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STRATEGY & GOVERNANCE

What we know about skills matching in the ICT industry

New Zealand Government

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Executive Summary

This paper summarises the available information on skills matching in the information and communications technology (ICT) sector. It draws from statistics and research in the area, and from recent systematic discussions with representatives from the ICT sector and from tertiary providers. It does not address any policy implications.

The ICT sector is dynamic and growing fast, with employment increasing at nearly twice the rate per year as the economy as a whole between 2002 and 2012. Employers are increasingly demanding higher qualified people (an estimated 75 per cent of all ICT employment in 2012 required a degree or higher qualification); while demand for lower qualified people is decreasing. Wages in the ICT sector are higher than average.

Enrolments in degree level ICT courses have grown since 2008, and the past year has shown strong growth in the number of students completing qualifications at this level. Around 60 per cent of *enrolment* in information technology courses was at degree or higher levels in 2012 (this has increased from around 50 per cent in 2005). A considerable amount of this degree-level study is taken by students who are not majoring in information technology. The share of *qualification completions* in information technology at degree or higher levels in 2012 was only 30 per cent.

Given this fast growth, and the high rate of technological change in ICT, evidence shows that the ICT sector currently faces skills mismatches that could potentially limit the future growth of the sector. These mismatches go beyond insufficient supply of graduates, and relate to the quality of the skills available, and the ability of employers to retain and effectively utilise the skills that are available. Specifically, current information and recent engagement with the sector shows that:

- Employers find that graduates often lack critical non-technical skills – the types of skills that are also important for those involved in ICT start-ups. Many firms said there was a misperception about what a career in ICT involved, and that more was needed to be done to attract a wider range of students, including women, to the sector. ICT firms find it difficult to engage with the tertiary providers, which may reflect the relative youth of the sector.

- Employers also report increasing difficulties in recruiting managers and professionals with the right skills. ICT occupations are listed on the skills shortages lists, and the sector is making extensive use of work visas to address skills needs. Wages for ICT occupations have been increasing strongly since 2009.

- A high proportion of ICT graduates leave New Zealand after completing their study. At the degree level, 36 per cent of 2003 computer science graduates were abroad seven years after study and had been abroad for at least three years, compared to 23 per cent of all graduates.

- A relatively high proportion of ICT graduates do not work in ICT occupations. Those that do, earn substantially more than those which do not. This could be due to ICT firms cherry picking the more skilled graduates. It could also reflect a mismatch between the growing demand for degree and higher qualifications, and the traditionally high numbers of ICT graduates at below degree level. There is good evidence that young information technology graduates at certificate and diploma level have poorer employment outcomes than their peers in other fields of study.

Introduction

This paper uses a demand and supply framework to summarise the available information on ICT skills issues. It does not look to address the policy implications of these issues.

The focus is on the ICT skills that are demanded by firms in the ICT sector. In particular, the goal is to examine the extent to which the future skill needs of the ICT sector can be met by increasing the number of ICT graduates. Unfortunately, data limitations mean that it is often not possible to look solely at ICT skills employed in the ICT sector. Instead, what is often available is data on all the skills employed in the ICT sector (i.e. including non-ICT workers), or on all ICT workers/graduates (i.e. including those that do not work in the ICT sector). However, an improved understanding of the skills issues in the sector can be gained by looking across the various information sources and taking account of these definitional differences.

Demand for ICT Skills

ICT sector outgrowing NZ economy

Growth in the number of jobs in New Zealand's ICT Sector

	Number of jobs in Feb 2012	Compound annual growth rate 02-12	Compound annual growth rate 08-11	Annual growth rate 11-12
Computer System Design	22,350	5.2%	3.9%	7.9%
Other IT Services	6,795	-0.9%	-6.4%	0.7%
IT Wholesale	13,240	0.8%	0.1%	-2.1%
ICT manufactruing	4,855	0.9%	-2.0%	2.2%
Telecommunications	14,980	3.5%	1.9%	6.8%
Total ICT sector	62,220	2.6%	0.8%	4.1%
All industries	**1,926,580**	**1.4%**	**-0.7%**	**0.7%**

Source: Statistics NZ, Business Demography Statistics (2012)

This table shows that employment in the ICT sector grew at nearly twice the rate per year between 2002 and 2012 as the economy as a whole. It also outperformed the overall economy in the years following the global financial crisis (GFC) (i.e. 2008 to 2011). The computer system design sub-sector, which contains firms that develop software, comprises a little over a third of the ICT sector. Its employment has grown at almost four times the rate of the overall economy since 2002, and its growth was relatively unaffected by the GFC. The telecommunications industry has also outgrown the overall economy, although other parts of the ICT sector have underperformed.

