the express permission of organisations to include particular case studies in its final report.

Name of organisation:

Contact information:

Name of case study (initiative/program/example):

1. Outline of case study

Please provide concise information about the initiative/program/example, including if it is run in partnership with other enterprises, professional organisations, government agencies, training providers, etc

2. How has the initiative/program/example boosted participation, improved productivity, or made some other impact?

Please provide any evidence if available

3. Please provide, if possible, any suggestions on how the example might be expanded and/or translated to other enterprises or jurisdictions

4. Any further information?