RESEARCH REPORT

Applied Research Project: Telecommunications Industry

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Executive Summary

This research report primarily seeks to confirm the sector and occupational profile of the Telecommunications Industry in order to establish the opportunities for IBSA to respond to the key skills and training needs. This specifically includes an examination of the likely impact of the National Broadband Network (NBN) will have on vocational education and training (VET) and future skill requirements. The data provided will inform other IBSA projects and shape any workforce development strategy for the telecommunications industry.

In January 2009 the Australian Government, decided to invest up to $43 billion over eight years to build and operate a National Broadband Network (NBN) that will deliver superfast broadband connectivity through high speed, next generation broadband. The NBN promises to deliver 100 Mbps fibre-to-the-home (FTTH) connectivity to 90 percent of Australian homes. The network will also be accessible to businesses and public facilities such as hospitals and schools. Those homes and workplaces not reached will be able to access complimentary, high speed wireless and satellite services connecting at not less than 12 Mbps.

Beyond this $43bn investment in infrastructure, parallel economy-wide investments across industries and communities should also be expected, reflecting that the main and enduring value of the NBN will be in its use, not its construction. This means that the $43bn NBN investment can be best understood as one part of a broader nation-wide transformation.

Australia's telecommunications industry and telecommunications workers will be at the centre of the NBN transformation. In the infrastructure construction phase, the quantity and quality of skilled telecommunications workers will substantially influence factors such as the overall cost, reliability, and duration of the NBN roll-out. However their influence will extend beyond this infrastructure role to critically influence Australia's ability to gain value from the NBN in terms of national growth, innovation and competitiveness, and social outcomes. For these reasons, issues surrounding the availability of telecommunications skills and training will retain national attention.

The Prime Minister and the Minister for Broadband, Communications and the Digital Economy have indicated that the NBN project will directly support up to 25,000 local jobs every year, on average, over the 8 year life of the project (April 2009). The scale and duration of the challenge is substantial.

An effective response to this challenge will involve IBSA proactively engaging industry, government, union, education and training providers, and other stakeholders to ensure that "whole-system" approaches are directed at meeting telecommunications skills needs. Specifically, this means:

- Developing a whole-system purpose that encompasses the needs and capabilities of stakeholders in relation to meeting telecommunications skills needs and helping to ensure the NBN delivers the best possible value for Australia;
- Providing reliable, rich and timely data relevant to whole-system decision-making and performance; and
- Maintaining dialogues and agreed strategies that help stakeholders work together to achieve the whole-system purpose.

Two Industry Skills Councils can have a central role in these initiatives: IBSA and EEoZ. Given the scale of the challenge and likely close government and industry attention, it will be imperative to ensure:

- **IBSA succeeds by helping Australia succeed** - Focus on delivering tangible results at the digital economy, whole-of-systems level;
- **IBSA enables participation** - Enabling community users to engage in using the technology;
- **IBSA facilitates forward planning** - Being clear and realistic about challenges, problems and opportunities faced so that it is clear what options exist and when extra resources are needed to achieve particular results; and

- **IBSA stimulates innovation –** using in-depth industry and training knowledge IBSA fosters viable career pathways across industries other than telecommunications and promotes diffusion of innovative solutions to regions and small businesses.

The NBN is likely to enable massive improvements in value, service and productivity throughout the economy. The step up from our existing infrastructure to the next generation NBN technology is perhaps metaphorically comparable to moving from early automobiles that carry goods to market to using the railway. Once built the infrastructure can be used by many others to carry larger payloads, more rapidly and, as volume increases, at lower cost.

The NBN is Australia's largest infrastructure investment. To maintain its role and fulfil its responsibilities IBSA needs to support national policy and be involved in responding to the challenges and opportunities presented by the NBN. With implementation having started in Tasmania in July 2009 there is an immediate imperative for IBSA to be proactive in engagement of industry and Registered Training Organisations in support of training and upskilling for NBN. The alternative—one that needs to be weighed and considered—is the likelihood of the NBN stalling and failing to meet national, regional or societal expectations as the skill are not available to build, maintain, use, or supply the network with viable products and services.

A whole-system approach will be critical because the scale of the telecommunications training challenge will transcend the resources and capabilities of any one stakeholder or stakeholder group. It seems clear that poor cooperation in this area could undermine the entire NBN investment. Similarly, effective cooperation to meet skills needs could multiply and leverage the NBN investment by helping Australia to leap ahead in terms of prosperity and national competitiveness.

It is also important to note a key finding of this report: that the NBN infrastructure roll-out is likely to be one element in a broader training-dependent transformation of the telecommunications industry. A survey conducted as part of this report indicates that telecommunications companies are planning a major re-skilling of their existing workforce, and that many are also planning substantial increases in employment of telecommunication workers. There are also indications that the NBN phase out and replacement of the copper network lacks detail and may be slower in regional Australia than is anticipated (thus impacting workforce planning and skilling). Although more research is needed, initial indications are that additional demands will be placed on the existing telecommunications workforce and as a result the existing demand for ICT Telecommunications Training Package based qualifications will at least double in the next three years. The additional demand of the NBN while raising the profile of telecommunications industry skill needs is only one component; albeit a component that could potentially raise demand beyond even these projections.

Summary of research findings

1. **A coherent and systematic telecommunications workforce and training plan should be in place to promote and support successful implementation of the NBN**: The capacity to up-skill and re-skill the existing workforce and find new entrants to action advances in telecommunications is not a new problem. However, this report posits research and data that suggests the scale of the problem would argue that any NBN plans cannot be made in isolation from the workforce and training issues. This is not an incidental risk; especially given workforce requirements will impact key design and technology decisions.
2. **Reaching and skilling the telecommunications workforce requires change to how both the national VET system and businesses currently invest in training:** A coordinated approach is required if we are to ensure all existing and potential telecommunications workers can be re-skilled or up-skilled with the competencies required to work and enjoy a sustainable career pathway. This includes up-skilling the estimated over 30,000 dislocated workers previously employed by large telcos that have over the past decade become self-employed as contractors or re-skilling those workers now in other sectors (eg. Digital and cable TV). The investment required over the next five years will not be insignificant. The emphasis will be on businesses investing to secure quality and performance targets. It will require individuals undertake specialist and continuing professional development (CPD) to be deemed competent or licensed to work on certain technologies. Yet this must occur against a backdrop where it is estimated of the $208m spend on training in 2008-2009 more than 70% was on informal, in-house courses. Engaging the telecommunications industry in

recognised VET programmes and courses has previously been a challenge. But corporate and government clients are beginning to demand telcos provide assurances of certified competence. The response is plans by a number of telcos to shift expenditure to emphasise formal recognition of competence. IBSA needs to promote this trend by ensuring it packages qualifications and coordinates public funding in a manner that not only encourages apprenticeships and traineeships but qualifications that provide viable pathways for the dislocated, older and often regional workers to be certified to pursue future vocational pathways.

3. **Even at current rates the commencements in ICT Training Package qualifications and skill sets will grow by 5,000 inside 2 years:** Despite economic downturn ICT02 Telecommunications Training Package defied the trend of other national packages with commencements in qualifications rising by 28% from 2006 to 2008. Further growth is anticipated with the new ICT10 Integrated Telecommunications Training Package. The existing expansion and switch over of telecommunications infrastructure—mobile, terrestrial and wireless—to digital broadband suggest demand will accelerate even further. Two changes will drive this improved demand: (a) Improvements in the ICT10 Integrated Telecommunications Training Package and the packaging of skill sets to meet emerging requirements; and (b) surveyed evidence many of the major employers will follow one of the larger telecommunications companies to switch training activity spend to formal, recognised VET qualifications, competencies and regulatory requirements.
4. **Growth in telecommunications infrastructure and services will place even greater pressure on national VET systems:** The Australian Government's commitment to the NBN has irrevocably changed more than the telecommunications landscape in Australia. While it will profoundly affect Australia's telecommunication industry it will have economic and social multipliers. The NBN impact cannot be fully appreciated if one just looks at it as a $43b investment in digital infrastructure. It is the quintessence of the digital economy; the convergence of technologies and networks, and the advances the broader ICT industry has been enabling for all industries. The NBN is a statement of intention. It embraces rapid change as a necessary way to seize competitive advantage in the digital economy. For the national VET system the challenge is therefore not just skilling those who will build and maintain the network, but to provide the skills for everyone to participate. Moreover it is a call to arms confirming even greater demands will be placed on Industry Skills Councils and the national system to respond to the unprecedented telecommunications-led growth.
5. **The isolation and accurate tracking of the telecommunications occupations is problematic**: There exists a need to provide more concise and defined occupational data and longitudinal tracking of economic and employment outcomes within the telecommunications industry. At present the data is confused and misaligned through various ways ASCO or ANZSCO are used, or how the ICT, IT, communications and electrical representative bodies and industry stakeholders choose to collect and report data. There would seem to be every advantage in IBSA and EEOz consolidating their reporting to agreed guidelines. In the future the Australian Government and the ABS should be prevailed upon to revisit the ANZSIC and ANZSCO classification regimes to give a more contemporary and relevant structure.
6. **The role of VET and IBSA extends beyond skilling up those building and maintaining infrastructure to include users seeking to participate in the digital economy:** Planning for the NBN and likely skills demand is being truncated by a focus only on the telecommunications supply-side of the network. Accurate planning must include the demand-side skill requirements. NBN will create demand for skills at all stages in the supply chain, including:
    a. Building and construction
    b. Connecting the home/premise
    c. Essential skills all consumers will need to use the network and maintain network connections and technology at their premise
    d. Maintenance and customer support
    e. Service providers, including digital content, entertainment, interactive applications and media.

7. **There exists a quantifiable regional undersupply of workers competent to not only build and maintain the network, but to assist consumers install and use household or business technologies:** It should be anticipated the workforce will neither be trained nor attracted to regional Australia to meet the projected NBN timelines. As such the most likely profile of a regional telecommunications worker will be one where they have a mix of skills that may span telecommunications, IT, electrical or other related occupations. Any workforce development strategy for these workers should encourage the development of foundation vocational qualification and specialist skill sets that augment the qualification or credit towards formal qualifications in another, related Training Package.
8. **A survey of direct training expenditure confirms some important details**.
    - Telecommunications respondents surveyed employ 21,360 workers (16,500 full time equivalent employees and 4,860 contractors)
    - Telecommunications occupations-related training expenditure for 2008-2009 financial year was $110 million (direct training costs only)
    - Training expenditure represents an average spend of $5,540 for each telecommunications employee or contractor, per annum
    - Based on extrapolating this average spend per worker across all workers in a classified telecommunication occupation (37,700) the total direct training spend in the industry could be estimated at $208,858,000 in 2008-2009
    - Approximately 68% of training is in-house
    - Just under 30% of training spend was on formal (11%) and informal (19%) VET
    - On average less than 9% of VET sourced training received public funding
    - Only 2% of training spend is on university related, higher education

1. Introduction

This research report primarily seeks to confirm the sector and occupational profile of the Telecommunications Industry in order to establish the opportunities for IBSA to respond to the key skills and training needs. This specifically includes an update on the National Broadband Network (NBN) and its impact on vocational education and training (VET) and future skill requirements. The data provided will assist IBSA form current and future workforce and training plans.

The main impact on Telecommunications skills and training needs over coming years will be the Federal Government's $43 billion investment in a NBN. Parallel economy-wide investments across industries and communities should also be recognised, reflecting that the main and enduring value of the NBN will be in its use, not its construction. This means that the $43bn NBN investment can be best understood as one part of a broader nation-wide transformation.

Australia's telecommunications industry and telecommunications workers will be at the centre of the NBN transformation. The quantity and quality of skilled telecommunications will substantially influence factors such as the overall cost, reliability, and speed of the NBN roll-out. However their influence will extend beyond this infrastructure role and critically influence key aspects of national growth, innovation and competitiveness. For these reasons, issues surrounding the availability, skills and training of telecommunications workers are likely to have ongoing national attention.

In its role as a national Industry Skills Council, Innovation and Business Skills Australia (IBSA) has responsibilities for helping to meet the workforce and skills needs of Australia's Telecommunications Industry. The purpose of this report is to augment IBSA's thinking on the challenges and opportunities ahead. In particular, the purpose of this report is to:

- Provide an overview of the Australia's Telecommunications industry;
- Examine current telecommunications training activity;
- Evaluate data resources and information;
- Explore and analyse some of the key influences on Telecommunications skills needs and training;
- Identify opportunities; and
- Confirm options for IBSA to collaborate with others.

1.1 IBSA current charter and role

The Innovation and Business Skills Australia Industry Skills Council (IBSA) is one of eleven ISCs funded by the Australian Government through DEEWR. ISCs are not-for-profit organisations. IBSA has a critical role providing independent skills and training advice to enterprises and government. It also has a role in leading high quality workforce planning and resulting training and development products and services across the following six industry sectors:

- Business services
- Cultural and creative industries
- Education and Training
- Financial services
- Information, Communication and Technology (ICT) and Telecommunications
- Printing and graphic arts.

Given its charter and industry responsibilities IBSA is a major stakeholder in the NBN process. Beyond being a stakeholder, IBSA has responsibilities to advise the Australian Government on skill needs in areas critical to realising the NBN. This is especially so given IBSA's role includes managing the Telecommunications Training Package as part of the ICT industry.

IBSA has not been formally consulted, nor has it put a position to decision makers on its interests and possible role in the implementation of a NBN. Perhaps most importantly, even the *Environmental*

Scan 2009 report by IBSA that covers skills supply in the telecommunications industry has not triggered discussion by Government as to the likely extent the identified skills shortages (Allen Consulting Group, 2009: 37 & 47) will impact on the implementation of the NBN. This skill supply issue will be reinforced in Escan 2010 (IBSA, 2010).

The huge construction task, the ability of consumers to use the network and access services, and the overall maintenance and quality of the network are critically dependent on skills. In all three facets IBSA can play a role of real importance in the NBN initiative.

2. Methodology

The deliverables for this project include completing research on the telecommunications Industry that will:

- identify and report about generally accepted segments of the sector and their respective size/s
- provide commentary on movements in technology and industry structure, including changes to employment and sub-contracting arrangements and effects of any reorientation of the industry sector towards media and communications and impacts from government-funding of infrastructure programs (with particular reference to the National Broadband Network)
- identify related short, medium and, where known, long term shifts in skills needs
- determine adjustments required to existing programs required by industry to support re training and up-skilling processes
- identify emerging skills priorities within the Telecommunications industry
- identify the hidden training effort in the Telecommunications industry

The research was conducted in an agreed 9 step process:

Step 1. Analyse and write up initial industry research on the scope and size of the sector, movements in technology and industry structure, any identifiable changes to employment and sub-contracting arrangements, infrastructure programs funded by government that will effect the existing labour market, training activity for the sector report by NCVER and other sources

Step 2. Based on issues identified through the industry research, construct a series of issues-based questions to guide businesses in responding to them

Step 3. Provide the questions in a survey format for online, phone and hardcopy access in exceptional cases where a business is unavailable for face-to-face interviews

Step 4. Undertake interviews with the agreed segment of large and small telecommunications businesses – face-to-face or by phone – with the questions providing the script for these interviews

Step 5. Consider and analyse industry responses to the questions and write up findings

Step 6. Review research and industry/ business interview data, confirm priority skills needs and identify options for up and re-skilling program adjustments and training package enhancements

Step 7. Incorporating all work undertaken, provide the first draft of the research paper

Step 8. Present the draft paper to IBSA for consideration and comment

Step 9. Finalise and submit the research paper for acceptance by IBSA, reporting qualitative and quantitative intelligence the scope of industry consulted.

3. Telecommunications industry

3.1 Snapshot of the industry

The total Information and Communications Technology industry in Australia is estimated to have generated $85-$98 billion in revenue for the year 2008-2009, to have employed some 268,000 people in the ICT industry in 2007-2008, and, as of February 2009, to employ a total of 532,500 ICT workers in all industries across Australia[1].

One of the most difficult and vexing issues is to correctly define the telecommunications industry as a component of the Australian ICT 'industry'. For the purposes of vocational education and training (VET) the confusion lies between what defines and 'classifies' the industry and occupations in workforce terms, and what this means in the real world of work and job roles at an enterprise level.

The telecommunications market in Australia generated revenues of over $37 billion in 2007-2008. This represents approximately 3.1% of total Australian Gross Domestic Product in 2007-2008 (IBISWorld, 2008:11). As with the whole ICT industry telecommunications products and services enable economic growth and stimulate employment across all industries (See Attachment 2).

The household segment formed 65% of the telecommunications market in Australia. This confirms just how profound the impact any improvements to the telecommunications network in Australia will be on not just growth in household consumption, but related telecommunications industry revenue and employment. This is of importance because while employment has experienced small growth, in real terms industry revenue has experienced a significant 2.6% shrinkage in the five years from 2003 to 2008 (IBISWorld, 2008).

Table 1: Telecommunications market segments and revenue: 2007-08

Industry	Million Dollars Revenue	Percentage Share
Wired Telecommunications	12703.2	34.3
Mobile Telecommunications	14215.2	38.4
Telecommunications Resellers	3562.1	9.6
Internet Service Providers	5929.0	16.0
Other Telecommunications	638.4	1.7
Total Telecommunications	37048.3	100.0

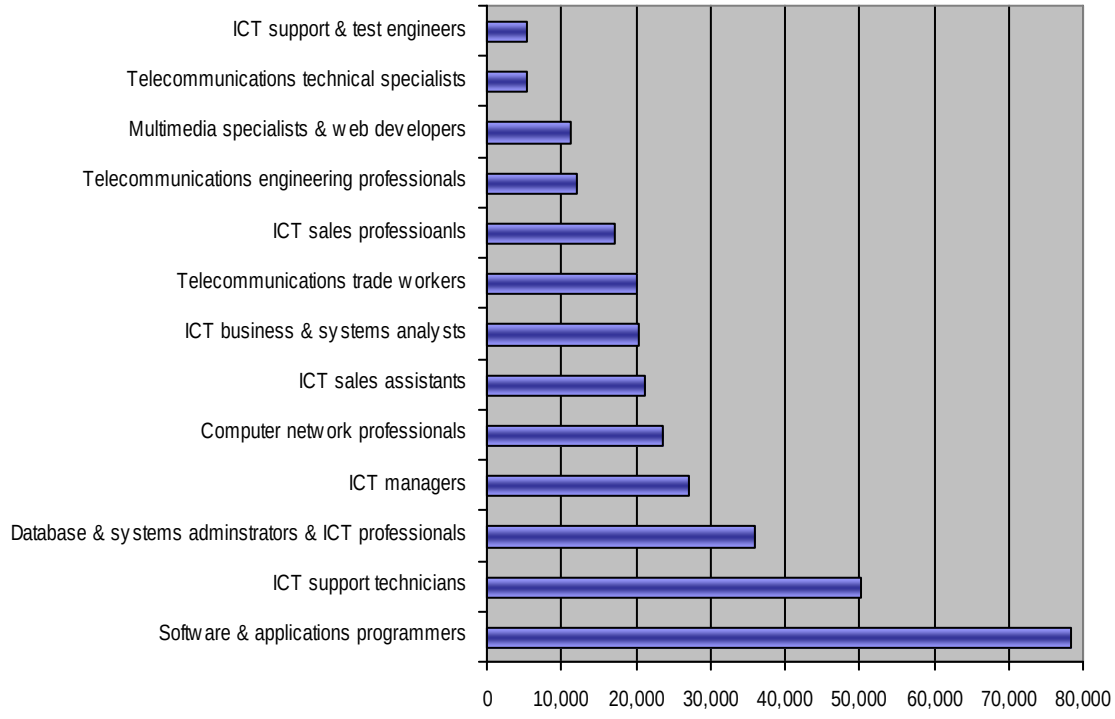
(IBISWorld, 2008:6)

Historically collecting accurate labour market data on the Telecommunications industry and occupations has been very difficult. The major problem being older data tends to mix telecommunications data in with the communications industry, or more lately with the ICT industry. IBSA has long advocated for improved data collection and more reliable reporting of forecasts relating to the telecommunications industry and occupations (Bowles and Wilson, 2008:5 & 64).