Demand for ICT skills outgrowing other types of skills

The following table shows a similar pattern when looking at those working in ICT occupations. Between the March 2004 and 2013 years, employment in ICT occupations grew at nearly triple the rate of the increase in total employment. Strong growth in ICT occupations continued in the years following the GFC. ICT occupations that require a skill level commensurate with a degree or higher qualification, which made up around 75 per cent of ICT employment in 2012, typically had even higher growth rates. However, the other 25 per cent of ICT employment in less skilled occupations had far slower growth rates. Note, that these occupational estimates are partially based on 2006 Census data, and may not reflect changes in how sector employment is currently allocated across occupations.

Estimated growth in demand for ICT occupations

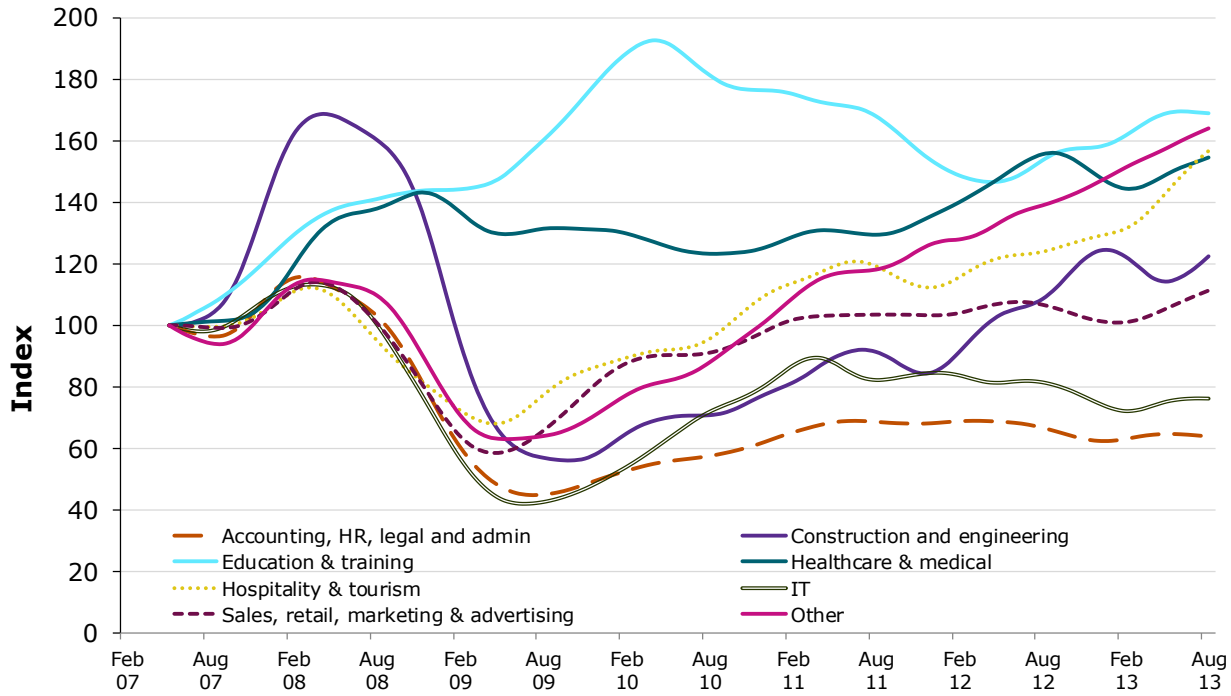
	Level of skill commensurate with	Number of workers on average over Mar 2013 year	CAGR Mar 04-13 years	CAGR Mar 08-11 years	CAGR Mar 11-13 years
ICT Managers	Degree or higher	6,309	5.9%	3.0%	6.4%
ICT Trainers	Degree or higher	1,305	5.4%	6.1%	2.1%
ICT Sales Professionals	Degree or higher	996	-7.8%	-6.4%	-9.6%
Web Designers	Degree or higher	756	4.4%	2.1%	2.8%
Electronics Engineers	Degree or higher	928	-2.2%	-1.2%	-2.3%
ICT Business & Systems Analysts	Degree or higher	9,659	4.9%	3.7%	4.5%
Multimedia Specialists & Web Developers	Degree or higher	1,425	6.8%	4.3%	4.3%
Software & Applications Programmers	Degree or higher	17,432	5.7%	3.5%	4.2%
Database & Systems Admin, & ICT Security	Degree or higher	6,254	3.8%	2.5%	1.4%
Computer Network Professionals	Degree or higher	3,135	5.0%	4.0%	3.0%
ICT Support & Test Engineers	Degree or higher	1,596	8.3%	3.4%	3.0%
Telecommunications Engineers	Degree or higher	1,482	7.0%	3.9%	0.8%
Electronic Engineering Draftspersons & Techs	Diploma	2,367	-1.0%	-1.6%	-3.0%
ICT Support Technicians	Diploma	9,864	2.6%	0.6%	1.5%
Telecommunications Technical Specialists	Diploma	108	0.5%	-0.3%	-2.3%
Electronics Trades Workers	Level 4	1,862	0.0%	-0.8%	-3.0%
Telecommunications Trades Workers	Level 4	2,558	-0.5%	-2.1%	-2.1%
ICT Sales Assistants	Level 1	157	2.5%	1.3%	1.0%
Total ICT workers	-	68,193	3.7%	2.1%	2.5%
Total workers - all industries	**-**	**2,218,350**	**1.3%**	**0.3%**	**0.6%**