In 2009 estimated total employment for telecommunications classified workers—telecommunications trade workers, engineering professionals and technical specialists—was 37,700 (ABS, February 2009). These occupations are grouped and tracked as part of the wider ICT industry (See figure below).

[1] ABS Labour Market Survey Feb 2009, ICT Industry logistics CIIER 2008 as reported in Australian Computer Society (2009: 6-7)

Figure 1: Workforce size for major ICT industry occupations in all industry categories (est. February 2009)



(

IBSA, 2009, eScan 2010 ICT: 5; ABS Labour Force Survey February 2009)

3.2 Industry stakeholders

Table 2: Telecommunications stakeholders

Stakeholder
Australian Chamber of Commerce and Industry
Australian Communications and Media Authority (ACMA), cabling regulation
Australian Industry Group
Australian Telecommunications Users (ATUG)
Cabler registration service providers (under ACMA) • Australian Cabler Registration Service (ACRS) • Australian Security Industry Associated Limited • BICSI Registered Cablers Australia Pty Ltd (BRCA) • Fire Protection Association Australia • TITAB Australian Cabler Registry Services
Cabling Advisory Group (CAG) of Australian Communication and Electrical Alliance, now Communications Alliance
Centre for Telecommunications and Information Engineering (Ctie)
Communications Alliance
Communications Electrical and Plumbing Union (CEPU)
Cabling Online Community
Department of Broadband, Communication and the Digital Economy (DBCDE)

Department of Education, Employment and Workplace Relations (DEEWR)
E-Commerce & Telecommunications Advisory Group (ETAG)
ICT Centre of Excellence - National ICT Australia (NICTA)
Internet Industry Association (IIA)
National Broadband Network Corporation (NBNCo)
National Electrical and Communications Association (NECA)
Other ISCs – particularly ElectroComms and Energy Utilities Industry Skills Council Ltd (EE-OZ)
Other telecommunications companies
Small Enterprise Telecommunications Centre Ltd
SMART Internet Technology CRC
State Governments
Telecommunications Industry Training Network
The Australian Electrical and Electronic Manufacturers' Association (AEEMA)

3.3 Key players and emerging stakeholders

The main incumbent telecommunications stakeholders include the carrier and the so called 'telcos'. The main examples[2] include the following.

AAPT

Austar United Communications Limited

ComTel Corporation

Dodo Australia

Freshtel Holdings Limited

Gotalk Australia

Hutchison Telecommunications (Australia) Limited

iiNet

M2 Telecommunications Group Limited

Macquarie Telecom

NetComm Limited

Optus

People Telecom

Primus Telecom

Queste Communications Limited

SingTel Optus

Soul Communications

Telstra

TransACT

Virgin Mobile

[2] Compared with listings on the Telecommunications Industry Ombudsman (TIO) site for registered telco companies.

Vodafone Australia

Westnet

Two groups of stakeholders are emerging are Vendors and product (content and service) providers on the broadband telecommunication networks. Examples of vendors (hardware and construction) include:

Lucent Alcatel

Cisco

Ericsson Australia Pty Ltd

Thomson Telecom Australia

Total Communications

John Holland Group

CCTS Construction

Emerging non-telecommunications listed companies that may be known to IBSA in other industry areas but now have an extended stake in the telecommunications sector; include for instance:

- Subscription TV (eg. FoxTel, Austar)
- Entertainment companies (Crawfords, Seven Network, Aristocrat, Virgin entertainment, Jumbuck Entertainment)
- Film and video (FoxStudios, Sony Pictures Australia, Village Roadshow, Blockbuster, Hoyts)
- Digital games companies (EA Games, Sega, Tantalus Media, Auran)
- ICT companies (eg., IBM Australia, Microsoft Corporation, Dell, SAP Australia, Sun Systems)
- Internet service providers (eg. AAPT, Bigpond, Activ8, iiNET, iPrimus, Soul, Internode, TPG)
- Internet (MelbourneIT, Google Australia, MSN)
- Education and Training providers (e-learning, RTOs, Schools and Universities)

4. Review of data collection and reporting issues

In order to fulfil its role and objectives, IBSA needs data and models that help it to maintain awareness of the telecommunications industry. To do this it needs accurate data and a model for action.

4.1 Industry grouping Telecommunications sector vis-à-vis communication and media, and ICT industry

The occupations targeted by IBSA's IT and Telecommunications Training Packages are some of the ones most affected by change and convergence. The dynamic nature of IBSA ICT- occupations was highlighted by the major changes that resulted when the Australian and New Zealand Standard Industry Classification (ANZSIC) originating in 1993 was replaced by Australian and New Zealand Standard Classification of Occupations (ANZSCO) Version 2 released in 2006 (Bowles & Wilson, 2008:5).

The Australian Bureau of Statistics (ABS) Census in 2006 collected and reported data using the new ANZSCO 2006 classifications 2006. This data profoundly altered the number of employees that fell under IBSA's ICT responsibilities. It also served to confirm in more granular detail how some occupations no longer neatly fitted into occupations that reside within one industry or a Training Package. This was most evident in providing a 'high resolution' understanding that IBSA needed to recalibrate how it targeted training to emerging or converging jobs. This was especially important in jobs that used IT, telecommunications or new media because they often fell across many different industries 'boundaries' and, as a result, qualifications in one Training Package could not meet the skill needs (Bowles & Wilson, 2009: 31).

Since April 2005 the EE-Oz has reported in its *Industry Skills Reports* on the skill needs associated with key telecommunications occupations and stakeholders such as National Electrical and Communications Association (NECA) and The Australian Electrical and Electronic Manufacturers' Association (AEEMA). For instance in the DEST sponsored NECA and NCVER industry skills report *Training and skills in the electrical and communications industry* (Woyzbun, et.al, 2006), the older Australian Standard Classification of Occupations (ASCO) instead of the current and more accurate Australian and New Zealand Standard Classification of Occupations (ANZSCO 2006) was used.

As presented in table 3, the use of the older classification presents occupations in groups that are obsolete and are now disaggregated to give a more accurate view. The ANZSCO 2006 revised classification of occupations in the telecommunications industry has made changes consistent with new communications markets and technologies.

Table 3: Occupations included in data scope for electrical and communications industry

Industry	Australian Standard Classification of Occupations (ASCO2)
3123	Electrical Engineering Associate Professionals
3124	Electronic Engineering Associate Professionals
4311	Electricians
4313	Electrical Distribution Tradespersons
4314	Electronic Instrument Tradespersons
4315	Electronic and Office Equipment Tradespersons
4316	Communications Tradespersons
9918	Electrical and Telecommunications Trades Assistants

4.2 ASCO vis-à-vis ANZSCO

While not always possible to achieve exact occupational match the previous and current classifications can been aligned. Please note **all** the following previously ASCO classified telecommunications occupations span more than one classification now. This means reclassified jobs that fall into IBSA's jurisdiction may have aspects of the original job that are grouped into other industries, typically the electro-technology industry.

Table 4: Translating previous ASCO (1999) telecommunication occupational classifications into the revised ANZSCO (2006)

	ASCO 2003		ANZSCO 2006
4316-01	Supervisor, Communications Tradespersons	313212	Telecommunications Field Engineer
4316-01	Supervisor, Communications Tradespersons	342411	Cabler (Data and Telecommunications)
4316-01	Supervisor, Communications Tradespersons	342412	Telecommunications Cable Jointer
4316-01	Supervisor, Communications Tradespersons	342413	Telecommunications Linesworker
4316-01	Supervisor, Communications Tradespersons	342414	Telecommunications Technician
4316-11	General Communications Tradesperson	313212	Telecommunications Field Engineer
4316-11	General Communications Tradesperson	342414	Telecommunications Technician
4316-13	Communications Linesperson	342411	Cabler (Data and Telecommunications)
4316-13	Communications Linesperson	342412	Telecommunications Cable Jointer
4316-13	Communications Linesperson	342413	Telecommunications Linesworker
4316-81	Apprentice General Communications Tradesperson	313212	Telecommunications Field Engineer
4316-81	Apprentice General Communications Tradesperson	342414	Telecommunications Technician
4316-83	Apprentice Communications Linesperson	342411	Cabler (Data and Telecommunications)
4316-83	Apprentice Communications Linesperson	342412	Telecommunications Cable Jointer
4316-83	Apprentice Communications Linesperson	342413	Telecommunications Linesworker (Aus)
9918-11	Electrical or Telecommunications Trades Assistant	899914	Electrical or Telecommunications Trades Assistant

(ABS, ANZSCO 2006)

All the occupations listed above are covered by IBSA's *ICT02 Telecommunications Training Package* and the ICT10 Integrated Telecommunications Training Package (endorsed April 2010). The table below confirms the employment levels for telecommunications ANZSCO occupations were identifiable as early as 2006.

Table 5: Telecommunications Occupation (ANZSCO) and employment for Australia, 2006

Occupations	Total employment
263299 ICT Support and Test Engineers, nec	69
263300 Telecommunications Engineering Professionals, nfd	208
263311 Telecommunications Engineer	1,980
263312 Telecommunications Network Engineer	5,310
312412 Electronic Engineering Technician	4,957
342400 Telecommunications Trades Workers, nfd	847
342411 Cabler (Data and Telecommunications)	2,217
342412 Telecommunications Cable Jointer	647
342413 Telecommunications Linesworker	2179
342414 Telecommunications Technician	13,231
Totals	**31,645**

(Source: Data sets from ABS 2006 Census of Population and Housing, Bowles and Wilson, 2008)

It is already apparent both the lack of consistency in how telecommunications as opposed to electrical and IT occupations are being classified and the use of different classification regimes (ASCO-ANZSCO) is affecting workforce planning. In Tasmania when NBN commenced roll out skill shortages emerged that had been masked or had not been fully appreciated when reported (TASIT, 2008).

It is not unexpected that technology convergence will promote uncertainty as to which Industry Skill Council has coverage of certain occupations. In the case of IT and Telecommunications—or ICT—IBSA has both within its own jurisdiction.

4.2.1 IBSA ICT Industry related Training Packages and ANZSIC and ANZSCO 2006 Coverage

The following table gives a view on existing IBSA ICT and Telecommunication Training Packages and their alignment and coverage of industries, industry groups, typical activities and occupations:

Table 6: IBSA managed Training Packages mapped to ANZSIC 2006 industry and ANZSCO 2006 occupations classifications

Training Package	ANZSIC coverage (Division or Sub-division)	ANZSIC Group Codes and Titles	Typical technology related job activities [3]	ANZSCO Occupations [4]
ICA05 Information and Communications Technology Training Package	700 Computer System Design and Related Services 591 Internet Service Providers & Web Search Portals 592 Data Processing, Web Hosting and Electronic Information Storage Services	7000 Computer System Design and Related Services 5910 Internet Service Providers and Web Search Portals 5921 Data Processing and Web Hosting Services 5922 Electronic Information Storage Services	Network administration Computer hardware consulting Programming Computer software consulting Software development Internet services management Software installation Data storage and processing Computer and computer peripheral equipment repair and maintenance	135111 Chief Information Officer 135112 ICT Project Manager 135199 ICT Managers nec 232414 Web Designer 261111 ICT Business Analyst 261112 Systems Analyst 261211 Multimedia Specialist 261212 Web Developer 261311 Analyst Programmer 261312 Developer Programmer 261313 Software Engineer 261399 Software and Applications Programmers nec 262111 Database Administrator 262112 ICT Security Specialist 262113 Systems Administrator 263111 Computer Network and Systems Engineer 263112 Network Administrator 263113 Network Analyst

[3] ANZSCO 2006; and IBSA (2006) *Industry Skills Report*, pp.18-20

[4] ABS (2006) *ANZSCO - Australian and New Zealand Standard Classification Of Occupations*, First Edition, ABS catalogue no. 1220.0, Canberra. Available at http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1220.02006?OpenDocument

Training Package	ANZSIC coverage (Division or Sub-division)	ANZSIC Group Codes and Titles	Typical technology related job activities [3]	ANZSCO Occupations [4]
				313111 Hardware Technician 313112 ICT Customer Support Officer 313113 Web Administrator 313199 ICT Support Technicians nec
ICT02 Telecommunications Training Package	580 Telecommunications Services 729 Other Administrative Services	5801 Wired Telecommunications Network Operation 5802 Other Telecommunications Network Operation 5809 Other Telecommunications Services (7294 Call Centre Operation now moved to Business Service Training Package)	Local telephone network operation Set up wireless networks Operating and maintaining switching and transmission facilities Cabling Broadcasting Data security Connecting telecommunication services Maintaining and installing telecommunications systems	263311 Telecommunications Engineer 263312 Telecommunications Network Engineer 313211 Radiocommunications Technician 313212 Telecommunications Field Engineer 313213 Telecommunications Network Planner 313214 Telecommunications Technical Officer or Technologist 342411 Cabler (Data and Tele342412 Telecommunications Cable Jointer 342413 Telecommunications Linesworker 342414 Telecommunications Technician

4.3 Workforce planning and an IBSA performance framework

It is suggested that IBSA's purpose can be understood as follows:

> *To take action to achieve a close and ongoing alignment between the supply and demand for skilled Australian workers in IBSA industries, and in this way, to enhance Australia's competitiveness, growth and quality of life.*

The underlying rational for this purpose is that close alignment between the supply and demand for skilled workers best supports Australia's competitiveness, growth and quality of life. This is because:

- Industry responses to competitive threats, market and innovation opportunities, technological change and regulatory changes are not impeded by an undersupply of skilled labour; and
- Individual workers have good opportunities for employment and a return on their personal investment in developing the skills and expertise relevant to a job or an industry.

The alternative is a poor alignment of skills supply and demand means either an excess supply of skilled workers, or an excess demand for skilled workers. Apart from serious implications of a poor alignment for workers and an industry, the secondary consequences are likely to include:

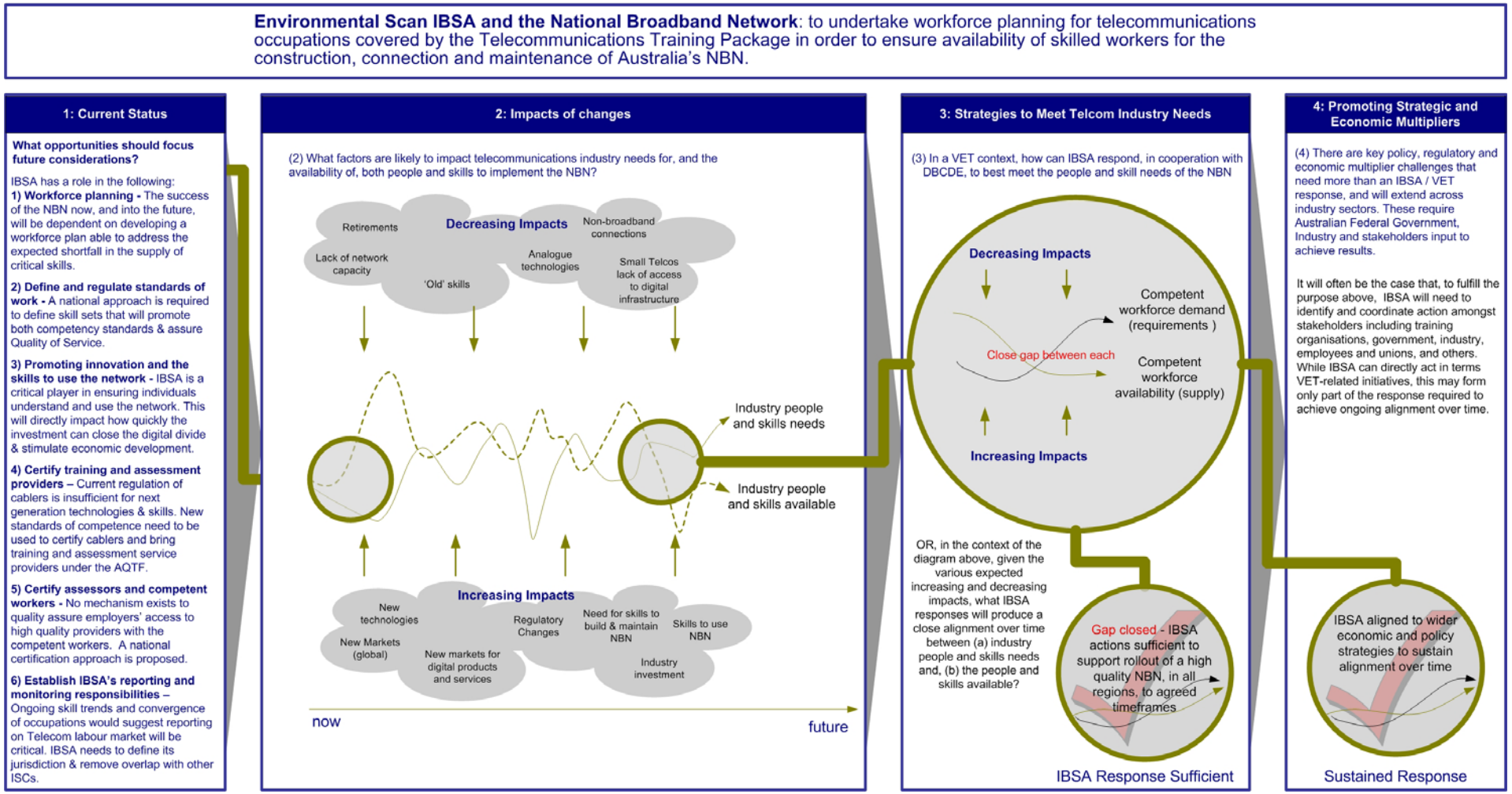
- Lost investments and opportunity costs to industry
- Unemployment and wages losses to workers
- Competitive threats to industry (and worker) prospects
- Unemployment costs to the economy
- Unrealised training investments, retraining costs and lost training opportunities.

To fulfil the purpose above, it is useful for IBSA to understand:

1. The current nature and performance of the telecommunications industry sector;
2. The factors likely to impact upon the ongoing alignment between the supply and demand for skilled workers;
3. IBSA's own options for action that will help achieve and maintain an ongoing alignment between the supply and demand for skilled workers; and, most importantly
4. When the extent or importance of a telecommunications skills shortage or gap needs a response beyond IBSA's usual resources and capabilities, and might require that IBSA initiate and support broader government, industry and/or other stakeholder responses.