Source: MBIE Detailed Employment Estimates, calculated from the HLFS, LEED and Census
CAGR = Compound annual growth rate.

Vacancies for jobs in information technology have lagged since the GFC

Jobs Online vacancy data shows that, although vacancies in the information technology sector have recovered since the global financial crisis, they have lagged other sectors with a flat trend since 2011. Note that the information from Jobs Online comes from two sources (TradeMe and Seek) and it may be that this is missing some demand for ICT workers that is not advertised on these sites. Vacancies are defined as information technology vacancies by employers; and this seems to result in data that generally represents ICT occupations across all industries.

Index of job vacancy growth in New Zealand, by sector



Source: MBIE, Jobs Online (2013)

Wage premiums exist for ICT skills, and they have been increasing since 2009

The recent ICT Sector report showed that average earnings in computer system design are around twice that of the New Zealand average, and increased at a faster rate between 2009 and 2011. However, while the following table – which uses a different set of statistics (sourced from tax data) – confirms the wage premium, it suggests that wages in the ICT sector have not increased at a faster rate than those for the overall economy since 2002. Note that these statistics could be affected by changes in the composition of jobs over time (i.e. changes in the skill composition, or in the proportion of employees working part-time).

Growth in average earnings in the ICT sector

	Average quarterly earnings per job over the March 2012 year	Compound annual growth rate 02-12	Compound annual growth rate 08-11	Annual growth rate 11-12
Computer System Design	21,365	2.2%	2.3%	2.8%
Telecommunications and Data Processing	21,438	3.2%	4.8%	2.2%
Total jobs - all industries	**12,875**	**3.9%**	**3.3%**	**3.2%**

Source: Statistics NZ, Linked Employer-Employee Data

A better approach is looking at changes in wage premiums for those working in ICT occupations. These are presented in the following table. They confirm the results from the ICT

sector report, with wage premiums increasing over recent years, after below average growth between 2007 and 2009.

Growth in median earnings in ICT occupations

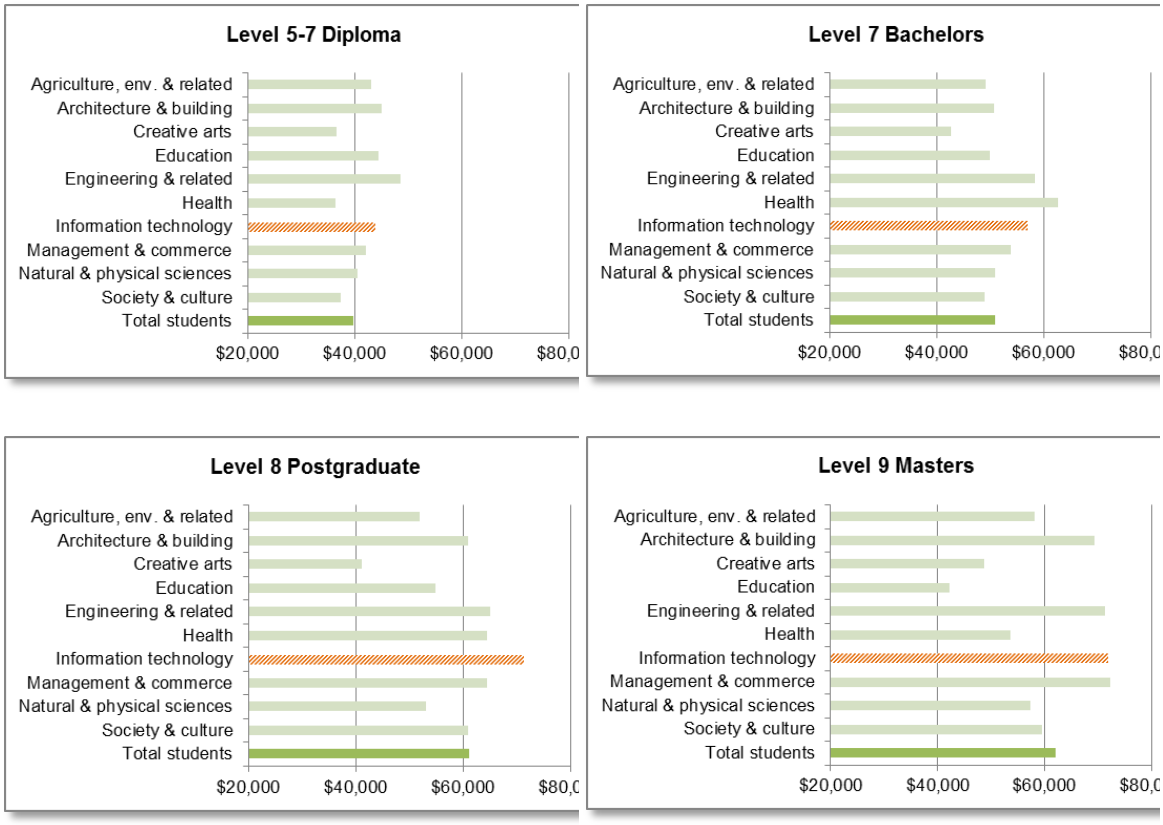
	Median hourly earnings per wage and salary employee (2009)	Compound annual growth rate 07-09	Median hourly earnings per wage and salary employee (2012)	Compound annual growth rate 10-12
Computing professionals	28.77	2.6%	not available	not available
ICT professionals	not available	not available	33.33	6.0%
Total - all professionals	26.89	3.7%	29.41	2.9%
Total - all occupations	**19.47**	**4.0%**	**20.83**	**2.1%**

Source: Statistics NZ, New Zealand Income Survey
The occupation classification changed between 2009 and 2010.

Wage premiums also exist for ICT graduates

Recent analysis by the Ministry of Education on what young people earn after completing their qualification shows that ICT graduates tend to earn more than average five years post-study. As the following diagrams show, wage premiums for ICT graduates increase in magnitude as the level of qualification increases.

Median earnings of young domestic completers five years after study



Source: Ministry of Education, Moving on up: What young people earn after their tertiary education (2013)

More detailed field of study results have only been published at the bachelors level. These show that five years after study graduates in computer science ranked 20th out of 54 fields with $55,870; graduates in information systems ranked 18th with $57,600 and graduates in

other information technology ranked 8th with $63,420. The overall median was $50,940 and the top three fields were medical: medical studies ($109,980), dental studies ($76,080) and pharmacy ($75,120).

A more recent Ministry of Education report[1] confirmed that young graduates in information technology at degree and higher levels have good employment outcomes compared to graduates in other fields of study. However, young people who completed below degree level qualifications in information technology (i.e. certificates and diplomas) have worse employment outcomes, in terms of employment rates and benefit receipt, than their peers in other fields of study – although if diploma completers were successful in gaining work, they then did go on to enjoy relatively high earnings.

As part of a 2013 study[2] on the Auckland labour market, comparisons were undertaken of job vacancies and qualifications completed in different fields. It found an undersupply of degree-level graduates in information technology, but a significant oversupply at diploma level.

These results confirm analysis undertaken in Occupation Outlook

There were four ICT occupations in the MBIE's first Occupation Outlook report. Web developers (combined with graphic designers), ICT business and systems analysts, and software developers were all seen as areas with strong job prospects. The lower skilled ICT and telecommunications technicians were seen as having middling prospects.

Supply of ICT Skills

Slow growth in graduate supply up to 2008, but now picking up

The following table summarises growth trends in the amount of domestic[3] tertiary study in information technology. From 2005 to 2008, equivalent full-time study units[4] (EFTS) enrolments fell in both absolute terms and in relation to overall tertiary enrolments. EFTS enrolments in information technology at degree level also fell during this period. However, since then there has been strong growth in the amount of degree level study in information technology, with average annual growth of 4.3 per cent per year between 2009 and 2011, and 9.0 per cent between 2011 and 2012.[5]

[1] Smyth, R (2013), Outcomes of Qualifications in Information Technology.
[2] Allpress J, (2013) The labour market and skills in Auckland
[3] I.e. this excludes international students.
[4] One equivalent full-time student unit is defined as the student workload that would normally be carried out in a single academic year (or a twelve-month period) by a student enrolled full-time.
[5] Auckland tertiary providers claim 10-12 per cent growth in recent years (see workshop section below).