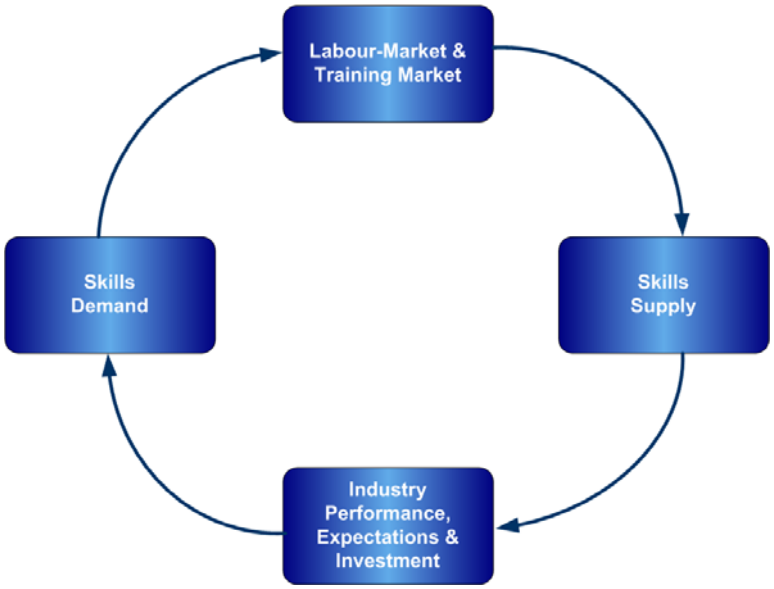
This performance framework is presented in a diagrammatic form on the following page.

Figure 3: Snapshot of IBSA-Telecommunications environment (post NBN) (Bowles & Wilson, June 2009)



Use of any IBSA performance framework depends on an understanding of the types change that impact upon the alignment between skills supply and skills demand. This can be understood using the following Skills Supply-Demand Cycle.

Figure 4: Skills Supply-Demand Cycle



(Bowles & Wilson, 2005:147)

In brief, the implications of this Skills Supply-Demand Cycle are that the skills supply-demand alignment for an industry is impacted by:

- **Industry performance, expectations and investment** and therefore indirectly by other factors such as competition, regulation, insurance, economic conditions, globalisation and technology change.
- The **Skills Demand** flowing from industry performance, expectations and investment – which encompass concepts of demand for skills in terms of worker numbers, price, location, working conditions and skill requirements.
- **Characteristics of the Labour Market** – including factors such as demographics, skills, new entrants, retirements, migration, and participation changes.
- **Characteristics of the Training Market** – which determines the timing, rate, quality and cost of achieving changes in student / worker skills – all within the context of Australia's overall demographics and participation in education and training.
- The **Skills Supply** flowing from the influence of skills demand on the Labour Market and Learning Market.

Finally it is worth noting the cyclical relationship between these types of impacts.

It is important to extend this analysis into an understanding of IBSA's strategic role and value in the context of national competitiveness and growth objectives. While IBSA's primary scope for active ongoing intervention in the skills supply-demand cycle is through the Training Market and services around IBSA's training packages, IBSA also has an important role in providing information, services and innovative solutions. In this way it can influence expectations in the industry and labour market components of the skills supply-demand cycle outlined above.

The rationale and value of such an approach are evident in the following table which depicts a typology of the supply-demand misalignments that can exist and response strategies. Most noteworthy is the implication that training-related responses are only directly relevant to one type of labour market mismatch (that is, Qualitative Mismatches).

Table 7: Supply-Demand Misalignments

Types of Skills Supply-Demand Misalignments	
Misalignment Type	**General Response Strategies**
Aggregate labour shortages	
Aggregate labour shortages involve there being an insufficient overall number of workers available.	• Immigration • Repatriation • Encourage entry by young people • Re-skill other workers • Delay retirement decisions
Mismatch on the labour market	
Whether they are on the supply-side or demand-side, mismatches on the labour market can take a number of forms. These include:	*Example response*
1. Qualitative Mismatches	**(Information/Training response)**
Mismatch between qualifications of workers and qualifications employers require to fill vacancies. **Evidenced by:** shortages and excesses of workers with particular skill sets	• Increase skills supply-demand information to/from industry, trainers and workers • Align/adapt content of training offerings
2. Regional Mismatches	**(Information /Other Response)**
Where people and work are located in different regions and the jobs/workers have been insufficiently mobile to reach alignment. **Evidenced by:** region-specific unemployment and skills shortages	• Increase skills supply-demand information to/from industry, trainers and workers • Liaise with government on initiatives for possible worker/industry relocation
3. Preference Mismatches	**(Information /Other Response)**
Where there is a mismatch between the work people are willing to take and the vacancies that are available in their region. **Evidenced by:** underemployment, unemployment	• Liaise between industry and workers to find preferable working circumstances for skilled labour • Liaise with government and industry on strategic responses.
4. Mismatches due to information deficits	**(Information Response)**
Supply does not meet demand because of a lack of information – qualified workers do not find out about vacancies, and/or firms do not have the information they need to find the skilled workers they require. **Evidenced by:** underemployment, unemployment, general supply-demand mismatch.	• IBSA, commercial and government service/information facilitate to assist worker and industry "matchmaking".

Sue Richardson and Yan Tan (2007:7) *Forecasting future demands: what we can and cannot know* [5] made some salient points confirming how difficult it is to forecast skill gaps or how VET activity can positively support changes in labour market demand:

- The complexity of the economy is such that it is not possible to make accurate projections of future skill needs in any detail, or for more than a few years into the future.

[5] Richardson S & Tan, Y (2007) *Forecasting future demands: what we can and cannot know*, National Institute of Labour Studies, Flinders University, accessed 2nd January 2008 online at: http://www.ncver.edu.au/publications/1744.html

- New VET graduates play only a modest part in filling expanding skill vacancies; other sources of supply are people who learn the required skills on the job and people who already have the required skills, but are working in other jobs, are out of the labour force or are unemployed, or are migrants.
- VET planners should not try to match training to projected skills in any precise way; they should instead focus on distinguishing skills that are in growing demand from those in declining demand, and on skills that take a long time to learn (and to gear up to teach).
- Vet planners also need to anticipate areas where there are large numbers of people with specific skills who will leave employment in the forecast period, that is, replacement demand.

The approach suggested by Richardson and Tan and advanced by later eScan reports (IBSA, 2008, 2009) confirms IBSA's commitment to develop training marketplaces that best reflect labour market strategies that are tied to the future needs of the Australian economy. In the case of the telecommunications industry and the National Broadband Network (NBN) and significant convergence and growth in the telecommunications services IBSA needs to:

- Tie workforce planning and improvement to the economic development imperatives underpinning the NBN strategy
- Work with Department of Education, Employment and Workplace Relations (DEEWR) to revise job prospects listing.
- Recognise the developments within the usual five years planning cycle will, for the telecommunications industry, be unusually profound.
- While retaining an Australia-wide focus IBSA will need to base forecasts on regional and skill needs in different occupations and at all level of employment.

4.3.1 IBSA strategies and supply-demand misalignment

Drawing upon the table above and general systems analysis, it seems apparent that IBSA can assist skills supply-demand alignment in the Telecommunications industry (and other industries) through:

Adapting the variety and content of Training Packages - to align with current and future needs, and to assist worker, and therefore industry flexibility in a competitive and changing global business/technological environment

Initiatives to improve the efficiency and effectiveness of Training Activities – thereby reducing training costs and/or improving training outcomes for workers and industry. The speed, efficiency and effectiveness of training activities is itself a critical enabler of industry productivity and growth.

Improving information flows between IBSA, Government, Industries and Workers – so that information about current and future skills scenarios can be shared and verified, and responses identified and undertaken. The core of this activity would be to achieve understanding and responsiveness to changing industry and worker needs.

Ongoing work to proactively identifying and responding to possible causes of skills supply-demand misalignment – in essence, developing an applied body of knowledge to support efforts toward ongoing skills supply-demand alignment. This would include; (i) information to support responses to alignment issues; and (ii) identification of circumstances where the need for broader industry, government and other stakeholder action would be required to achieve alignment.

4.4 Applying the Performance Framework to Telecommunications

The implications of the National Broadband Network for IBSA's activities can be understood clearly within the Performance Framework outlined above. In particular:

1. The $43bn NBN represents a major impact on Industry Performance, Expectations & Investment; it will drive significant skills demand and, without focused IBSA (and other) responses, is likely to create a significant misalignment between the supply and demand for skilled telecommunications industry workers;
2. Given the scale and duration of the NBN implementation (and parallel economy-wide adoption), IBSA will need will a significant and well planned response to telecommunications industry skills needs;
3. An IBSA effective response will need to extend beyond its normal strategies and responses, and may demand more resources and close ongoing work with industry, government, unions, and other stakeholders.
4. A full range of IBSA responses strategies will be needed to deal with likely skills supply-demand misalignments.

4.4.1 Multiplier effects of NBN on other IBSA-related industries

The impact of the NBN can bring significant changes to other industries within IBSA jurisdiction. As these changes occur the labour market and education and skilling needs in these industries will also change. Contingent on factors such as rate of adoption, the quality of service (QoS), and perceived value the following industries within IBSA direct span of interest would be affected:

Digital content industry	The convergence of technologies and the shift to digital content will have a profound affect on the content industry. Just as we have seen a rapid shift from cameras requiring hard copy printing of images to digital cameras, so broadband will accelerate the capacity of users to create, store, discover, access and share digital content. This includes the games development, virtualisation and interactive applications sectors that span the cultural and IT industries.
E-business	High speed broadband will trigger not only different ebusiness activities, it will accelerate the diversification of businesses into online activities. This will include increased adoption of mobile services, new and modified ways of engaging in e-retailing, and improvements to collaboration and data management across the supply chain.
Business services	The range of commercial and management applications available to business will change. This will mean the services business can offer will change and the services available to them may increasingly be accessed from lower-cost, easier to access online sources (eg. e-payment gateways). It can be expected the NBN will trigger innovations in the way business operate (eg. telework, out source specific activities, etc.)
Education	The NBN can accelerate the diffusion of existing higher quality e-learning and m-learning applications and content. Not only will the capacity of providers and learners to access higher quality content improve, the NBN will enable the use of more interactive, synchronous and collaborative learning applications and environments. Users will be able to access this digital content irrespective of the device (PC, mobile phone, etc.) or location.

Financial services	The finance industry has always operated in a global marketplace. The NBN will offer not only higher speed capabilities to do existing trading and business functions, it will support new consumer products and services.
Printing	Directly impacted by the digital content changes mentioned above the printing industry often leads demand for access to high speed broadband (AIG, 2008:25). Access can improve production activities. In part this may involve improve collaboration or accelerate the sharing of the print production across multiple, specialist personnel. In other cases the high speed networks can significantly improve how businesses operate. For instance processes can be centralised as it becomes more cost effective to transfer very large, high quality images and data between customers and printing companies located anywhere across the globe.

5. Training activity

5.1 Vocational education and training

5.1.1 IBSA coverage

IBSA has two Training Packages that cover the ICT industry: the ICA05 Training Package that covers the Information Technology (IT) and related technology occupations, and the ICT02 Training Package that covers the telecommunications industry. The later is IBSA's primary document for covering telecommunications occupations.

The ICT02 Training Package is being updated and should be endorsed as ICT10 by March 2010. The redevelopment of the package has been done with great sensitivity to the competencies required by the current and future workforce. This includes expanding the package beyond a focus on cabling to include all aspects of the modern industry.

The following table confirms the relevant existing ICT Training Package based national qualifications that apply to telecommunications occupations.

Table 8 – List of Telecommunication-related IBSA Training Packages and qualifications

Summary of AQF Qualifications in ICT02 Telecommunications Training Package	
ICT20208	Certificate II in Telecommunications
ICT20308	Certificate II in Telecommunications Cabling
ICT20408	Certificate II in Telecommunications Access Network Cabling
ICT20508	Certificate II in Telecommunications Digital Reception Technology
ICT30208	Certificate III in Telecommunications
ICT30302	Certificate III in Telecommunications Cabling and Customer Premises Equipment
ICT30408	Certificate III in Telecommunications Access and Associated Services
ICT30508	Certificate III in Telecommunications Digital Reception Technology
CUF30207	Certificate III in Broadcast Technology (from Screen & Media TP)
ICT40208	Certificate IV in Telecommunications Engineering
ICT40302	Certificate IV in Telecommunications Computer Systems
ICT40408	Certificate IV in Telecommunications Network Planning
ICT40508	Certificate IV in Telecommunications Networks
ICT40608	Certificate IV in Telecommunications Computer Telephony Integration
ICT40708	Certificate IV in Telecommunications Radio Communications
CUF40307	Certificate IV in Broadcast Technology
ICT50202	Diploma of Telecommunications Engineering
ICT50302	Diploma of Telecommunications Computer Systems
ICT50402	Diploma of Telecommunications Photonics
ICT50508	Diploma of Telecommunications Networks
CUF50307	Diploma of Broadcast Technology
ICT60202	Advanced Diploma of Telecommunications Engineering
ICT60302	Advanced Diploma of Telecommunications Computer Systems
ICT60408	Advanced Diploma of Telecommunications Networks

5.1.2 Training activity

In 2008 there were 13,545 students commencing *ICT Telecommunications Training Package* related training (See table 9 below). Less than 10% of these enrolments were in cabling related telecommunication activities (i.e. related to connecting a household/premise).

Table 9: Course enrolments in ICT training package qualifications, 2002-2008 (NCVER)

Qualification	2002	2003	2004	2005	2006	2007	2008
ICT20102 - Certificate II in Customer Contact	0	117	632	599	338	363	205
ICT20197 - Certificate II in Telecommunications	373	376	242	25	23	0	0
ICT20202 - Certificate II in Telecommunications	0	11	200	469	335	227	373
ICT20297 - Certificate II in Telecommunications (Cabling)	608	840	302	14	0	0	0
ICT20302 - Certificate II in Telecommunications Cabling	0	0	205	315	363	361	257
ICT20399 - Certificate II in Telecommunications (CAN)	59	38	1	0	0	0	0
ICT20402 - Certificate II in Telecommunications Access Network	0	0	0	2	4	1	0
ICT20499 - Certificate II in Telecommunications (Call Centres)	2,179	2,144	261	5	3	0	0
ICT30102 - Certificate III in Customer Contact	0	319	4,657	6,903	7,141	7,818	10,262
ICT30197 - Certificate III in Telecommunications	507	627	157	9	0	0	0
ICT30202 - Certificate III in Telecommunications	0	15	144	273	580	1,005	703
ICT30297 - Certificate III in Telecommunications (CPE)	1	1	0	0	0	0	0
ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment	0	0	60	155	41	21	46
ICT30397 - Certificate III in Telecommunications (CAN)	18	1	0	0	0	0	0
ICT30497 - Certificate III in Telecommunications (Cabling)	411	314	200	14	0	0	0
ICT30599 - Certificate III in Telecommunications (Call Centres)	7,439	7,484	2,942	321	33	0	0
ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipmen	18	0	0	0	0	0	0
ICT40102 - Certificate IV in Customer Contact	0	21	350	1,059	1,163	1,345	1,082
ICT40197 - Certificate IV in Telecommunications	204	66	26	4	1	0	0
ICT40202 - Certificate IV in Telecommunications Engineering	0	76	84	101	105	173	199
ICT40302 - Certificate IV in Telecommunications Computer Systems	0	0	0	0	0	20	65
ICT40599 - Certificate IV in Telecommunications (Call Centres)	1,922	1,414	766	171	5	1	0
ICT50102 - Diploma of Customer Contact Leadership	0	0	1	0	0	2	10
ICT50197 - Diploma of Telecommunications Engineering	103	109	62	12	4	0	0
ICT50202 - Diploma of Telecommunications Engineering	0	30	74	81	91	76	175
ICT50302 - Diploma of Telecommunications Computer Systems	0	0	0	0	0	19	36
ICT50402 - Diploma of Telecommunications Photonics	0	0	0	0	8	5	2
ICT60102 - Advanced Diploma of Customer Contact Management	0	0	2	2	0	0	0
ICT60197 - Advanced Diploma of Telecommunications Engineering	99	185	29	2	0	0	0
ICT60202 - Advanced Diploma of Telecommunications Engineering	0	60	102	136	148	107	107
ICT60302 - Advanced Diploma of Telecommunications Computer Systems	0	0	0	0	0	16	23
TOTAL ICT - Telecommunications	**13,941**	**14,248**	**11,499**	**10,672**	**10,386**	**11,560**	**13,545**

Source: National VET provider collection, 2009

Table 10: Qualifications completed in ICT training package qualifications, 2002-2008*

Qualification	2002	2003	2004	2005	2006	2007	2008
ICT20102 - Certificate II in Customer Contact	0	37	279	190	125	114	96
ICT20197 - Certificate II in Telecommunications	71	58	41	20	0	0	0
ICT20202 - Certificate II in Telecommunications	0	0	41	170	95	63	92
ICT20297 - Certificate II in Telecommunications (Cabling)	46	71	25	3	0	2	0
ICT20302 - Certificate II in Telecommunications Cabling	0	0	44	47	54	44	57
ICT20399 - Certificate II in Telecommunications (CAN)	40	11	0	0	0	0	0
ICT20402 - Certificate II in Telecommunications Access Network	0	0	0	0	3	1	0
ICT20499 - Certificate II in Telecommunications (Call Centres)	666	1,074	192	2	1	0	0
ICT30102 - Certificate III in Customer Contact	0	43	1,709	2,960	2,231	2,202	2,950
ICT30197 - Certificate III in Telecommunications	16	56	0	1	0	0	0
ICT30202 - Certificate III in Telecommunications	0	1	12	12	76	165	98
ICT30297 - Certificate III in Telecommunications (CPE)	0	1	0	0	0	0	0
ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment	0	0	1	17	4	5	6
ICT30397 - Certificate III in Telecommunications (CAN)	6	0	0	0	0	0	0
ICT30497 - Certificate III in Telecommunications (Cabling)	43	21	12	1	1	0	0
ICT30599 - Certificate III in Telecommunications (Call Centres)	2,237	2,520	1,372	216	20	0	0
ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipment)	1	0	0	0	0	0	0
ICT40102 - Certificate IV in Customer Contact	0	1	141	501	296	478	372
ICT40197 - Certificate IV in Telecommunications	22	17	22	0	0	0	0
ICT40202 - Certificate IV in Telecommunications Engineering	0	17	15	21	28	42	15
ICT40302 - Certificate IV in Telecommunications Computer Systems	0	0	0	0	0	0	0
ICT40599 - Certificate IV in Telecommunications (Call Centres)	653	502	449	125	6	0	0
ICT50102 - Diploma of Customer Contact Leadership	0	0	0	0	0	0	0
ICT50197 - Diploma of Telecommunications Engineering	26	51	36	43	3	2	0
ICT50202 - Diploma of Telecommunications Engineering	0	9	15	25	23	13	20
ICT50302 - Diploma of Telecommunications Computer Systems	0	0	0	0	0	0	0
ICT50402 - Diploma of Telecommunications Photonics	0	0	0	0	0	0	0
ICT60102 - Advanced Diploma of Customer Contact Management	0	10	0	0	0	0	0
ICT60197 - Advanced Diploma of Telecommunications Engineering	19	81	24	1	0	0	0
ICT60202 - Advanced Diploma of Telecommunications Engineering	0	1	34	37	55	27	4
ICT60302 - Advanced Diploma of Telecommunications Computer Systems	0	0	0	0	0	17	1
TOTAL ICT - Telecommunications	**3,846**	**4,582**	**4,464**	**4,392**	**3,021**	**3,175**	**3,711**

Source: National VET provider collection, 2009

* Data for qualifications completed in 2008 is preliminary. The 2008 data will be updated in the 2009 VET Provider Statistics.