Growth in study (EFTS enrolments) in Information Technology courses

	EFTS enrolled in 2005	EFTS enrolled in 2012	Compound annual growth rate 05-08	Compound annual growth rate 09-11	Compound annual growth rate 11-12
Information Technology					
Certificate L1-3	2,480	512	-12.0%	-8.0%	-62.7%
Certificate L4	400	670	13.8%	19.3%	-44.6%
Diplomas L5-6	2,200	2,610	0.9%	-0.9%	14.5%
Degree L7	4,440	5,310	-3.1%	4.3%	9.0%
Postgraduate L8-10	770	640	-3.6%	-6.1%	-4.5%
All EFTS in IT	**10,280**	**9,740**	**-3.4%**	**1.9%**	**-6.4%**
All fields of study					
Certificate L1-3	64,180	50,010	-5.1%	-4.6%	-1.9%
Certificate L4	33,260	29,690	-3.5%	-4.9%	1.1%
Diplomas L5-6	31,240	28,490	-0.4%	-5.0%	-4.4%
Degree L7	93,470	113,300	1.8%	2.6%	2.3%
Postgraduate L8-10	21,130	25,170	1.3%	1.2%	-0.7%
All EFTS	**243,290**	**246,640**	**-1.0%**	**-1.0%**	**0.2%**

Source: Ministry of Education, Education Counts

There has been a large decrease in information technology study at certificate levels 1-3 since 2005 and in level 4 certificates since 2011. This has helped shift the balance of EFTS enrolments to degree and higher, despite increases in diploma-level study and decreases in postgraduate-level study. The share of information technology EFTS enrolled at the degree or higher level has increased from 51 per cent in 2005 to 61 per cent in 2012.

However, the growth in the number of students *completing* degree level qualifications has been less than the growth in the amount of degree-level *EFTS enrolments*. [6] The share of information technology completions at the degree or higher level has actually decreased slightly from 32 per cent in 2005 to 29 per cent in 2012 – although growth in degree-level completions now seems to be picking up, with strong growth between 2011 and 2012.

Growth in number of students completing qualifications in Information Technology

	Completions in 2005	Completions in 2012	Compound annual growth rate 05-08	Compound annual growth rate 09-11	Compound annual growth rate 11-12
Information Technology					
Certificate L1-3	1,630	423	-16.7%	-13.0%	-60.9%
Certificate L4	306	1,107	29.3%	25.2%	-32.6%
Diplomas L5-6	1,351	2,032	5.1%	0.1%	7.8%
Degree L7	1,167	1,113	-11.1%	3.8%	25.2%
Postgraduate L8-10	389	327	-5.3%	-5.1%	-7.1%
All completions in IT	**4,843**	**5,002**	**-3.7%**	**2.4%**	**-14.5%**

Source: Ministry of Education, Tertiary Sector Performance Analysis team

The diverging growth between EFTS enrolments in information technology courses (in red) and the number of students completing qualifications (in green) scan be seen in the following diagram. The dashed line represents a count of students enrolled in information technology

[6] Comparisons of the number of EFTS enrolments and qualification completions need to take account of the length of the qualification (i.e. you would at best expect 1 completion per 3 EFTS for a 3-year full-time programme).

qualifications (i.e. it excludes study in information technology courses as part of non-information technology qualifications).

Growth (indexed to 1000) in domestic degree-level study in information technology; enrolments (EFTS) in courses vs. enrolments in qualifications vs. students completing qualifications

Source: Ministry of Education, Tertiary Sector Performance Analysis team

There are a number of potential reasons for the difference in trends between EFTS study (course enrolments) and students completing qualifications:

- It could be that there was a fall in qualification completion rates. However, although completion rates for information technology degree-level courses are below average, they actually rose between 2005 and 2012, from 69 to 79 per cent.[7]

- It could be that a growing share of enrolments consisted of students who do information technology courses as part of non-information technology qualifications. This type of enrolment is particularly prevalent at the degree-level. Around 48 per cent of 2005 EFTS enrolments in information technology courses at degree or higher level involved students undertaking non-information technology qualifications. This increased to around 50 per cent in 2007-08, before falling to 39 per cent in 2012.[8] This pattern is reflected in changes in the relationship over time in course-level enrolments (red) and qualification-level enrolments (dashed line) in the above diagram.

- Finally, it can take a few years, at degree level, for changes in the numbers of enrolments to be reflected in qualification completions. This seems to be the case here, with the increase from 2008 in enrolments in information technology qualifications (the dashed line) being followed by an increase in qualification completions from 2011.

[7] Across all fields of study at degree-level, the course completion rate went from 79 to 86 per cent over the same period. This data was supplied by the Ministry of Education's Tertiary Sector Performance Analysis team.

[8] This data was supplied by the Ministry of Education's Tertiary Sector Performance Analysis team.

A high proportion of ICT graduates do not stay in New Zealand and do not end up in ICT occupations

There is research that indicates that New Zealand may not be making the best use of ICT graduate skills, with many leaving the country or working outside ICT occupations.

MBIE's recent study[9] of migration patterns for people who graduated in 2003 found that, while bachelors and higher graduates in information systems left New Zealand at similar rates to other graduates, graduates in computer science left at above average rates. In fact at the postgraduate level, graduates in computer science were the most likely to be overseas seven years after graduation (42.4 per cent were out of New Zealand in 2010 and had been for at least three years). At the bachelors level, 35.8 per cent of computer science graduates were abroad seven years after study and had been for at least three years, compared to 22.7 per cent of all graduates. This high rate of emigration for computer science appears to be driven by the characteristics of the students who study the subject – they tend to be younger, male and to belong to ethnic groups who are more likely to leave New Zealand after graduation. This could indicate students choosing a field of study that makes it easier to go overseas after study.

A study[10] of graduate employment outcomes using 1996, 2001 and 2006 census data found that less than 40 per cent of people aged under 30 years with computer and information science qualifications (at all levels), held jobs in occupations related to their field of study (across all industries). This was lower than the overall figure of 60 per cent across all fields of study. The minority of young people who were working in occupations related to their computer and information science qualifications earned much higher incomes than those working in unrelated jobs (60 per cent higher in 2006, compared with an in-field premium of 20 per cent across all fields of study). There are several possible explanations for this pattern, including the selection of more able post-school graduates disproportionately into in-field jobs, or geographical mismatches between jobs and skills. It could also reflect a mismatch between the growing demand for degree and higher qualifications, and the traditionally high numbers of ICT graduates at below degree level.

These two pieces of research suggest that simply raising ICT graduates numbers across the board may not be sufficient to address the skills issues in the ICT sector.

Matching of ICT Skills

Given this fast growth, and the high rate of technological change in ICT, it would be surprising if this sector does not experience some problems acquiring the skills it needs. This section looks at the extent of skills mismatch in the industry.

[9] Papadopoulos, T (2012). Who Left, Who Returned and Who Was Still Away? Migration patterns of 2003 graduates, 2004–2010.

[10] Mare, D and Liang, Y (2006). Labour Market Outcomes for Young Graduates, Motu Working Paper 06–06. Unpublished tables using 2006 Census produced by the authors for the Department of Labour in 2008.

ICT recruitment difficulties increasing as the economy recovers

The ICT Sector report presented results from the latest Business Operations Survey. These showed that around half of firms in computer systems design report *some* difficulty recruiting managers and professionals in 2012, compared to only 20 per cent of all firms. The proportion of computer system design firms reporting *severe* difficulty rose from 12 to 20 per cent between 2011 and 2012, whereas this figure remained around 5 per cent across all firms. Very similar patterns were observed for technicians and associated professionals.

Recent Canterbury ICT Sector Workforce report provides useful information on firms views

The Canterbury Development Corporation (CDC) surveyed 62 Canterbury ICT firms in September 2012. The survey had a low response rate (20 per cent), and although respondents roughly reflected the demographics of ICT firms in Canterbury, it may be that ICT firms with particular skills issues were more likely to respond.

Half of respondents agreed that a lack of suitably skilled employees was the greatest challenge facing their firm. Of those firms that agreed:

- Around 50 per cent would lift wages
- Around 50 per cent would upskill employees
- Around 40 per cent would recruit overseas
- Around 30 per cent would use technology substitutes
- Around 25 per cent would outsource work
- Around 5 per cent would share employees

The most in-demand roles (e.g. programming and development, help desk & IT support, electronics engineering, sales and marketing) were not the ones that respondents thought were unlikely to be filled. Instead, it was more specialist roles (ICT architect, database/data warehousing, telecommunications) that they saw being the problem. It may be that these types of specialist roles are less able to be filled by new graduates.

Around 50 per cent of respondents agreed that tertiary institutions are not training people with the skills their organisation need. In terms of solutions:

- Around 75 per cent of respondents viewed better links with education institutions as a key strategy in overcoming skills shortage barriers
- While around 75 per cent of respondents indicated that the creation of more internships through local tertiary institutions is imperative or high value, only 30 per cent use it to recruit employees
- Around 55 per cent of respondents want to develop school campaigns to promote ICT careers.

Essential skills shortages list

Immigration NZ maintains a Long Term Skill Shortage List (LTSSL) which identifies those occupations where there is a sustained and on-going shortage, both globally and throughout New Zealand. The following table shows that most ICT occupations are on this list. Many ICT occupations are also on Australia's Skilled Occupation List and the United Kingdom's Tier 2 Shortage Occupation List.