The above tables indicate the ICT Training package has been experiencing strong demand growth in the past two years. While other packages experience slow down due to the global

financial crisis and other factors, enrolments have risen 11% from 2006 to 2007 and again by 100% in 2008.

As a broad indication, the NCVER data suggests just over 1 in 4 students who commence complete a qualification. Compared to completion rates in qualifications from other national Training Packages, this is very high. But there is a lack of finer detail on how many commencements resulted in completions in the same year. The NCVER approach to annual data collections means participant numbers are inflated because qualifications are generally completed over a number of years and the same student is counted in each calendar year they are enrolled. As a result participant numbers cannot be compared with completions for individual years or longer time periods.

The planned rollout of the National Broadband Network and work on all forms of broadband networks (mobile, fixed and satellite) in Australia suggest the ICT10 qualifications will have substantially more demand than in previous years. As will the government processes and demand for training incentives. For IBSA this would exponentially improve numbers of trainees and recognised training activity; a major enhancement to those serving this marketplace.

5.2 Current regime for regulation of cablers

Currently the Australian Communications and Media Authority (ACMA) have a regulatory responsibility for certifying a cabler connecting the customer side of the network, or the connecting the home or business to the carrier's (network service provider's) network.

The ACMA have chartered organisations to provide cabling registration service providers. They include:

- Australian Cabler Registration Service (ACRS), http://www.acrs.com.au
- Australian Security Industry Associated Limited, http://www.asial.com.au
- BICSI Registered Cablers Australia Pty Ltd (BRCA), http://www.brca.asn.au
- Fire Protection Association Australia, http://www.fpaa.com.au
- TITAB Australian Cabler Registry Services http://www.titab.com.au.

The Cabler Registry Service providers are ACMA accredited, non-commercial, impartial, industry owned bodies. Currently ACMA registers and maintains records for cablers including for:

- Registered Assessor
- Registered Trainers
- Registered Cablers

A standard fee structure seems to apply for such services
(See http://www.citt.com.au/index.cfm?contentid=3).

The Cabling Provider Rules (CPRs) outline the requirements for cablers[6]. These rules were introduced in October 2000. CPR's are mandatory and only apply to individual cablers (not companies or businesses). Registered Training Organisations (RTO) usually conduct the training courses. Unlicensed/Registered Cablers with previous experience or from other countries can have their qualifications recognised by an assessor.

The critical question is whether the existing system is robust enough to deal with the coming volume of demand it will have to survive, and it will be sufficient to enforce competence standards appropriate to NBN requirements. Initial research would suggest it is not, and that it will require a scale of changes that matches the transformation of the telecommunications workforce and training systems

[6] Cabling Provider Rules are listed at http://www.acma.gov.au/WEB/STANDARD/pc=PC_1897

Even a layperson can appreciate the likely skills differences between working with fibre optics, which are glass or polymers, as opposed to working with copper cables. Nor does one have read very much to see the underpinning knowledge required to use the tools to competently connect or join fibre to an electronic receiver network (in-home) is typically an advanced course following those learning to work with copper wires or other older cabled transmission technologies[7].

In Attachment 1 Bevan Ramsden suggests some of the current problems associated with how cablers are registered. Not least of which is the overlap of regulatory jurisdictions as technologies converge at the point the home is connected, and the fact FTTH will changes requirements for what may be considered a 'competent' cabler.

The inappropriateness of current cabler skills and regulations governing their work on fibre optic and MDF connections is a point consistently raised in discussions at the Australian Media Centre Community, the most popular discussion board for professionals in this field (see http://www.xpmediacentre.com.au/community/windows-networking-support-wired-wireless/31430-legality-cabling-revisited.html) and the main FTTH blog site (http://ozftth.blogspot.com).

[7] For instance see the Open University course, T305_1 Optical fibre communication, available at http://openlearn.open.ac.uk/course/view.php?id=3014

6. Survey of current employers spend on telecommunications related vocational education and training

A survey of Telecommunications Industry employers was conducted as a part of this research report. The purpose of this survey was to gather information on the overall volume and type of training provided to telecommunications workers.

Survey participants were selected by IBSA and represented a range of sizes and types of telecommunications companies. A total of 23 people were asked to participate, with 13 responses received. The sample was drawn from across the telecommunications sector and a balanced range of large, medium and small businesses. The top three employers were involved, and taken together, the respondents collectively employed over 70% of the telecommunications total workforce in Australia (See Table 11 below).

All participants were assured that their organisation's and their own confidentiality would be maintained, and that data collected would only be used in ways that maintained that confidentiality.

The survey consisted of five questions that covered the following themes:

1. The number of employees (full-time and part-time) the organisation had at the end of the 2008-2009 financial year;
2. The organisation's total spend on training-related costs for the 2008-2009 financial year;
3. Whether the organisation trained contractors in the 2008-2009 financial year, and if so, how many;
4. How the organisation's training spend was allocated across VET training (both with and without government incentives or subsidies), in-house training, and formal university-related education or professional development;
5. Other information, comments or ideas on training-related issues for telecommunications businesses.

In effect, although it was short, the survey sought fairly detailed financial, employee and training information from participants. Given this level of detail, and that some organisations may not necessarily record the type of data sought, some variation in the overall quality of data was expected. It was also important that the survey questions were not so specific and onerous that people would choose not to participate. The end-result is that the survey provides indicative data drawn from executives and training managers in telecommunications companies.

The key results for the organisations surveyed are outlined below.

- **Telecommunications respondents surveyed employ 21,360 workers** (16,500 full time equivalent employees and 4,860 contractors)
- **Telecommunications occupations-related training expenditure for 2008-2009 financial year was $110 million** (direct training costs only)
- This represents an **average spend by telecommunication worker of $5,540** for each employee or contractor, per annum
- Based on extrapolating this average spend per worker across all workers in a classified telecommunication occupation the **total industry direct training spend in the industry could be estimated at $208,858,000**
- Approximately **68% of training is in-house**
- Just under **30% of training spend was on VET** (formal 11% and informal 19%)
- On average **less than 9% of VET sourced training received public funding**

- Only **2% of training spend is on university related, higher education**

A range of general feedback was also gathered via the survey, indicating:

- A high degree of attention on the National Broadband Network and its implications;
- Future budget allocation of over half a billion dollars on training to 2014
- Plans for substantial training and up-skilling of existing telecommunications workers;
- Plans for substantially increasing employment, with examples given of plans to increase some telecommunications-related employment by 50% or more;
- Increased recognition of the need for qualifications amongst telecommunications workers, in part driven by customer demands that work be completed by people with recognised qualifications;
- Positive feedback for, and strong interest in, IBSA's Telecommunications Training Package Stage 2 Development Project.

These points will be discussed in more detail below.

6.1.1 Size and distribution of activity in the telecommunications training marketplace

The number of Australian telecommunications workers and contractors employed by the companies surveyed are shown below. Smaller respondents indicated quite precise numbers, apparently based on everyday first-hand knowledge, whereas some of the larger employers gave indicative "ball-park" responses reflecting the scale and more dynamic nature of their employment numbers.

Table 11: Employment coverage of survey respondents

Employment - Telecommunications occupations (ABS, Census 2009)	37700
Survey respondents - total (employed + contractors)	21360
Survey respondents - employment	16500
Survey respondents - contractors	4860

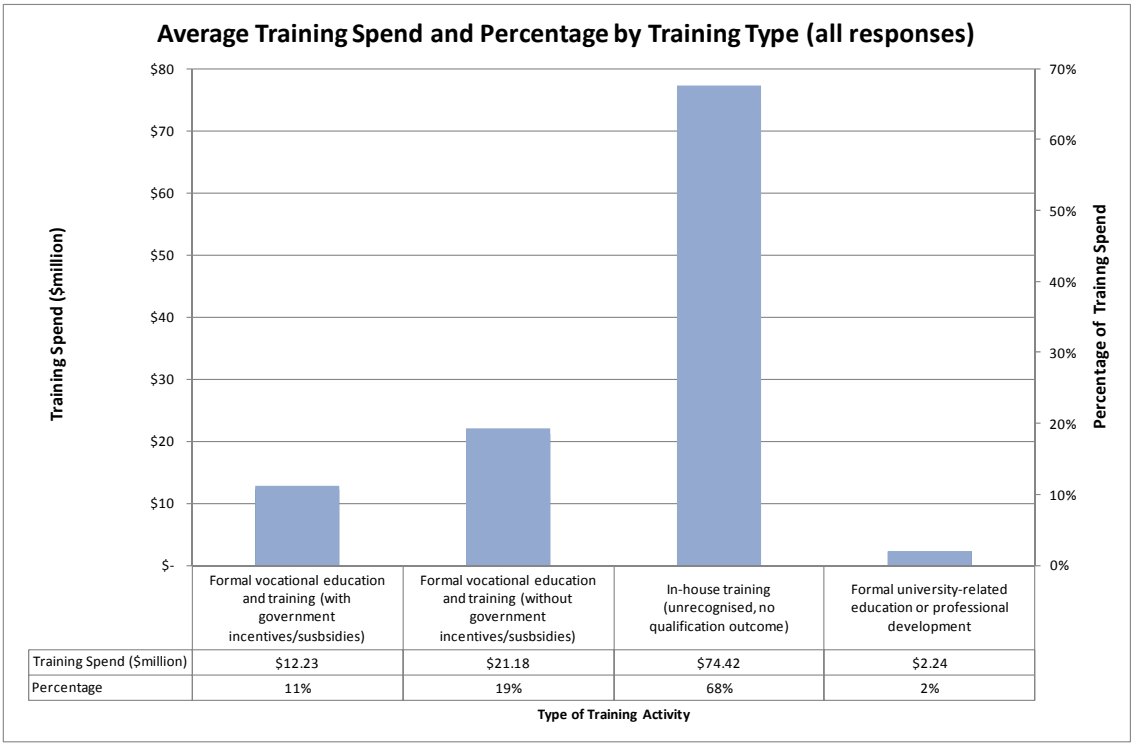
There are a number of factors which mean these survey numbers can only be regarded as indicative. However a number of major employers were surveyed and a sizeable (non-random) sample of employer training for telecommunications workers was achieved.

The total telecommunications-related training spend was in the order of $110 million for the 2008-2009 financial year. Again the indicative-only nature of these figures needs to be highlighted. This is because some respondents provided multi-year budgets (e.g. $X over 3 years), and these amount were averaged to gain a 2008-2009 financial year figure. It is also noted that, while the survey did seek information on indirect training costs (e.g. roster costs, 'back-fill' for workers on training, etc.), most respondents only indicated their direct training spend.

The tables below indicate the average training spends and percentages across four types of training:

- Formal vocational education and training (with government incentives / subsidies);
- Formal vocational education and training (without government incentives / subsidies);
- In-House training (unrecognised, with no qualification outcome); and
- Formal university-related education or professional development.

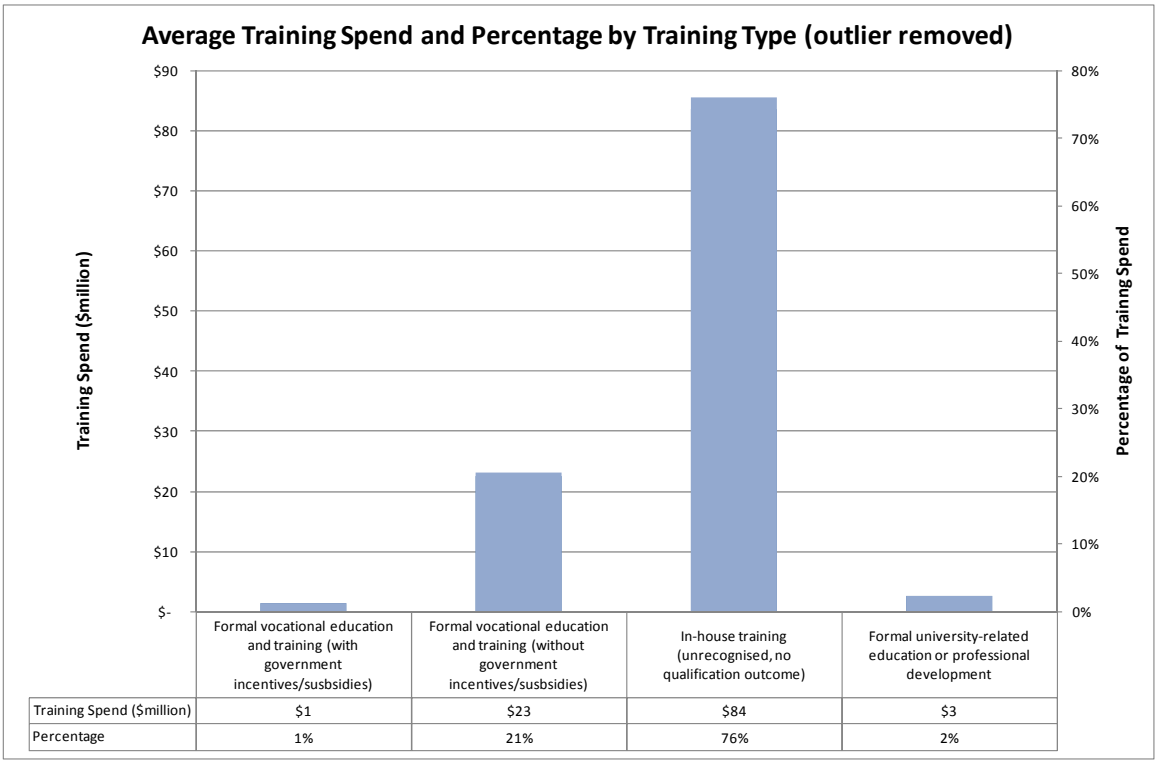
Table 12: Average training spend and percentage by training type (all responses)



It is noted that one response appeared to be significantly different from the others and, given its scale, accounted for more than 99.6% of the VET (with incentives/subsidies) result above. The chart below shows the results with that one outlier removed.

It is clear in each case that in-house training activity dominates annual training spends. In the absence of further data, it could be reasoned that most of the workers represented in this survey already have some formal qualification, and so only in-house training has been needed to up-skill workers.

Table 13 Average training spend and percentage by training type (outlier removed)



The information regarding training spend is vital. Past estimates of training spend by the telecommunications industry has been estimated at over $1.4billion with just over 70% on in-house training (Bowles, June 2009:17-18). This estimate included all occupations and all costs associated with training in the telecommunications industry. While consultation confirmed some companies are collectively anticipating investing over $600m in training over the next five years to 2015, the reported direct spend by all respondents for 2008-2009 was $110m.

Reported direct training expenditure confirms what was seen in telecommunication company annual reports. There exists a drive to reduce costs and cut training budgets. It also confirms the 'hidden' nature of many training costs. This includes indirect costs not being accounted for such as using contractors, capital costs, or 'HR' and rostering costs associated with training a person or so-called 'back fill' costs.

What the expenditure indicates is the higher per person cost to train a telecommunications worker. This suggests the budgets required to up-skill the existing workforce or to train new workers to meet anticipated demands is far in advance of actual expenditure on training being reported in the survey or available in a climate of tight budget pressures.

Other feedback that IBSA needs to note is some respondents indicated major changes were being considered to move away from informal, unrecognised training. Three major employers and one smaller employer noted that their major clients required telcos have formally qualified or accredited telecommunications workers providing services. This was a firm preference of major employers in the finance and insurance, transport, health and government sector. This is leading some major employers to explore options for formal training and qualifications as a high priority. This shift is explored further in the explanation of general feedback below.

6.1.2 Hidden, non-government funded training activity

The survey conducted for this research report confirms less than 9% of telecommunications training expenditure was likely to be publically funded VET. This is consistent with previous surveys and research. Mather (7 December 2009) reports on a recent survey undertaken by the Enterprise RTO Association (ERTOA) on behalf of the federal government, pointing to the finding that a substantial number of qualifications and volume of training spend is currently not included in government statistics and goes unreported. This is corroborated by NCVER research; in its report on ICT statistics, ACS (2009:18) note that:

> [NCVER data on ICA / ICT enrolments] is limited to publicly funded Vocational Education and Training (VET) activity. The private VET training market is also substantial. NCVER indicated in 2005 that it was approximately the same size as the publicly funded VET market.

6.1.3 General survey feedback and observations

A range of general feedback was also gathered via the survey, indicating:

- A high degree of attention on the NBN and its implications;
- Plans for substantial training and up-skilling of existing telecommunications workers (as discussed above);
- Plans for substantially increasing employment, with examples given of plans to increase some telecommunications-related employment by 50% or more;
- Increased recognition of the need for qualifications amongst telecommunications workers, in part driven by customer demands that work be completed by people with recognised qualifications;
- Positive feedback for, and strong interest in, IBSA's Telecommunications Training Package Stage 2 Development Project.

Additional feedback themes and observations are discussed below.

A. National Broadband Network

A high degree of attention on the NBN and its implications, with a range of comments on its implications for training needs and future plans. These will be raised and discussed in more detail below.

B. Increasing Employment and Up-Skilling to meet Customer Requirements

Several respondents from the larger telecommunications companies indicated plans for increasing some areas of telecommunications-related employment by 50% or more. This encompassed occupations related to telecommunications infrastructure and telecommunications-network management specialists.

In parallel with this anticipated growth, respondents also indicated a planned major shift away from informal, unrecognised training. Three major employers and one smaller employer noted that their major clients wanted to have formally qualified or accredited telecommunications workers providing services for them. This was a firm preference of major employers in the finance and insurance, transport and logistics, and government sector. This is leading some major employers to explore options for formal training and qualifications as a high priority. This confirms a change to the pattern of training expenditures represented above as likely to occur inside 18 months.

It is important to note that this shift to qualifications-focussed training would put substantial extra demand on training systems at precisely the time it will already be under pressure to deliver large additional numbers of qualified workers to support the NBN infrastructure roll-out. With forecasts of an annual 25,000 direct telecommunications-related employment on the NBN, and assuming that most or all of this number will require formal training at some stage, survey feedback suggests this training load could be doubled by demand from existing telecommunications providers.

C. Contractors, Employees and Government funding of Telecommunications Training

The scale of the telecommunications skill and training demand will present a range of challenge for the industry and the NBN project.

It is useful to note that the shift to qualifications-focussed training noted above may carry with it a trend towards outsourced or contract workers in the industry. The Huntly Consulting Group (2008:8) examines distinction between vocational and enterprise-specific training in the context of the reasons that people exit the trades. They note that vocational training produces skills which are of use to many employers, allowing workers with vocational qualifications tend to be more mobile within the labour market. This is in contrast with enterprise-specific training which tends to produce skills of value to only to the employer who supplies the training. In effect, enterprise-specific training tends to have a negative or neutral influence on worker mobility in the labour market.