The number of work visas approved for ICT occupations is an indicator of the extent of skills shortages in the sector.[11] The following table shows that, on average, there were around 4,000 work visas approved for ICT occupations per year over the past five years. This was around 7.7 per cent of the total number approved over this period, whereas ICT workers comprise only around 3.1 per cent of the total workforce. In other words, work visas are approximately 2.5 times more common in ICT occupations than in other occupations.[12]

Work and residence visas approved in ICT occupations

	On long-term essentials skills list?	Average annual number of **work** visas approved from 2008/09 to 2012/13	Average annual number of **skilled migrant** visas approved fromn 2008/09 to 2012/13	Average annual number of **work** visas approved as share of total w orkers in occupation	Average annual number of **skilled migrant** visas approved as share of total w orkers in occupation
ICT Managers	Yes	264	133	4.2%	2.1%
ICT Trainers	No	28	7	2.1%	0.6%
ICT Sales Professionals	No	114	47	11.5%	4.7%
Web Designers	Yes	36	13	4.8%	1.8%
Electronics Engineers	No	48	34	5.1%	3.6%
ICT Business & Systems Analysts	Yes	365	137	3.8%	1.4%
Multimedia Specialists & Web Developers	Yes	317	46	22.2%	3.3%
Softw are & Applications Programmers	Yes	1,073	356	6.2%	2.0%
Database & Systems Admin, & ICT Security	Yes	163	80	2.6%	1.3%
Computer Netw ork Professionals	Yes	207	91	6.6%	2.9%
ICT Support & Test Engineers	Yes	290	104	18.2%	6.5%
Telecommunications Engineers	Yes	94	43	6.3%	2.9%
Electronic Engineering Draftspersons & Techs	No	57	40	2.4%	1.7%
ICT Support Technicians	Yes	586	390	5.9%	4.0%
Telecommunications Technical Specialists	No	66	25	61.3%	23.4%
Electronics Trades Workers	No	67	43	3.6%	2.3%
Telecommunications Trades Workers	No	147	99	5.7%	3.9%
ICT Sales Assistants	No	13	0	8.4%	0.1%
Total ICT w orkers	-	3,934	1,689	5.8%	2.5%
Total workers - all industries	**-**	**50,977**	**10,345**	**2.3%**	**0.5%**

Source: Immigration NZ statistics, MBIE Detailed Employment Estimates

Over the past five years there was also an average of 1,700 skilled migrant visas approved per year (in terms of principal applicants) for people in ICT occupations. Note that around 5 per cent of these people were previously on work visas (i.e. there is a small degree of double counting between the two columns). The number of visas approved under both the work and skilled migrant categories need to be combined with flows from tertiary education when thinking about the supply of skills into the sector.

A review of the occupations listed on the LTSSL is scheduled to be completed by the end 2013. However, none of the occupations signalled for removal are ICT occupations.[13] This reflects

[11] In most cases, for a work visa to be approved to an overseas worker the occupation must be on the LTSSL or other shortage list, or the employer has demonstrated that they have been unable to successfully recruit a New Zealander.

[12] The high share for telecommunications technical specialists is likely due to the detailed employment modelling underestimating the size of the occupation.

[13] The review will recommend the removal of the occupation 'Project Manager (not elsewhere classified)' which has associated ICT related qualifications. This is in effect a double listing of the 'ICT Project Manager' occupation. The removal will correct an historical anomaly; ending the confusion caused by having two very similar occupations on the LTSSL.

Immigration NZ's view that these occupations are still in shortage. Unlike many other occupations on the LTSSL, ICT occupations are not generally subject to complaints from individuals or unions about their impact on New Zealand workers. One issue Immigration NZ has with ICT occupations is keeping the qualifications requirements up to date with the needs of a fast changing sector – this is addressed annually through the Technical Issues review that runs parallel to the review of occupations.

ICT Workshops on Skills Issues and the Innovation Precincts

Recently MBIE and the Tertiary Education Commission organised workshops and meetings with representatives of the ICT sector and tertiary providers in Auckland, Wellington and Christchurch on the possible role of ICT tertiary provision in the planned innovation precincts. The workshops were primarily organised to discuss the proposal to locate ICT tertiary education provision in the innovation precincts. The Minister of Tertiary Education, Skills and Employment has received a separate briefing on this topic dated September 16, 2013 (tracker no: S/13/00642 refers). As part of these discussions, the sector's views on their skills issues were canvassed.

Industry discussions

The firms involved in the workshops and interviews generally represented mid-size, fast growing ICT companies. Their views[14] therefore represent only a snapshot from some firms and not a comprehensive account from the sector. However, there was consistency in the views of workshop participants on underlying skills issues, and these views were also generally consistent with the preceding statistical analysis in this report.