Huntly Consulting Group (2008:8) observe that “the distinction between vocational and enterprise-specific training is most relevant in relation to how training is financed”. In essence, employers are usually willing to pay for enterprise-specific training, but not for vocational training. (This reason for this is the mobility of workers noted above). In this context, and given the planned shift of employers away from in-house training and towards vocational qualifications, it seems likely that any government decisions to provide funding to support telecommunications training may have a significant impact on the balance between contractors and employees in the industry. Further items for consideration and investigation in this area include:

- The possibility that skills shortages will put telecommunications workers in a strong bargaining position, with the result that they may choose to become contractors and pursue the most highly-paid work offerings;

- The possibility that a shift to contractors makes achieving volume in telecommunications training more problematic, given training would more likely be self-funded, and involve taking a (or the) primary earner away from the small telecommunications business;
- Contractors may find it more difficult to take on and provide support for trainees or apprentices, given their smaller scale and resources;
- Contractors may be less productive than employees because they typically need to be involved in more day-to-day business management activities such as finding clients, doing bills and accounts, and ordering supplies.

Applied across a workforce of 25,000 (for the NBN alone) and across 8 – 10 years of NBN roll-out, even minor changes in contractor numbers and productivity rates are likely to have a significant impact on overall costs and outcomes, for both the NBN and the training system.

D. End-User Telecommunications Skills Needs

Feedback also highlighted the need to consider the telecommunications-related skills of householders and end-users because the NBN will not be "plug and play". This means that there would be some demand on end-users to configure and maintain their own NBN-based services. This echoes observations in the recent IBSA ICA05 Scoping Review that once-specialist technologies (e.g. network routers and wireless network equipment) have rapidly migrated to being common household items, with specialist technology and telecommunications demands being placed on end-users. Indeed various news reports over recent years have highlighted the range of security created by householders setting up home networks that inadvertently expose them to a range of security dangers including identity and data theft, and unauthorised access to networks. It seems clear that, with the increased capacity of the NBN, increased numbers of people and businesses connected to "always-on" services, and a substantially increased number of non-expert end-users configuring their (NBN-based) networks in some way, there is substantial additional potential for novice-created problems, lost productivity, and criminal exploitation of (human) network weaknesses.

The design of in-premises NBN technologies and the skills of end-users are critical control points for avoiding costly service call-outs to already-stretched telecommunications workers, avoiding electronic crime, and maximising the commercial and service value of the NBN to Australians.

E. The future of the Copper Network

The future of the copper network was also raised in survey responses, with some respondents expecting that the NBN would remove the need for having or maintaining the copper network, and so training would be substantially discontinued for this network. However Alcatel Lucent (2009) report that the on-premises Optical Network Termination (ONT) equipment required for NBN would need electric power. They point out that "unless battery backup is provided, the system will not function if the house [or premises] loses power", and that without battery backup, NBN-based emergency telephone services will also be lost in a power outage. This scenario raises a range of questions on requirements for the NBN and the future of the copper network; functioning telephone services recognised as being essential, and are critical for safety, our economy, and national security at many levels. If the NBN is unable (or not designed) to ensure emergency services will be available, then this implies that some level of copper network training for telecommunications workers will need to continue indefinitely. In this scenario, the current scale of national workforce would need to be retained to keep up with new connections and maintenance of the copper network. This would clearly have implications for ongoing training demands and the volume of newly-trained telecommunications workers needed for the NBN roll-out and maintenance.

F. Attracting Workers to Telecommunications: TAFE and Career Path Issues

Some survey respondents indicated problems finding people with Telecommunications training or qualifications. This was seen as being because people did not necessarily understand the work and opportunities involved, or did not regard ICT as an attractive career. It was explained that, as a result of these circumstances, “TAFE struggles to get people”. However once people had embarked on this path, they were reported to enjoy it and find it rewarding. Other feedback and issues noted were:

- A desire to recruit more women into Telecommunications (apart from achieving an improved gender balance, this focus may help increase overall recruitment); and,
- A perception that TAFE funding cutbacks were impacting on telecommunications training.

7. Impact of the NBN on the telecommunications workforce

7.1 The National Broadband Network

On 7 December 2007, the Minister for Broadband, Communications and the Digital Economy, Senator the Hon Stephen Conroy, announced that the Australian Government (Government) would call for expressions of interest from companies to build a national high-speed broadband fibre-to-the-node (FTTN) network, and that it would run an open and transparent process to determine who would build the network. However, in January 2009 the Australian Government, in consultation with the Panel of Experts, decided it should take a lead role in building the national broadband network (NBN) and ensure it delivered quality outcomes by connecting fibre-to-the-premise (FTTP) or what is herein titled, fibre-to-the-home (FTTH) (DBCDE, 20 January 2009).

Investing up to $43 billion over eight years the Government's aim is to build and operate a National Broadband Network that will deliver superfast broadband connectivity through FTTH. The NBN will deliver fibre connectivity of not less than 100 Mbps to 90 percent of Australian homes and to businesses and public facilities such as hospitals and schools. Those homes and workplaces not reached will be able to access complimentary, high speed wireless and satellite services connecting at not less than 12 Mbps.

Central to the building and operation of the NBN will be the National Broadband Corporation (NBNCo). This company will offer wholesale-only, open access universal services.

To turn its vision into action in April 2009 the Government undertook to:

- establish a company to build and operate the network and make an initial investment of $4.7 billion in the network;
- commence an implementation study to determine the company's operating arrangements, detailed network design and ways to attract private sector investment;
- build upon its National Broadband Network proposal and begin the rollout of a FTTP network and next generation wireless services in Tasmania as early as July 2009;
- implement measures to address regional backbone 'blackspots';
- progress legislative changes that will govern the national broadband network company and facilitate the rollout of FTTP networks; and
- commence a consultative process on necessary changes to the existing telecommunications regulatory regime (DBCDE, 19 May 2009).

The NBNCo will be established through an initial investment by the Government. However, the stated intention is for the Government to sell down its interest in NBNCo within 5 years after the network is built and fully operational. This suggests an expectation that over $35 billion of the NBN funding will come through private equity raising and other companies taking an ownership stake in the NBNCo (DBCDE, April 2009:7).

No immediate detail is available on how the NBNCo will attract the required capital given the current global financial crisis. Nor on the level of ownership in the NBNCo telecommunication companies (Telcos) in the Australian marketplace can secure.

7.1.1 Economic multipliers

The Government's commitment to the NBN has irrevocably changed more than just the telecommunications landscape in Australia.

As with any piece of infrastructure, such as roads or a bridge, a FTTH network offers regions the ability to create jobs by stimulating economic activity. Some of this impact will be through the jobs created during the construction phase of the network. For each year over the 8 years of the Australia-wide NBN rollout 25,000 jobs are expected to be created (Senator Stephen

Conroy, April 2009). However, the Government's investment in the NBN is intended to stimulate activity beyond the employment and costs associated with building the infrastructure.

Currently Australia has very low levels of broadband penetration into the home user market segment. The Australian Industry Group noted (2008:24):

> Australia ranked 23rd out of 127 economies in terms of accessibility to digital content across a wide range of platforms including fixed-line internet wireless, internet mobile network satellite etc; 27th in terms of quality of competition in the ISP sector; 19th in terms of high-speed monthly broadband subscriptions; and 29th in terms of lowest cost of broadband.

For consumers even the fastest broadband communication speeds they can experience are significantly slower than major international competitors. This has consistently promoted a view that education and business services are being hamstrung and Australia is incapable of competing internationally until it possessed world-class broadband infrastructure (Sydney Morning Herald, 2006).

Not only will the speed of the NBN permit new products, services and capabilities to be accessed at home; it can advantage other users. Users such as medical and educational institutions are but two of the expected major beneficiaries of access to the NBN.

The creation of economic activity and jobs will therefore stimulate the creation of new services to homes and allow businesses to leverage the network to reach new markets or perform activities not possible on the existing, slower broadband networks.

7.1.2 Impact of the NBN on participation in the digital economy

Participation of IBSA industries in the global digital economy is reliant on universal access of consumers and businesses to high speed, reliable Internet connections. The NBN is therefore much more than a piece of digital infrastructure. Senator Conroy, Minister for Broadband, Communications and the Digital Economy stated the key elements of success for Australia's digital economy are:

> Firstly, a digitally aware and enabling government.
>
> This is a government that lays the foundations for world-class digital infrastructure, that facilitates innovation and sets a conducive regulatory framework.
>
> Secondly, a digitally-confident and innovative industry.
>
> This includes the tech industry that is the engine room, if you will, in which to build our digital skills and grow our digital capabilities. It includes the broader industry that will adopt smart technology and develop sustainable online content models.
>
> Thirdly, a digitally-empowered and literate community.
>
> This is a community with strong digital confidence and digital media literacy. (15 July 2009)

As the last point confirms, at the social level the focus is on digital literacy and bridging the digital divide so every Australian can choose to participate in the digital economy. As the first two points reinforce government and the building of digital skills play essential enabling roles.

The NBN is the embodiment of Australia's effort to enable digital participation and engagement. In overly simplistic terms the higher the bandwidth the faster the files can be transferred. At 100 Mbps the improvements to speed represented by FTTH will go way beyond simply improving the loading of web pages or sending and receiving files.

As of June 2008, some 82% Australian homes had an Internet connection, but only 67% had broadband connecting at speed over 512 kbps (ABS, December 2008). Currently the 'best' cable broadband connection available in most regions of Australia is ADSL2 with a speed of around 1.2 Mbps. Ignoring the many variables this means a file could currently take 100 minutes to download, will only take 1.4 minutes on a 100 Mbps connection. Potentially Blue-Ray® quality DVD content could be downloaded in less than 8 minutes or be viewed in real time. For nearly 30% of Australian homes without broadband the time to download a similar

file – if the connection could be maintained – will be measured in numbers of days, not minutes or hours.

For home users FTTH opens opportunities to access high quality audio files and DVD quality movies. For hospitals or medical facilities it may mean they can undertake web conferencing or exchange high quality digital medical images. It could allow rural and remote areas to undertake telehealth where a remote physician accesses expertise and assistance from a metropolitan expert by streaming digital TV quality images and engage in synchronous discussions in real time over the Internet.

We also need to remember that complimenting the FTTH will be a 12 Mbps wireless and satellite network. Under the Australian Broadband Guarantee[8], homes not able to access FTTH will have an option to access high speed non-terrestrial solutions.

The existence of wireless and satellite infrastructure able to support those not able to connect to the NBN will have significant parallel effect on the mobile internet landscape in Australia. While there were 21.26 million mobile phone services in operation, some 8.55 million subscribers were connected to the 3G mobile network services with connection speeds around 1 Mbps (ACMA, 2007; ACMA, 2008: 45 & 47). Making mobile networks of over 12 Mbps available to the public will have as profound an impact as the FTTH. Unlike the FTTH such networks are not tied to cables and can be accessed by anyone within range that has the right permission and equipment.

How the presence of a next generation broadband FTTH network will alter the use of the Internet is illustrated in the following table.

Table 14 - Moving from today's Internet to the next generation high speed Internet

Today's Internet	Next generation Internet
Reactive	Pro-active
Mass information and data	Customised to personal preferences
Download to use (Music, video, data, etc.)	Use or share in online environment
Applications and data stored on local network and computing device	Applications and data shared and distributed over the internet
Own resources and applications	Cloud computing: distributed data sets and computing
Type of device determines, access to network, speed of connection and where user can connect	Any device, anywhere to multiple high speed network connections
Asynchronous – one to one, one to many communication and web cam connections	Synchronous – two-way, same time communication, many to many connections
Low quality, slow to download audio and video	High quality, high definition audio and video
Buy to own	Pay to access on demand, as required

7.2 Impact of NBN, new technologies and convergence

The NBN will increase the speed of broadband available to Australians. The technology involved is a quantum leap from current technologies to next generation technologies. In effect we will introduce innovations that move the bulk of households from copper cable technologies originating in the 1940s, to modern fibre optics. Innovation will result in advances at four levels:

1. the network architecture (design and construction)
2. applications available (products and services that can be used)
3. connecting to the networks (how different technologies connect to one network)

[8] The Australian Government has allocated $270 million between 2009 and 2013 to this guarantee – see http://www.dbcde.gov.au/broadband/australian_broadband_guarantee.

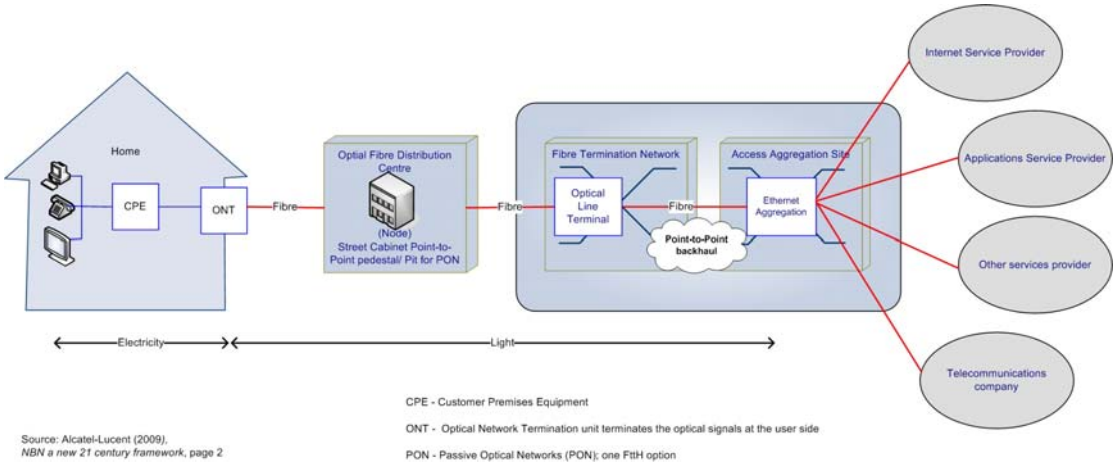
4. Managing data transmission (regulating speed of connection and data packaging)

The following sections overview some of these advances.

7.2.1 NBN Network architecture

This section gives a brief overview of the possible architecture and main components in the NBN. The architecture and components of the NBN may vary contingent on the network service provider (NSP – Telco), location or customer. The following figure below shows a possible architecture for the 100 Mbps FTTH network.

Figure 5 - Illustrative example key components in a FTTH network



When FTTH-based signals reach the customer's premises, at the Optical Network Termination Unit (ONT), it changes the optical signal (transmitted by light) to an electronic signal. Existing technologies in the home can then connect to that network (i.e. “in-building” or “Customer Premises Equipment"). This is a critical consideration. As we will later examine the connecting of ‘old’ to ‘new’ technologies uses tools and knowledge in excess of the cabling and joining skills required in the current workforce. Existing regulatory and ‘electro-technology’ skills relating to the customer-side connection (in-building) would no longer seem sufficient to cover the ‘next generation’ requirements of an NBN connection. Nor do the competencies cover the range of variables associated with the types of connections, joining options or the associated in-building technologies that can be connected in future.

7.2.2 Broadband access

Broadband is an Internet connection with a higher bandwidth than a standard telephone line. Bandwidth is the rate of data transfer or data carrying capacity of a network connection or communication channel. The greater the bandwidth, the greater the capacity and speed at which information can be transmitted (Bowles, 2003: 103). For users of the Internet what content and services may be accessed are dictated by the bandwidth available. Ideally, the connection should be broadband (high-speed data transmission), which is essentially as high as possible over 1000 kilobits per-second (Kbps) or 1 megabits per second (Mbps) speed. As depicted in Figure 6 below bandwidths range from mobile cellular network voice connections at 9.5 kbps to the much larger 15000 kbps or 150 Mbps.

Figure 6: Bandwidth and applications

	Bandwidth – Speed kbps									
Application	9.6	14.4	28	**56.6**	**144**	**384**	**2000**	**2400**	**5000**	**15000**
Voice/SMS										
Messaging/text										
Transaction processing										
Instant messaging/chats										
Still images										
Internet/VPN access										
Reliable IP telephony (VoiP)										
Database access										
Applications sharing										
Low quality video streaming to mobiles										
Low-quality video										
High-quality video										
High resolution TV/Video conferencing										
HD Digital IP TV, Video IP telephony/ Telepresence										
HD Video conferencing, High – end applications sharing										

Key

Indication of application performance

= Nil capability = Uncertain = Preferred

(Updated from Bowles, 2003:104)

The immediate implications for national deployment of FTTH will be improvements to the functionality of online products and services. Given bandwidth of 100 Mbps the NBN will trigger a radical breakthrough in the functionality possible with applications and content. Even more significant and difficult to quantify will be the removal of barriers to the deployment of new applications and services; most of which are unknown to Australian consumers (eg. In 2007 over 74% of USA homes receive CableTV via a Broadband connection). The FTTH will improve functionality through:

- Enabling faster data connection permitting rapid transfer of data and files, streaming data such as high definition digital TV or videos (Video on Demand – VoD), applications sharing, high-definition synchronous video or web conferencing, data casting and broadcasting content, and real-time collaboration tools;
- Improving services and Web-based applications that can deliver benefits to:

- **Households** – for instance Videos on Demand, high definition IP TV, smart homes and security systems, centralised computing capability through existing technologies (eg. Use the TV and a key board to access virtual computer capabilities).
- **Educational institutions** – for instance synchronous virtual classrooms, central learning object repositories, high speed research computing, data visualisation, cross-campus collaboration, virtual laboratories and applications, enhanced electronic and mobile learning.
- **Employees and Wage-Earners** – opportunities for telecommuting and working for businesses and customers in different or remote locations.
- **Medical facilities** - for instance telehealth, remote and rural audio and visual real-time consultations and diagnosis, remote medical imaging and central storage (eg. X-Rays), shared data facilities, and improved collaborative medical research.
- **Businesses, government agencies, and others** – for instance communications such as high quality IP telephone and videoconferencing, cloud computing, remote high-end applications sharing (eg. CAD), synchronous collaboration and networking spaces, shared supply chain management systems, enhanced ecommerce and ebusiness options and capabilities.
- **Digital content, games and media companies** - by enhancing collaboration on and sharing of large files, promoting interaction and collaboration (eg. massively multi-player online games, video social networking) promoting access to new markets and consumers, and enabling content (eg. a film) to be received by different devices (PC, TV, mobile phone) off a single network.

7.2.3 NBN and education

In addition to the NBN, the Australian Government has a number of “Digital Education Revolution” initiatives. These include the Government investing funding of $2 billion to provide:

- the National Secondary School Computer Fund, to provide for new information and communication technology (ICT) for all secondary schools with students in years to 9 to 12;
- the Fibre Connections to Schools initiative, a contribution of up to $100 million to support the development of fibre-to-the-premises (FTTP) broadband connections to Australian schools (i.e. the $100m program noted in the previous communications infrastructure section);
- collaboration with states and territories and Deans of Education to ensure new and continuing teachers have access to training in the use of ICT that enables them to enrich student learning;
- $32.6 million over two years to supply students and teachers with online curriculum tools and resources to support the national curriculum and conferencing facilities for specialist subjects such as languages;
- the development of online learning and access that will enable parents to participate in their child’s education; and
- $10 million over three years to develop support mechanisms to provide vital assistance for schools in the deployment of ICT provided through the National Secondary School Computer Fund (DEEWR, 2008b).

8. Skill shortages and needs arising from the NBN initiative

The NBN is a social as well as an economic initiative. As such business and governments at all levels in Australia seek to ensure any investment will have multipliers well beyond the telecommunications industry. This makes NBN a proactive policy intervention stimulating benefit beyond connecting Australian homes to high speed broadband.

At the labour market level, governments implementing national social or economic policy initiatives that involve physical infrastructure have to be able to answer three questions:

- Do we have the skills to build the infrastructure?
- Do we have the skills to maintain the infrastructure?
- Can and will consumers access and use the infrastructure?

8.1 Supply side –Building and maintaining the infrastructure

Senator, The Hon. Stephen Conroy, Minister for Broadband Communication and Digital Economy, suggests:

> *The National Broadband Network will form the basis for a generation of innovators and for businesses to drive efficiency and productivity growth.*
>
> *Access Economics predicts that a national high-speed broadband network would drive economy-wide productivity growth 1.1 per cent higher after ten years compared to going without.*
>
> *It views this as a conservative estimate.*
>
> *Another report by the Centre for International Economics said broadband could lift national economic output by 1.4 per cent after five to six years.*
>
> *This is equivalent to $15 billion in terms of GDP in 2007/2008* (19 May 2009).

As to the specifics of the economic impact on employment no robust research has been released. Again it is The Minister that suggests at least 25,000 jobs and up to a peak of 37,000 jobs per annum will be created during the eight years of the NBN rollout (Conroy, April 2009)[9].

A study of existing data suggests the NBN initiative could suffer through the lack of available skills in the Australian labour market. This could trigger resulting effects that could include increased costs (potentially pushing the NBN over budget), longer time to completion, slower (and perhaps lower) realisation of benefits from the NBN investment, and decreased competitive advantage to Australian businesses and industry compared to global competitors.

Major labour gaps and shortages are apparent even if a conservative estimate that 10% of the 37,000 plus jobs created per annum were in occupations directly related to telecommunications occupations associated with building and connecting households to the FTTH network. These include:

1. Current numbers of available cablers and network engineers falls well below expected demand.
2. The expected regional availability of competent telecommunications workers in the occupations required to build and maintain the NBN appears to be grossly inadequate.
3. The definition of competence for existing telecommunications workers vis-à-vis the 'next generation' technologies proposed in the NBN has not been specified and is not adequately regulated under the existing Australian Communication and Media Authority (ACMA), national cabler registration service.

[9] However, this statement is somewhat following a long line of research on the economic, employment and innovation benefits of Australia implementing high speed broadband. Such reports date back to the previous Howard Government; eg. Accenture (2001). *Innovation Delivered—Broadband for Australia, An Economic Stimulus Package*.

4. Convergence of technologies means boundaries between the cabling related occupations and other ICT, electrical and utilities, or related occupations classified in other industries is, at best, unsustainable.

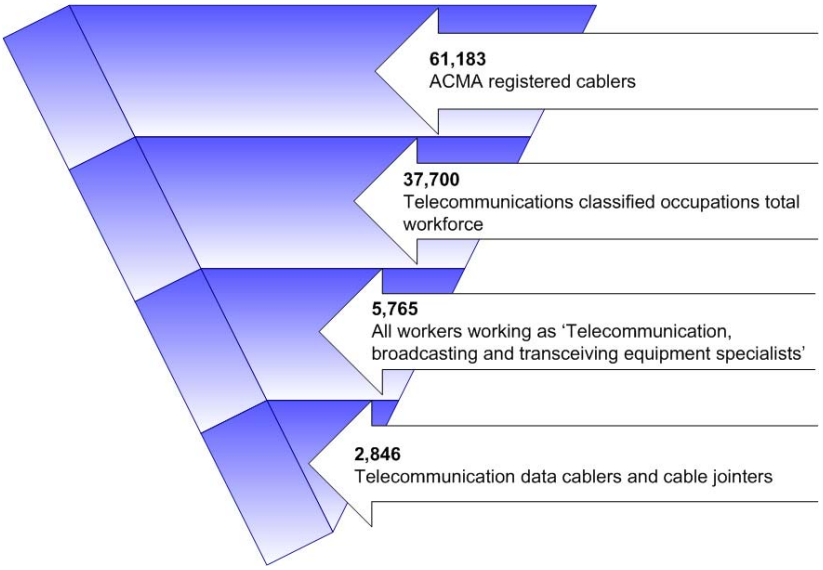
At minimum there will be a requirement to up-skill many of the existing registered cablers. At the end of the March quarter 2009 the Australian Communications and Media Authority (ACMA) reported there were 61,183 registered cablers in Australia (IBSA, eScan2010:ICT, 2009:11; & ACMA, 2009). This much publicised figure is misleading. It does not mean all are qualified to do NBN connections, nor work with fibre optics. Of greatest concern for NBN related roll out is the most reliable data on specific numbers of telecommunication data cablers and cable jointers suggests a workforce of around 2,846 (IBSA, ABS Census 2006 data tables, eScan 2008). Even in 2009 the best figures currently available to Government from the ABS suggest that total employment for all workers working as 'Telecommunication, broadcasting and transceiving equipment specialists' was 5,765 (ABS, 2008a)[10].

Based on the most precise and reliable data even if the level of competence could be assured to the standards required for the NBN rollout in the 5 years from 2009 to 2014, the inclusion of all other specific occupations in ICT networking, electro-technology, or fire and security systems cablers the available workforce in 2006 did not exceed 21,700 workers (ABS, 2006 Census)[11]. In 2009 to total workforce for **all** telecommunications trade workers, engineering professionals and technical specialists totals only 37,700.

One could speculate and suggest if the NBN Australia-wide rollout does create over 200,000 jobs by 2018 (Conroy, April 2009) and just 37,000 were created in telecommunications industry then the impact on total employment in this industry is self evident. Moreover proportional employment could double faster than recorded by any other major industry in the recent history of Australia.

Unfortunately no research was available or could be created within the constraints of this project's budget and brief to sort out which figures we need to heed and how they will affect regions and different sectors.

Figure 7: The range of estimates regarding available workers relevant to NBN roll-out, 2009

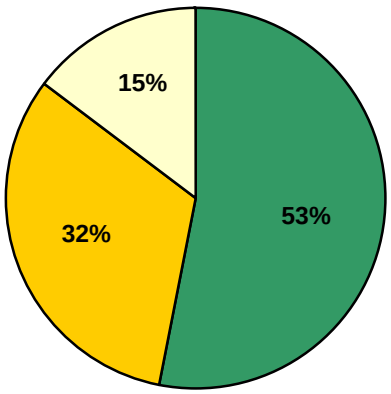


It is safer to conclude that it would be a substantial risk for any future workforce planning for NBN telecommunications workers to estimate the total workforce **currently** working in telecommunications that is qualified and available to connect fibre to the node, connect

[10] These figures are 4 years out of date and still use the older, less refined 1993 version of the Australian and New Zealand Standard Industrial Classification (ANZSIC), rather than the 2006 update.
[11] A request was made to ACMA to get total numbers of cablers registered under the current regime but this data was not made available at the time of this paper.

premises and install telecommunications network in a premise is more than 15-20,000 workers.

Figure 8: Employment telecommunications occupations, 2009

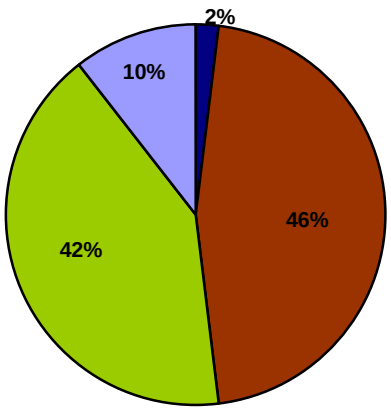


Telecommunications trade workers	20,000
Telecommunications engineering professionals	12,200
Telecommunications technical specialists	5,500
Total	37,700

(ABS Labour Force Survey February 2009)

The availability of any workforce or its desire to re-skill to work on new technology will typically be influenced by the age profile. A high proportion of the telecommunications workforce (1 in 8) are aged over 55. The following table uses data specially commissioned by IBSA from the ABS in 2007 to confirm if the telecommunications workforce is expanding the available workforce through recruiting young people (15-19 year olds). With only 2% of the workforce below 20 years of age it was concluded telecommunications is performing below other IBSA industries in attracting or retaining young people (IBSA, eScan 2008).

Figure 9: Age profile telecommunications employment (ANZSCO), 2006

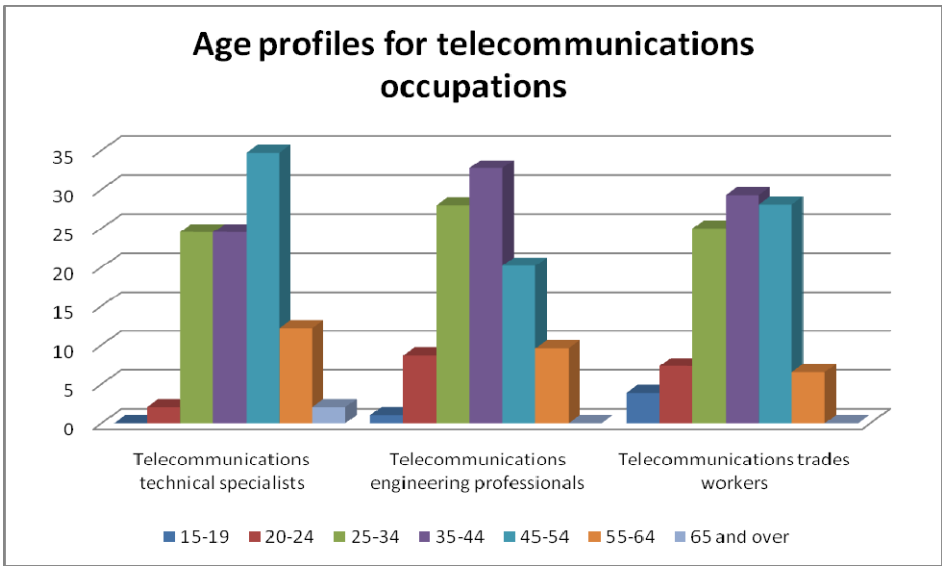


15-19 years	783
20-39 years	18,598
40-54 years	16,827
+ 55 years	4,221
Total	40,429

(Source Data tables prepared for IBSA, ABS Census 2006 data, Bowles & Wilson, 2008:69)

The age profile has not significantly changed from 2006 to 2009. In addition, study of all three major occupations confirms the need for workforce plans to attract more employees aged below 24 and to address the exit of employees aged over 55.

Figure 10: Age profile major telecommunications Industry occupations (ANZSCO), 2009

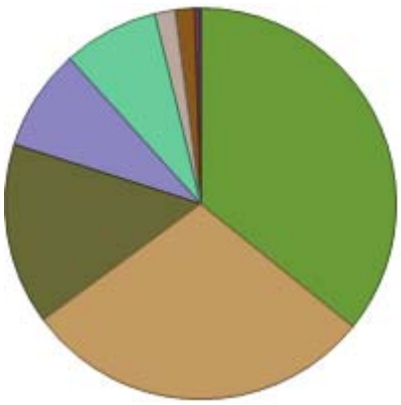


(ABS, February 2009)

Of equal significance is the evidence the NBN will at times stimulate demand for telecommunications workers in a directly inverse relationship to where they are now located.

An examination of the graph below on the distribution of the telecommunications workforce confirms what we would expect; states and territories with smaller populations have lower demand for services and as a result smaller levels of employment in telecommunications occupations. However, the current patterns of service and revenue don't reflect the future reality when the NBN is implemented. Nor does it reflect the potential heightened demand in regional Australia for maintenance and support.

Figure 11: Geographic Spread – Telecommunications Employment



Region	Percentage
NSW	35.8
VIC	29.1
QLD	15.0
WA	8.4
SA	7.9
TAS	1.7
ACT	1.6
NT	0.5

(IBISWorld, 2008:9)

The immediate demand for telecommunications workers will be driven by the work required to construct, connect and maintain the NBN. In metropolitan areas the ability exists to connect once to a dwelling with multiple residences (apartments, estates, etc.), or to connect a large number of dwellings off a single fibre cable and the distribution centre (node). With existing fibre and related infrastructure installed in new or 'greenfield' estates the speed of installation will be easier in many metropolitan locations. This will help reduce the immediate burden on the demand for workers.

Such numbers of connections off a single node in a metropolitan location will far outstrip what is possible in remote locations. Nevertheless, the workforce required to construct a rural and remote FTTH network will be proportionally higher than metropolitan locations during the

construction and maintenance stages of the NBN. Networks may have to span further, replace older copper or above ground terrestrial connections, connect fewer dwelling, and have more onerous requirements to reach the home. This is because the distance from the main fibre optic cable to the dwelling will typically be much greater than in built up towns (ie. Dwelling can be expected to be located further from the roadside and the node).

While the current activity of telecommunications industry is concentrated in the major East coast states and capital cities, a need for cablers and cable joiners to connect rural and remote households can be expected to create region-specific short to medium term skill shortages. In addition, the construction and especially the maintenance requirements for the NBN can be expected to place short to long term demands on the existing supply of telecommunications workers.

Even if the rural and remote locations use mobile, satellite or wireless networks the radical shift to a 12 Mbps connection will alter existing transmission infrastructure and user-side reception technologies. Whilst the impact on the demand for workers has not been accurately planned, there is difficulty meeting current demand (Woyzbun, et. al, 2006), let alone re-skilling the existing workforce to meet future needs (ie. Up-skilling electrical workers installing Foxtel or Austar subscription satellite or cable TV).

The success of the NBN now, and into the future, will be dependent on addressing the expected shortfall in the supply of skills in critical telecommunications occupations. A national approach is required to plan how the industry will attract new employees; or undertake to fill short term skill shortages through up-skilling, re-skilling and cross-skilling workers in other occupations (eg. IT, security, electro-technology). Given the nature of the workforce and the fact a high percentage are self-employed contractors, developing a strategy to address the supply of workers deemed competent in the required occupations and regions of Australia will be no small undertaking.

The demand on existing workers is an important consideration. No research could be found addressing the issues of not just providing competent workers to build and maintain the NBN, but to do so while existing infrastructure—particularly the terrestrial copper network—is phased out. The old infrastructure does not simply phase out overnight and NBN seamlessly take over. While new builds may be connected without the existence of old infrastructure the phase out of old infrastructure for next generation fibre will be slower in regional Australia. This will be due to:

- Lack of confidence or desire to use the new network (ACMA, August 2009: 5)
- The desire for a back-up contingency whereby power failure may cause the FTTP network to fail while copper will operate without power[12]
- Mobile telephony is not a consumer option or preference
- Lack of critical mass in user take up or volumes necessary to make connections more affordable
- NBN is implemented using existing overhead lines (ie. via telegraph poles instead of being buried)
- Phase out is slow due to lack of technical staff

All the above factors reinforce a major workforce planning pressure; the workforce will have an as yet to be defined period of time when dual networks operate. In effect the labour capacity planning on the supply side will require skills for both existing infrastructure **and** the NBN infrastructure. In cases where the NBN uses existing infrastructure the workers will need to be up-skilled in the new while still requiring the traditional competencies. As an example in Tasmanian the roll out of NBN uses overhead distribution which means the existing workforce needs more skills or any worker seeking to work on both networks must have fibre optic, electrical and traditional copper cabling and/or line technician competencies.

[12] All ONTs need 240 volt to operate. At the time of writing no plan is in place for back up batteries or a contingency plan should power failure occur and NBN be non-operational (Alcatel Lucent, 2009:5)

In workforce planning terms either the training budget has expanded and the available capacity to work on both networks proportionally reduced or a new workforce has to be engaged and trained proportional to labour demand. The reduced capacity occurs as the existing workforce, no matter how well trained, and has now to perform new tasks. For instance maintaining both copper telephony lines and FTTP.

The constraints affecting supply-side workforce capacity could stall the NBN or its adoption by businesses or the community. This can undermine the initiative and the economic value of the project for Australia.

The capacity to up-skill and re-skill the existing workforce and find new entrants to action NBN and advances in telecommunications is not a new problem. However, the above research and data suggest the scale of the potential problem would argue that NBN plans cannot be made in isolation from the workforce and training issues. This is not an incidental risk; especially given workforce requirements will impact key design and technology decisions.

8.2 Demand side – enabling consumers to access and participate in the digital economy

For the government to deliver the economic and social benefits from the NBN investment the VET system has to be able to respond to the massive increase in both traditional ICT 'user' skills, and skills for those working at the leading edge of the products and services enabled by high speed broadband. The skill demand is not just for those building the network or resulting products, it is also about the community being able to use the network on an equitable basis.

The NBN will accelerate the convergence of technologies and networks. High speed broadband permits multiple forms of transmission to occur through the same network, connecting to multiple technologies. It also means technologies traditionally dedicated to one function can be used to perform multiple functions. For instance a single computer on a FTTH connection can be used to view HDD TV, IP TV, make telephone and video calls, listen to music or watch high quality videos on demand.

The Australian Government has noted that expanding Australia's ICT skills base by promoting technology-focused VET, is important to ensure Australian businesses are ready and able to participate fully in the digital economy (DBCDE 2008, as cited in the Allen Consulting, *IBSA Environmental Scan* 2009:28).

A basic list of potential customer segments or users of the NBN includes the following:

1. Home users
    - Young people
    - Mature users/ Parents
    - Older citizens
2. Community and not-for-profit organisations
3. Small and home businesses
4. Medium and large businesses
5. Government organisations, especially schools and medical facilities (eg. hospitals)

It can be expected the NBN will affect different customer's current access and patterns of use in a variety of ways (See Table 15 below). As with digital economic activity, the ability to use the technology (digital literacy) and secure short term gains that are valued will affect the speed of adoption.

While outside the direct scope of this report it also has to be understood that the NBN is a two-way network. As such competition for products and services will be introduced into regional Australia where the lack of digital infrastructure had promoted many niched business offerings. Training business to not only leverage the commercial opportunity generated by the

NBN will also require tempering with the skills to better market, plan and run businesses reliant on the Internet or digital content.