All but one of the firms spoke of facing large skills constraints. Despite this, firms still tended to see labour costs in New Zealand as competitive with overseas. Firms appeared to use a combination of different strategies to deal with their skills issues:

- Import the skills from overseas
- Hire non-ICT graduates and teach them ICT skills
- Use internships and interaction with secondary schools to identify future employees

There was a strong consensus that engagement with tertiary providers was not working:

- Although there are isolated examples of good engagement, especially with polytechnics, in general firms saw a cultural disconnect; some described this as "a non-relationship" with tertiary providers.
- Most industry engagement with providers is driven by, and relies on, individuals and therefore lacks long term sustainability (e.g. if someone should change job).
- There were comments that the inability to influence the curriculum was a real issue
- Concerns were also raised about the difficulty in co-locating ICT research (e.g. lack of platforms being created, and one example of a firm approaching a university with a $2

[14] These results are based on discussions in Auckland and Wellington only.

million research grant and no one was willing to engage with them – they ended up working with an international university).

- Some commented that, in their experience, overseas universities were viewed as more accommodating and willing to partner than New Zealand universities.
- Some thought that incentives are wrong for tertiary education (e.g. PBRF incentivises esoteric research; the semester system and course structure out of sync with business cycle).
- However, one firm commented that the software/computer system design sector needed to grow more in size before it could successfully push for more engagement.

When discussing ICT graduates specifically, the discussion seemed to be less about numbers, and more about their quality, and the relevance of their qualifications:

- Given the high rate of technological change in the industry, non-technical skills and the ability to learn are often considered more important than technical knowledge.
- Most firms talked about the lack of non-technical skills in graduates, being some combination of entrepreneurial, business, management, non-cognitive, employability, and soft skills.
- Future ICT entrepreneurs and start-ups tend to come from ICT graduates. Business incubators highlighted skills (technical and leadership/softer skills) as a major constraint on ICT start-ups.
- However, this issue may be as much about the type of student. One firm thought that ICT traditionally attracted a particular type of student, but the sector has moved on and needs a wider set of skills and attributes.
- In response to this need Ensprial[15] is implementing finishing schools/boot camps for non-ICT graduates where they can learn technical skills. There will be a selection process based on soft skills.
- The low proportion of women, Maori and Pasifika studying ICT qualifications is a constraint on the pipeline.
- There may be a misperception about what a career in ICT entails (i.e. “that it’s about programming, instead of problem solving”), limiting the types of students who enter ICT study.
- There is a need to attract children through school to ICT as a career; perhaps by looking to educate their parents on the potential of the sector.
- Some firms passed on concerns from students about not learning the right skills at their tertiary provider.

Attracting the best ICT students to these growing New Zealand ICT firms can also be a challenge. Firms thought that they are more attracted to work at banks and insurance companies. One medium sized firm (currently one of New Zealand’s fastest growing companies) gave the example of a recent graduate day they attended at a university. Their stand got 5 students, another NZ IT services firm got 5 students, and Fonterra got 150.

[15] Enspiral is a network of ICT companies and professionals, with a Wellington co-working space.

Tertiary provider discussions

Finally, some points from discussions with Auckland tertiary providers:

- Recent 10-12 per cent p.a. growth in ICT student numbers, but given the overall 2 per cent cap they are running into infrastructure issues ("starting to blow out at the seams", "stage 3 class with 250 people")
- Being an open entry field, computer science students have a wide distribution of skills. The top are able to compete with the best in the world, but there is a very long tail.
- New Zealand high schools were generally seen to be a large constraint to the pipeline, although there was some acknowledgement that recent NCEA changes are a big positive in this regard.
- They have seen the need to provide a wider set of skills. One provides a 200 level entrepreneurial course, the other communications and business courses.
- The firms that they had the strongest engagement with were large firms, often multinationals (e.g. IBM, Microsoft, Orion).
- Unlike some other careers (e.g. engineering), ICT graduates do not need work experience for their qualifications.
- There are issues around the amount of time needed to get NZQA to approve new qualifications.

One tertiary provider commented that ICT postgraduates are not as valued in New Zealand as in other countries, and that some large New Zealand ICT firms do not take interns. However, as the following table shows, preliminary numbers from the Callaghan Innovation internship programme show that nearly half of postgraduate internments approved were ICT focused.

Proportion of Callaghan internships that are ICT focused

	Total Approved	ICT Focused	Percentage
R&D Student Grants: Postgraduate internships	71	32	45.0%
R&D Student Grants: Undergraduate internships	220	59	27.0%
Total	291	91	31%

Source: Callaghan Innovation