Table 15: Key patterns of householder use of the Internet

Current home usage of the Internet	Likely new or improved services
Email	Video chat
Collaborative or social networking	Interactive conferencing, webinars
Online games	Media streaming or broadcasts
Basic application sharing	Simulation, interactive online games
Banking	Application sharing
News and sport	HD Digital video and audio sharing
Maps and direction	HD Digital videos on demand (streaming)
Instant messaging	Virtual spaces
Web-conferencing	Digital TV
Education	Synchronous, real-time virtual classrooms/ learning environments
Video and music sharing/downloading	IP TV
Chat groups	Telepresence
VOIP telephony	Video telephony
Online radio	Digital radio

(Current listings based on AMCA, 2008: 50)

8.3 The Importance of innovation

Innovation drives economic and business growth. The importance of innovation sits at the heart of how IBSA seeks to assist Australia build a flexible, innovative and adaptable workforce. IBSA states it can do this by:

> … broadening the focus from skills development to capability building and considering the requirements for innovative capability and leadership in the development of training products. (Blueprint, Cited in Wong 2009:4)

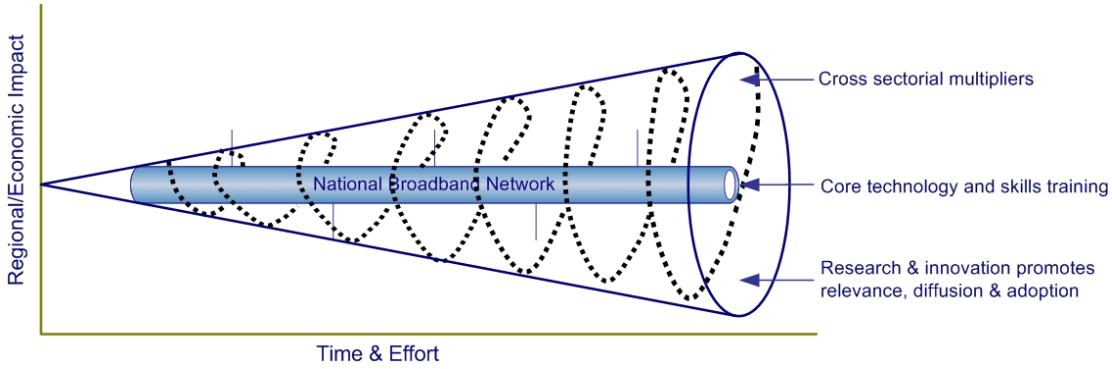
The NBN provides a platform for significant innovation. This innovation can be leveraged to promote use of broadband and related technologies to achieve workforce and industry outcomes.

IBSA can monitor and diffuse innovations to promote positive outcomes for their stakeholders. Such effort could include:

- Identifying innovative VET products and services that can use the NBN as a 'channel to market'
- Promoting education-related activities that can use the NBN to encouraging new industries/ businesses to locate in regions
- Using wireless transmission systems off a FTTH connect to create wireless precincts for tourist spots and industrial clusters, or to connect residences not able to secure FTTH
- Promoting VET activities that can grow existing VET markets
- Using broadband to stimulate industries within IBSA's portfolio
- Identifying and accelerating dissemination of information through case studies on innovative practices enabled by broadband access to the digital economy
- Promoting collaborative endeavours

- Confirming innovative ways to access global markets for enhanced VET products and services

Figure 12: Prompting innovation to stimulate critical mass and economic multipliers in regional Australia



By promoting innovation associated with the NBN IBSA can not only improve the ability of its stakeholders to derive benefit from the network, they can improve the cost and quality of VET products and services available to businesses, especially small businesses.

9. Confirm opportunities and possible partnership options

9.1 Snap shot of NBN process and IBSA's position

A consistent theme in this research report has been the need for IBSA to engage at a systems level. The roll out of the NBN is accentuating wider telecommunications industry skilling needs occurring as the digital economy accelerates technology and network convergence. More importantly the planning for the NBN seems to be occurring in a vacuum of robust data on the workforce planning and training needs. Remediating this situation is an opportunity for IBSA to fulfil it charter while making a substantive contribution to national outcomes.

However, there is still much data we do not have on the NBN.

The first is the exact build. Even as this report is completed the NBNCo tendered for FTTP work requesting a Gigabit Passive Optical Networks (GPON) broadband service model. Chief Executive Officer Mike Quigley confirmed the main build configuration will be based on GPON or a Layer 2 model (Quigley, 2009). GPON is based on a shared fibre from the central network running out to a local splitter that then runs off to serve 32 to 64 homes. The alternative was point-to-point, a dedicated, direct fibre connection to the home from the local splitter. Different vendors and experts promoted different models. The GPON approach has its critics. The Cisco Australia Chief Technology Officer, Kevin Bloch effectively condemned the model as a minimalist approach (Colley, 2009). The concern being the GPON approach will be more labour intensive in the build phase, link the supply to one home with other homes, make later delivery of services harder and more reliant on the service providers and home owner investing in configuring and maintaining future services (eg. to achieve Layer 3).

While it is not the place of this report or IBSA to comment on the technology in the NBN build all such decisions affect skill demand and training needs. For instance GPON has less electronics in the network and costs less to build and therefore to access. But it accentuates some skill needs. The NBN will not be 'plug and play'. It will certainly require householders to have more skills to connect, configure and maintain connectivity between different technologies, and between these technologies and the Internet via the FTTP. It will affect how services are bundled. The construction will require more connections on the cable the further it extends from the splitter or the node. This has implications for the time to build and labour capacity planning in regional Australia.

A second unknown is the affect the NBN will have on IBSA industries that supply digital content (eg. Multimedia, e-learning, digital games development, film, screen, entertainment, IT, banking, ebusiness, etc.). Just because the 100 Mbps speed is possible, it may not always be achieved. This is due to:

- Inherently network connection speeds (eg. both upload and download) will vary contingent on infrastructure;
- Speeds will vary over the same network contingent on the users technology and the applications being used;
- Servers and services on the Internet will often set slower speeds to suite their infrastructure, capabilities, advertising or business model; and
- Content owners licensing arrangements may seek to preserve lower quality online product offerings (eg. Owners of photographic images wishing to sell high quality books rather than individual images over the Internet).

A third unknown is the likely price to connect to the network. Early suggestions are that just having NBNCo wholesale FTTH will not guarantee the attractiveness of prices charged. The prices will not just be for the connection. Prices will involve the retail company providing the connection to the home (The Network Services Provider), the retailer of Internet access (Internet Service Provider), and/or firms supplying applications consumers may use (Applications Services Providers).

No information is available as to what the retail price will be to access the NBN in different locations. The pricing profile will need to cover:

- Access charge
- Data usage charges (charge for volume of data download and upload per month)
- Other services (eg. Storage of data)

The cost of data will be as critical as the monthly access fee. As speeds increase so will the amount of data used by a home within a given billing period.

It is also likely providers will bundle services with Internet access and charges for other applications such as IP TV, IP telephony and other possible FTTH services that can replace services using older technologies (eg. Cable TV, home terrestrial phone lines, security services, subscription services). Bundled offerings have no comparable pricing benchmarks in the existing marketplace.

It is also noteworthy that the best predictions suggest the NBN and the wireless and satellite networks will still only reach 90-95% of Australian homes. As with existing networks some homes are too remote or located in a terrain where neither terrestrial nor other broadband solutions (eg. Satellite) are effective in terms of cost or quality.

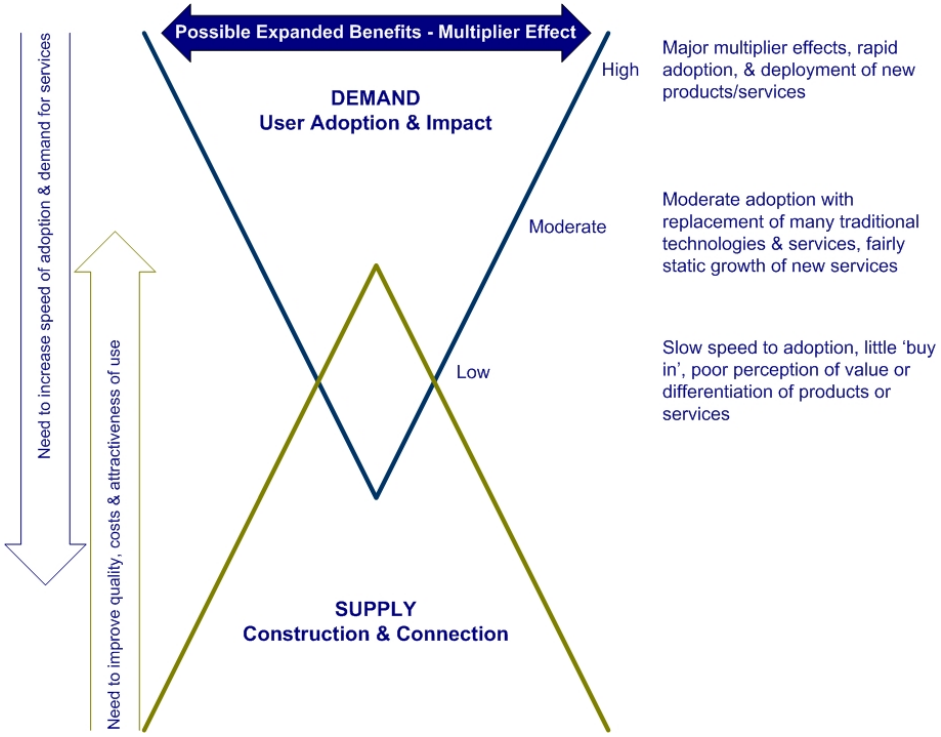
A fourth unknown that IBSA will need to consider is the quality of service issues. No information is available on the quality of service (QoS) the Network Service Providers will be expect to provide to homes, or to businesses connected to the NBN.

Many businesses are critically dependent on their information and communications infrastructure, collectively spending many millions each year on 24 x 7 security, data backup and storage, monitoring, and redundant systems in case of disaster. It seems unthinkable that they would accept their NBN-related services being installed by technicians not regulated or certified in any manner. Certification and regulation of NBN service providers could be managed in parallel with the training and assessment services provided under the national VET system.

However this need does not stop with large businesses. The integrity of Australia's economy and communication systems will critically depend on the effective performance of this work. The opportunities and innovations that will flow from the NBN will depend on decentralisation of activities to people and centres that may not have been important before. For example, people telecommuting (working from home) rather than travelling to offices, or collaborating on medical diagnoses for patients in remote communities. The security, integrity, and reliability of the NBN will deeply influence the ability of Australian businesses and communities to generate value and benefits from it.

The unknowns create uncertainty in both the labour market and training marketplace. IBSA needs to contribute to national workforce and training plans but also needs clarity on some major issues that will affect the rate of adoption. This will impact any forecasts for telecommunications workers and resulting workforce capacity planning. As depicted in Figure 13 below the derived economic, regional benefits and social multipliers will essentially rest on how well the construction and connection of the NBN accelerates demand.

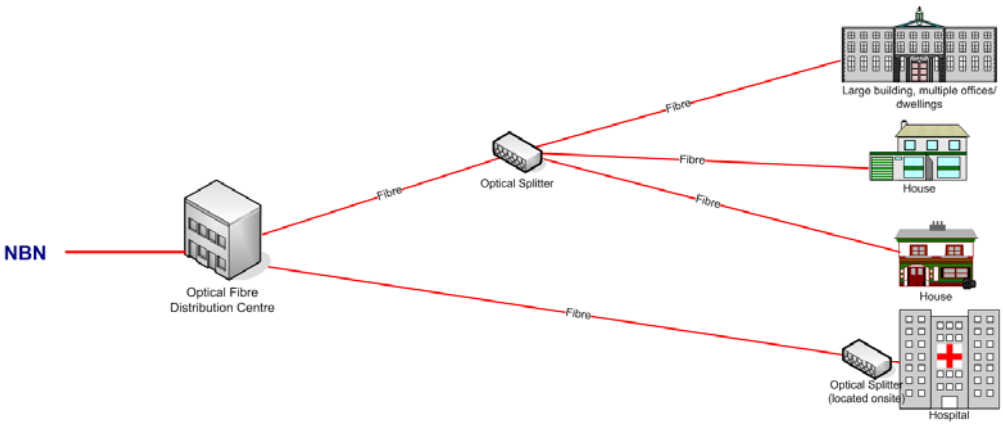
Figure 13: Enhancing demand to accelerate expected economic multipliers



9.2 What registration role can IBSA play, if any?

IBSA's role is national. Given earlier evidence that the NBN will have a 'disruptive' impact on both the labour market and training market through demand for skills IBSA should focus on relationships that add critical mass to any systems-level response. Examining the NBN context promotes a systems-wide view of the Australian telecommunications regulatory players and the main stakeholders. The following image merges the earlier stakeholder analysis with the overall stages of a supply chain for the NBN.

Figure 14: Possible IBSA stakeholders and partners at stages in the NBN supply chain



	Design, Regulation & National Planning	Build and Maintain Network	Connect Customers	Quality of Service
Workforce Planning & Reporting	DCBDE NBNCo DEEWR NECA CommsAlliance Major employers SETEL	NBNCo State NBNCo (eg TasNBNCo) Telcos Network Service Providers	Telcos ISPs Cablers & contractor representative bodies Resellers	DBCDE ATUG Telcos ISPs ASPs
Certifying Competence	ACMA NBNCo	Existing Cable Registration Service providers EE-Oz IBSA	Regulation of providers & Assessors: ACMA AQTF	Regulation of workers ACMA Electrical Licensing Bodies

(After DBCDE, May 2009:2; Bowles, March 2009)

The opportunity exists for IBSA and EE-Oz to work collaboratively to present ACMA, DBCDE and other stakeholders with a more robust workforce plan and a skills ‘safety net’; assuring certified workers with an agreed standard of competence are available to connect premises.

Further this role can value add in the areas where skill sets linked to regulatory or licensing requirements can be mapped to and credit towards a formal qualification.

As with bodies such as the FTTH Council in the USA (http://www.ftthcouncil.org/en) Certification of Service Providers assures both the skills of the person connecting the optical fibre cables from the Node and the telecommunications operator's switching equipment to the home or business. In major America and Sweden FTTH rollouts the regulators specify the quality requirements but the state and/or endorsed training centres ‘police’ the standards for assessors and trainers, and manage the competency certification reporting process.

As proposed the certification of an ‘NBN service provider’ is not just about regulatory compliance. It is about reinforcing competence and Quality of Service. This means the connection will be capable of operating to a standard and will be ‘fit for purpose’ in terms of carrying telecommunications traffic from one or more service providers, one or more types of applications (for example internet access, telephony and/or IP television), to one or more subscribers using standard equipment and technologies they have in their homes (eg. a digital TV, a computer, etc.).

Initially the ACMA provided a licensing regime under an Austel licence for those that were required to work on the Telecommunications Network. This was changed to the CPR. CPR is a competency and module based system. It is designed to cover a pathway for telecommunications workers and another for electrical workers who were required to be registered by ACMA. This was later extended to those requiring a registration for work in lifts, registration for fire monitoring installations, and a registration for security monitoring installations.

The use of competencies is preferred but not dictated. The cabling registration service providers either use existing competencies within IBSA (ICT02) or EE-Oz (UEE) or develop their own. They determine which competencies and modules were acceptable for registration purposes following the demise of the Austel licence system. At present ASIAL, FPAA, and BICSI use existing competencies rather than develop their own.

IBSA and EE-Oz are in liaison with the cabling registration service providers over inclusion of ICT02/ICT10 competencies. Such discussions will extend to include competencies in the new updated ICT10 Integrated Telecommunications Training Package. IBSA has initiated a project and is working in conjunction with EE-Oz to ensure changes in Training Package updates are incorporated in the *Pathways to ACMA Cabling Provider Rules Cabler Registration* document (ACMA June 2009). This document will then be provided to ACMA for final endorsement before it is released to the 5 Registrars, then Registered Training Organisations (RTO), and finally to stakeholders as the endorsed document for those seeking restricted and open registration.

The registration system can be improved. The following observations are noted:

- ACMA is a regulatory body. Its role is distinct to an Industry Skills Council. Together IBSA and EE-Oz can add value to ACMA's role and responsibilities.
- IBSA is updating the ICT02 Training Package. IBSA has the opportunity in this process to establish skill sets that can support the next generation requirements of telecommunication workers on the NBN.
- More consistent, formal and systematic processes for certifying competence must be developed to deal with the volume of workers the NBN will require.
- More formal and systematic quality assurance processes need to be in place to regulate training or assessment that results in certification of a service provider (anecdotal evidence suggests quality of training and of trainers varies enormously. A quick survey of 6 'certified' providers of courses for people seeking the same cabler registration extended from 3 days to 3 weeks full time equivalent; pre-requisite competencies varied or were not listed; and only 2 of the 6 providers confirmed where the staff involved held TAA competencies).
- Certification and competency requirements should be investigated to establish requirements beyond current network service provider boundaries to include in-home/consumer side connection and related QoS issues.

9.3 Digital literacy

Encompassing the issue of skilling users of the NBN is the issue of digital literacy. This concerns skilling Australians of all ages to be able to participate in the digital economy.

Currently ATUG have picked up on the Australian Government's education revolution and social justice agenda. A central part of that platform is to improve the digital literacy of Australians and close the 'digital divide'.

On the demand side of the NBN marketplace the digital literacy or 'user skills' is an area where IBSA can partner with ATUG to introduce, consolidate and improve access of users to competencies associated with use of broadband networks and associated applications.

In early 2009 IBSA completed the Report into making ICT-related Training Packages more flexible and relevant to young people (Bowles & Wilson, March 2009). It provided commentary and the data to support how national approaches to ICT education and training should be reformed to accommodate young people. This was again reinforced in the IBSA Stage 1 Scoping review of the ICA05 IT Training Package were national consultation stressed the critical importance of skill sets for the 'essential skills' in not only 'IT user skills', but also 'New media and content creation'; 'Internet technology and social networking' and 'Wireless and VoIP' (IBSA, 16 December 2009:70-72).

Coupled with past Australian Government efforts to accelerate business participation in the digital economy (for instance the Australian Electronic Commerce Centre) and current "Digital Education Revolution" policy initiatives (See the earlier section 'NBN and Education'), successful implementation requires foundation skills and enabling centres. The recent investment in the Centre for Telecommunications and Information Engineering (Ctie), confirms the Government's desire to establish collaborative centres able to span "cultural institutions,

organisations in health, the environment, government and key industry sectors, and provides professional training courses" (http://www.ctie.monash.edu.au/ctie_home.htm).

9.4 Connecting vocational skill demand with training

IBSA can lead effort to link broadband users with providers of appropriate, recognised training. This could be achieved by becoming the recognised centre of competence for skilling telecommunication workers and broadband users. This role would include promoting innovation that creates the critical mass necessary to ensure the NBN grows the telecommunications industry and benefits other industries within IBSA's portfolio.

9.5 Targeting and coordinating micro-business and contractor training

ABS defines micro-business as less than 5 employees. But in the telecommunications industry the standard seems comparable with other industries where over half the businesses are owner operated with no staff[13].

This raises the opportunity for IBSA to strategise and work with national bodies and funding mechanisms to assist:

- Balance the need for qualifications with just-in-time, on-time training
- Lack of time to navigate or apply for government incentives
- Need to learn in blended modes with an emphasis on workplace application
- Coordinate and consolidate demand to create critical mass in locations or in specific occupations or qualifications
- Balance hard edge technical skills with business management
- Advance appropriate learning and assessment strategies and resources

[13] Mitchell reported in 2006 that micro businesses with an operator but no staff represent 56.3% of all small businesses and 7% (715,000) of the national workforce (Mitchell, 2006:7)

10. Acronyms

ABS	Australian Bureau of Statistics (http://www.abs.gov.au)
ACMA	Australian Media and Communications Authority
ACS	Australian Computer Society (www.acs.org.au)
ADTIA	Australian Digital Television Industry Association (http://adtia.asn.au)
ANZSCO	Australian and New Zealand Standard Classification of Occupations (version 2006)
ANZSIC	Australian and New Zealand Standard Industry Classification
AQF	Australian Qualifications Framework (http://www.aqf.edu.au/)
AQTF	Australian Quality Training Framework
ATUG	Australian Telecommunications Users
AVETMISS	Australian Vocational Education & Training Management Information Statistical Standards
CEPU	Communications Electrical and Plumbing Union
CPD	continuing professional and development
CPR	Cabling Provider Rules
COAG	Council of Australian Governments (http://www.coag.gov.au/)
DBCDE	Department of Broadband, Communication and the Digital Economy
DEEWR	Department of Education, Employment and Workplace Relations (www.deewr.gov.au)
EE-OZ	ElectroComms and Energy Utilities Industry Skills Council Ltd
ERTOA	Enterprise RTO Association
ETAG	E-Commerce & Telecommunications Advisory Group
FTTH	Fibre-to-the-home
HDD TV	High Definition Television
ICT	Information and Communications Technology
ISC	Industry Skills Council
IBSA	Innovation and Business Skills Australia (http://www.ibsa.org.au)
IT	Information Technology
NBNCo	National Broadband Network Corporation
NCVER	National Centre for Vocational Education Research (http://www.ncver.edu.au/)
NECA	National Electrical and Communications Association
NQC	National Quality Council
NBN	National Broadband Network (http://www.dbcde.gov.au/funding_and_programs/national_broadband_network)
NSP	Network Service Provider
ONT	Optical Network Termination
GPON	Gigabit Passive Optical Networks
RTO	Registered Training Organisation
VET	Vocational Education and Training

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12. Attachments

Attachment 1: Ramsden Letter

A Howard Government legacy could frustrate delivery of NBN's 100 Mb/s broadband within the customer premises

When the NBN's 100 Mb/s broadband service reaches the customer's premises, it changes from an optical signal to an electronic signal in the ONT (customer's optical network termination unit). From this ONT, "triple play" broadband services are distributed within the premises using data cabling (structured category 5/6 cable) and coaxial cabling. If this high performance cabling is not installed correctly and tested for this performance, the customer will not benefit from the full bandwidth of the NBN broadband delivery.

All such cabling on the customer's side of the network boundary (ONT) is subject to the regulations arising from the Telecommunications Act and administered by the ACMA (Australian Communications and Media Authority).

In order to ensure such cabling is safe and doesn't adversely affect the telecommunications network, the ACMA has made mandatory that the cabling installer hold a Restricted or Open Registration (previously called an Austel Licence). In order to obtain such a registration, the cabler must meet certain national competency standards and apply for the registration with one of the five ACMA Registrars.

For a short space of time, (1995 to 1997), the ACMA also mandated that a cabler who installs high performance cabling such as structured data cabling or coaxial cabling, must hold additional national competency standards relating to this high performance cabling. The cabler could register these high performance cabling competencies with an ACMA registrar and these were noted as specialist endorsements on the cabler's registration card.

Under the Howard Government, the ACMA **ditched these additional mandatory** requirements which ensure quality for high performance cabling on the customer premises.

Presumably the Howard Government considered this a financial imposition on business as it sought to minimise regulation of industry. The ACMA by lowering the mandatory standard required of customer premises cabling has left customer cabling performance set at **a level appropriate to basic telephony as installed 50 years ago**. This leaves the customer with no guarantee that the performance of the distribution cabling within the premises will support the full bandwidth of the NBN's 100 Mb/s service.

A close reading of the Telecommunications Act (pre-amble) makes it clear that the Act indeed is intended to embrace performance and quality in its implementation. It would be a great shame if this national telecommunications project of immense proportions and cost was frustrated at the end users premises because the ACMA fails to "raise the bar" and mandate that cablers hold performance endorsements on their Registration. If they did "raise the bar", there would be some guarantee that the cabling performance of customer cabling smoothly interfaces with the NBN delivery maintaining the high speed bandwidth to the end users' devices.

Bevan Ramsden
BE(Elec), Dip Ed, TITAB Registered Assessor; Open Registration plus endorsements

Attachment 2: Industry Research

The following table shows the age demographic for the IT workforce.

Table 16: Telecommunications employment by relevant occupation (ANZSCO 2006) and age

Age Demography of ICT - Telecommunications Workers

ANZSCO Job-Type	% 40 & Over	%55 & Over	Grand Total	Median Age
3420 Electronics and Telecommunications Trade Workers (nfd)	100.0%	48.3%	1,045	53.54
3132 Telecommunications Technical Specialists	87.2%	0.0%	3,954	45.26
3124 Electronic Engineering Draftspersons and Technicians	64.4%	23.7%	8,247	44.23
3423 Electronics Trades Workers	49.3%	12.7%	41,025	39.31
3424 Telecommunications Trades Workers	47.7%	6.3%	13,957	39.12

(Source: ACS 2009, based on ABS Labour Market Statistics, February 2009 and CIIER estimates)

Table 17: Business use of Information Technology, selected indicators by employment size, 2007-08

	Estimated number of businesses	Businesses with Internet access	Businesses with web presence	Businesses with Internet access and broadband as main type of Internet connection	Businesses which placed orders via the Internet or web	Businesses which received orders via the Internet or web
	'000	%	%	%	%	%
Employment size						
0–4 persons	451	82.8	26.8	92.2	36.9	20.5
5–19 persons	197	92.3	48.3	95.4	50.5	28.6
20–199 persons	60	97.5	65.4	95.9	59.3	31.6
200 or more persons	3	99.3	95.8	99.6	70.7	28.6

(Source: Summary of IT Use and Innovation in Australian Business, 2007-08, ABS 25/06/2009)

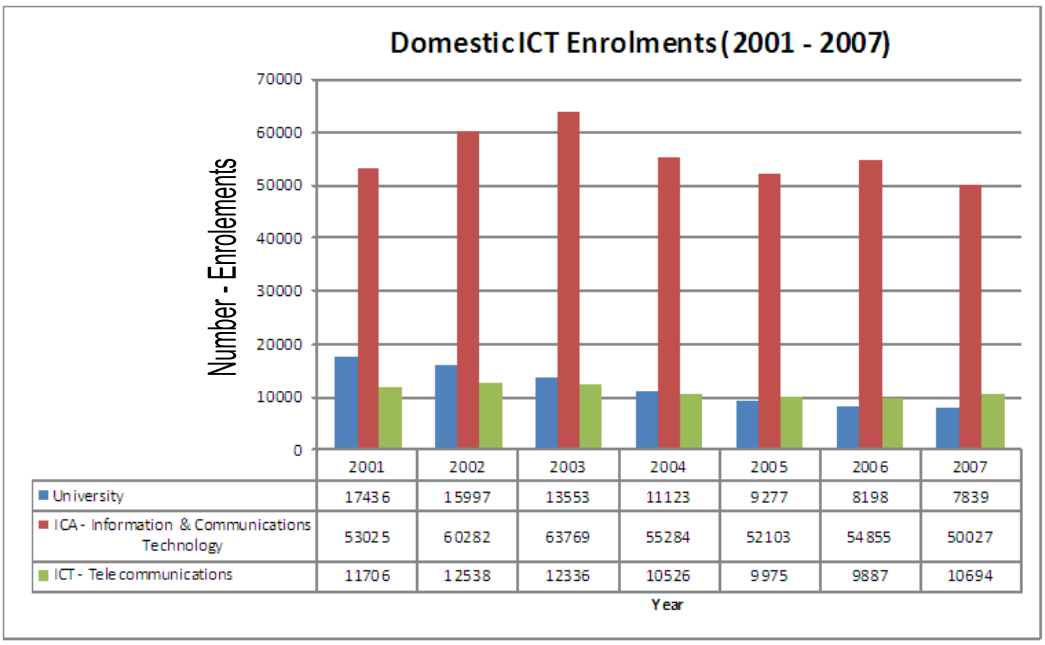
Table 18: Business use of Information Technology, selected indicators by industry, 2007-08

	Estimated number of businesses	Businesses with Internet access	Businesses with web presence	Businesses with Internet access and broadband as main type of Internet connection	Businesses which placed orders via the Internet or web	Businesses which received orders via the Internet or web
	'000	%	%	%	%	%
Industry						
Mining	3	92.5	47.7	97.5	45.6	13.9
Manufacturing	53	89.3	45.7	93.4	46.2	37.6
Electricity, Gas, Water and Waste Services	3	86.6	32.5	91.8	33.8	22.7
Construction	126	83.8	14.7	94.0	29.9	19.2
Wholesale Trade	41	93.6	52.9	96.2	49.7	39.6
Retail Trade	79	81.8	40.0	92.4	48.0	31.5
Accommodation and Food Services	52	71.1	37.3	91.6	32.8	16.7
Transport, Postal and Warehousing	40	76.0	17.7	91.6	28.0	17.2
Information Media and Telecommunications	7	97.8	62.4	96.7	61.4	41.1
Financial and Insurance Services	22	98.1	47.8	98.7	50.2	19.1
Rental, Hiring and Real Estate Services	31	85.4	51.6	95.6	50.7	24.1
Professional, Scientific and Technical Services	109	98.1	51.1	93.8	60.0	25.8
Administrative and Support Services	35	92.3	37.5	93.4	42.8	22.1
Health Care and Social Assistance	52	88.6	26.4	94.8	39.2	11.3
Arts and Recreation Services	13	91.7	51.5	90.7	50.9	23.8
Other Services	45	80.5	29.2	88.4	31.6	16.6
Total	**711**	**86.8**	**36.3**	**93.5**	**42.7**	**23.7**

(Source: Summary of IT Use and Innovation in Australian Business, 2007-08, ABS 25/06/2009)

Attachment 3: ICT Training Package data

Figure 15: Australian domestic enrolments in ICT 2001-2007



Source: ACS 2009 (based on DEEWR 2007 and NCVER data)

Note: The NCVER data (on ICA / ICT enrolments) is limited to publicly funded Vocational Education and Training (VET) activity. The private VET training market is also substantial. NCVER indicated in 2005 that it was approximately the same size as the publicly funded VET market (ACS 2009).

Figure 16: Course enrolments in ICT training package qualifications, 2002-2008

Qualifications	2002	2003	2004	2005	2006	2007	2008
ICT20102 - Certificate II in Customer Contact	0	100	518	512	274	277	110
ICT20197 - Certificate II in Telecommunications	301	288	204	5	20	0	0
ICT20202 - Certificate II in Telecommunications	0	10	176	431	300	178	300
ICT20297 - Certificate II in Telecommunications (Cabling)	359	518	186	14	0	0	0
ICT20302 - Certificate II in Telecommunications Cabling	0	0	149	203	249	280	180
ICT20399 - Certificate II in Telecommunications (CAN)	59	38	1	0	0	0	0
ICT20402 - Certificate II in Telecommunications Access Network	0	0	0	2	4	1	0
ICT20499 - Certificate II in Telecommunications (Call Centres)	1,771	1,442	135	3	3	0	0
ICT30102 - Certificate III in Customer Contact	0	312	4,543	6,618	6,977	7,488	9,914
ICT30197 - Certificate III in Telecommunications	472	608	142	2	0	0	0
ICT30202 - Certificate III in Telecommunications	0	14	132	229	531	900	641
ICT30297 - Certificate III in Telecommunications (CPE)	1	1	0	0	0	0	0
ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment	0	0	58	148	38	18	13
ICT30397 - Certificate III in Telecommunications (CAN)	18	1	0	0	0	0	0
ICT30497 - Certificate III in Telecommunications (Cabling)	354	239	161	7	0	0	0
ICT30599 - Certificate III in Telecommunications (Call Centres)	6,998	6,903	2,709	307	29	0	0
ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipmen	18	0	0	0	0	0	0
ICT40102 - Certificate IV in Customer Contact	0	21	347	1,048	1,172	1,227	1,053
ICT40197 - Certificate IV in Telecommunications	174	27	5	2	0	0	0
ICT40202 - Certificate IV in Telecommunications Engineering	0	71	78	87	83	142	86
ICT40302 - Certificate IV in Telecommunications Computer Systems	0	0	0	0	0	0	2
ICT40599 - Certificate IV in Telecommunications (Call Centres)	1,828	1,391	745	169	5	1	0
ICT50102 - Diploma of Customer Contact Leadership	0	0	1	0	0	0	3
ICT50197 - Diploma of Telecommunications Engineering	86	91	33	7	0	0	0
ICT50202 - Diploma of Telecommunications Engineering	0	27	67	73	61	56	94
ICT50302 - Diploma of Telecommunications Computer Systems	0	0	0	0	0	3	10
ICT50402 - Diploma of Telecommunications Photonics	0	0	0	0	6	3	1
ICT60102 - Advanced Diploma of Customer Contact Management	0	10	1	2	0	0	0
ICT60197 - Advanced Diploma of Telecommunications Engineering	99	168	34	2	0	0	0
ICT60202 - Advanced Diploma of Telecommunications Engineering	0	56	101	104	135	105	101
ICT60302 - Advanced Diploma of Telecommunications Computer Systems	0	0	0	0	0	15	15
TOTAL ICT - Telecommunications	**12,538**	**12,336**	**10,526**	**9,975**	**9,887**	**10,694**	**12,523**

Source: National VET provider collection, 2009

Figure 17: Course enrolments in ICT training package qualifications, 2002-2008

Qualification	2002	2003	2004	2005	2006	2007	2008
ICT20102 - Certificate II in Customer Contact	0	117	632	599	338	363	205
ICT20197 - Certificate II in Telecommunications	373	376	242	25	23	0	0
ICT20202 - Certificate II in Telecommunications	0	11	200	469	335	227	373
ICT20297 - Certificate II in Telecommunications (Cabling)	608	840	302	14	0	0	0
ICT20302 - Certificate II in Telecommunications Cabling	0	0	205	315	363	361	257
ICT20399 - Certificate II in Telecommunications (CAN)	59	38	1	0	0	0	0
ICT20402 - Certificate II in Telecommunications Access Network	0	0	0	2	4	1	0
ICT20499 - Certificate II in Telecommunications (Call Centres)	2,179	2,144	261	5	3	0	0
ICT30102 - Certificate III in Customer Contact	0	319	4,657	6,903	7,141	7,818	10,262
ICT30197 - Certificate III in Telecommunications	507	627	157	9	0	0	0
ICT30202 - Certificate III in Telecommunications	0	15	144	273	580	1,005	703
ICT30297 - Certificate III in Telecommunications (CPE)	1	1	0	0	0	0	0
ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment	0	0	60	155	41	21	46
ICT30397 - Certificate III in Telecommunications (CAN)	18	1	0	0	0	0	0
ICT30497 - Certificate III in Telecommunications (Cabling)	411	314	200	14	0	0	0
ICT30599 - Certificate III in Telecommunications (Call Centres)	7,439	7,484	2,942	321	33	0	0
ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipment	18	0	0	0	0	0	0
ICT40102 - Certificate IV in Customer Contact	0	21	350	1,059	1,163	1,345	1,082
ICT40197 - Certificate IV in Telecommunications	204	66	26	4	1	0	0
ICT40202 - Certificate IV in Telecommunications Engineering	0	76	84	101	105	173	199
ICT40302 - Certificate IV in Telecommunications Computer Systems	0	0	0	0	0	20	65
ICT40599 - Certificate IV in Telecommunications (Call Centres)	1,922	1,414	766	171	5	1	0
ICT50102 - Diploma of Customer Contact Leadership	0	0	1	0	0	2	10
ICT50197 - Diploma of Telecommunications Engineering	103	109	62	12	4	0	0
ICT50202 - Diploma of Telecommunications Engineering	0	30	74	81	91	76	175
ICT50302 - Diploma of Telecommunications Computer Systems	0	0	0	0	0	19	36
ICT50402 - Diploma of Telecommunications Photonics	0	0	0	0	8	5	2
ICT60102 - Advanced Diploma of Customer Contact Management	0	0	2	2	0	0	0
ICT60197 - Advanced Diploma of Telecommunications Engineering	99	185	29	2	0	0	0
ICT60202 - Advanced Diploma of Telecommunications Engineering	0	60	102	136	148	107	107
ICT60302 - Advanced Diploma of Telecommunications Computer Systems	0	0	0	0	0	16	23
TOTAL ICT - Telecommunications	**13,941**	**14,248**	**11,499**	**10,672**	**10,386**	**11,560**	**13,545**

Source: National VET provider collection, 2009

Figure 18: Qualifications completed in ICT training package qualifications, 2002-2008*

Qualification	2002	2003	2004	2005	2006	2007	2008
ICT20102 - Certificate II in Customer Contact	0	37	279	190	125	114	96
ICT20197 - Certificate II in Telecommunications	71	58	41	20	0	0	0
ICT20202 - Certificate II in Telecommunications	0	0	41	170	95	63	92
ICT20297 - Certificate II in Telecommunications (Cabling)	46	71	25	3	0	2	0
ICT20302 - Certificate II in Telecommunications Cabling	0	0	44	47	54	44	57
ICT20399 - Certificate II in Telecommunications (CAN)	40	11	0	0	0	0	0
ICT20402 - Certificate II in Telecommunications Access Network	0	0	0	0	3	1	0
ICT20499 - Certificate II in Telecommunications (Call Centres)	666	1,074	192	2	1	0	0
ICT30102 - Certificate III in Customer Contact	0	43	1,709	2,960	2,231	2,202	2,950
ICT30197 - Certificate III in Telecommunications	16	56	0	1	0	0	0
ICT30202 - Certificate III in Telecommunications	0	1	12	12	76	165	98
ICT30297 - Certificate III in Telecommunications (CPE)	0	1	0	0	0	0	0
ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment	0	0	1	17	4	5	6
ICT30397 - Certificate III in Telecommunications (CAN)	6	0	0	0	0	0	0
ICT30497 - Certificate III in Telecommunications (Cabling)	43	21	12	1	1	0	0
ICT30599 - Certificate III in Telecommunications (Call Centres)	2,237	2,520	1,372	216	20	0	0
ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipment	1	0	0	0	0	0	0
ICT40102 - Certificate IV in Customer Contact	0	1	141	501	296	478	372
ICT40197 - Certificate IV in Telecommunications	22	17	22	0	0	0	0
ICT40202 - Certificate IV in Telecommunications Engineering	0	17	15	21	28	42	15
ICT40302 - Certificate IV in Telecommunications Computer Systems	0	0	0	0	0	0	0
ICT40599 - Certificate IV in Telecommunications (Call Centres)	653	502	449	125	6	0	0
ICT50102 - Diploma of Customer Contact Leadership	0	0	0	0	0	0	0
ICT50197 - Diploma of Telecommunications Engineering	26	51	36	43	3	2	0
ICT50202 - Diploma of Telecommunications Engineering	0	9	15	25	23	13	20
ICT50302 - Diploma of Telecommunications Computer Systems	0	0	0	0	0	0	0
ICT50402 - Diploma of Telecommunications Photonics	0	0	0	0	0	0	0
ICT60102 - Advanced Diploma of Customer Contact Management	0	10	0	0	0	0	0
ICT60197 - Advanced Diploma of Telecommunications Engineering	19	81	24	1	0	0	0
ICT60202 - Advanced Diploma of Telecommunications Engineering	0	1	34	37	55	27	4
ICT60302 - Advanced Diploma of Telecommunications Computer Systems	0	0	0	0	0	17	1
TOTAL ICT - Telecommunications	**3,846**	**4,582**	**4,464**	**4,392**	**3,021**	**3,175**	**3,711**

Source: National VET provider collection, 2009

* Data for qualifications completed in 2008 is preliminary. The 2008 data will be updated in the 2009 VET Provider Statistics.