MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Advanced trade, technical and professional qualifications

Trends in supply

New Zealand Government

Beyond tertiary study

This report forms part of a series called Beyond tertiary study.
Other topics covered by the series include how graduates' earnings change over time, labour market outcomes, education and economic growth, and qualifications and income.

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1 KEY FINDINGS

- There is consistent evidence of an ongoing shortage of graduates in **engineering and related technologies**, **architecture** and **building.** The downturn in construction and manufacturing will reduce demand for these qualifications in the short term, but demand is likely to continue to increase in the medium to long term.

- Overall supply and demand appears reasonably well matched in **medical studies**, **nursing** and **health**. There are likely to be some specialist areas where demand has not been met and others where there is oversupply.

- There is also evidence of a shortage of graduates with postgraduate qualifications in **information technology** and bachelors and above in **accountancy**.

- The findings in this report support the view that increasing the number of people graduating with advanced trade, technical and professional qualifications is one part of the solution to addressing medium- to long-term skill shortages.

2 EXECUTIVE SUMMARY

During the period of steady economic growth from 2001 to 2007 there was increasing concern about the shortage of people with advanced trade, technical and professional qualifications. This was seen by the government as a priority to be addressed and was included in the Tertiary Education Strategy 2007-12. As the country moves through a period of global recession, this issue is by no means diminished. While short-term demand is less certain, demand for a more highly skilled workforce is likely to continue in the medium to long term. Also, the drivers of demand for people with advanced qualifications are not limited to economic conditions, but include the increased use of technology and demographically driven demand for health and social services.

This is the last in a series of three reports looking at advanced trade, technical and professional qualifications. The first report looked at skill demands within occupations and the qualifications held by the current workforce. It identified occupations that were experiencing ongoing skill shortage and required advanced-level qualifications. The second report looked further into the qualifications highlighted in the first report and made use of labour market data to see which ones may be in genuine shortage due to a lack of graduates.

This report uses recently developed data on tertiary education completions by field of specialisation to look at the trends in the supply of graduates in the areas highlighted in the earlier reports. It then presents estimates of how well the number of people who graduated from 2002 to 2009 was likely to have met demand from occupational growth and retirements. It also includes comments on the likely effect of inward migration in meeting shortages. However, outward migration is not covered due to lack of data.

This work aims to build the evidence for understanding which areas the tertiary education system could concentrate on more to address skill shortages. The relative supply of New Zealand graduates is just one part of the picture in terms of addressing skill shortages. It needs to be considered within the context of other factors, which include the quality and relevance of the content of qualifications, international supply of and demand for qualified people and the attractiveness of working in related occupations.

The analysis in this report confirms and modifies the conclusions of the first two reports.

The areas where there has been consistent evidence of a shortage of graduates are **engineering and related technologies**, **architecture** and **building**. Demand in these areas has been driven by strong economic activity, and also by increasing use of new technologies and a significant proportion of the existing workforce nearing retirement. Increases in supply have been restricted to below degree level and mostly achieved through industry training. Shortages at bachelors level and above appear to have been met by inward migration. While the downturn in the construction and manufacturing industries will ease demand in the short term, demand for skilled workers in these areas is likely to continue to increase in the medium to long term.

Supply and demand for advanced qualifications in **medical studies**, **nursing** and **health** appear to have been balanced overall. The overall supply of graduates has been reasonably well matched to demand generated by occupational growth and retirements. Inward migration has been similar to other fields of study. However, there are likely to be specialist areas that have not been well supplied, while other areas may have been oversupplied.

The analysis in this report found only two other areas where graduate supply appears to be insufficient to meet demand from occupational growth and retirements. These were people with postgraduate qualifications in **information technology** and those with bachelors and above in

accountancy. The shortage of people with postgraduate qualifications in information technology has been met by a high reliance on inward migration.

The findings in this report generally support a theme established in the first two reports – namely, that increasing the number of people achieving advanced trade, technical and professional qualifications is only one part of the solution to addressing medium- to long-term skill shortages. In most areas, it is as or more important to ensure that graduates have knowledge that is relevant to the current and future labour market, which requires educators and employers to work closely together to identify and understand skill needs.

3 INTRODUCTION

3.1 Purpose of this report

New Zealand experienced a sustained period of economic growth from 2001 to 2007. During this period the proportion of the workforce holding tertiary education qualifications also increased. However, there was little growth in labour productivity in this period. The low labour productivity growth was partly due to increased employment rates, which resulted in more low-skilled workers entering employment and lower increases in the average production per person (Ministry of Education, 2008). At the same time, there were also persistent shortages of people with higher levels of skills in trade, technical and associate professional and professional occupations. The need to increase the number of people with advanced trade, technical and professional qualifications was signalled in the Tertiary Education Strategy 2007-12 (Minister for Tertiary Education, 2006).

At the time of writing this report, the country is experiencing the effects of a global recession. This has created uncertainty about skill demands in the short term. However, in the medium to long term, the need for higher skilled workers in order to support innovation and productivity is likely to persist. Also, the drivers of demand for people with advanced qualifications are not limited to economic factors. The drivers include increased adoption of new technology, increased demand for health and social services as the population ages and the further extension of regulation of occupations, with a focus on accredited qualifications, in the trades and health services.

In April 2008, the Ministry published the first in this series of three reports looking at advanced trade, technical and professional qualifications (Earle, 2008a). That report looked at skill demands within occupations and the qualifications held by the current workforce. It identified occupations that were experiencing ongoing skill shortage and required advanced-level qualifications.

A second report was published in July 2008 (Earle, 2008b). That report looked at the qualification areas highlighted in the first report. It considered how well those qualifications matched the occupations with identified skill shortages, as well as examining measures of employment rates and income premiums to assess the value placed on these qualifications in the labour market.

This is the third report in the series. It looks at the number of people who graduated with the advanced trade, technical and professional qualifications identified in the first two reports. It provides estimates of how well the number of people who graduated is likely to have met demand from occupational growth and retirements. It also provides comment on the extent to which immigration has met shortfalls in demand.

The overall purpose of this work is to build evidence to understand which areas the tertiary education system could concentrate on more in addressing skill shortages. In each of these areas, further detailed work will be required to understand issues of quality, quantity and timeliness of supply.

3.2 Linking education to skill needs

The first report in this series discussed the link between education and skill needs. It noted that skill shortages arise and can persist for a number of reasons. These can include both insufficient supply of people with the required skills and lack of attractiveness of work within certain

occupations and industries. Making changes in the supply of qualified graduates is just one of several possible responses to skill shortages.

The link between education and skill demand was conceptualised as a process with multiple links:

- People make decisions about what they would like to study and/or what occupation(s) they would like to work in.
- People attain education relevant to one or more occupations.
- People build experience relevant to one or more occupations (which may be before, during or after their period of study).
- Their qualifications and occupational experience enable them to be employed within one or more industries.

3.3 Methodology

This report looks further into the supply of qualifications. The new data presented in this report is the trends in numbers of people who have graduated with advanced qualifications in trade, technical and professional subjects. This data combines both provider-based and work-based completions and covers the period from 2002 to 2006 inclusive. The provider-based data comes from new work to identify the fields of specialisation of completed qualifications from course level data (Scott, 2009).

For each field of study, this report presents:

- a short summary of the findings from the previous reports
- the trends in completions by level of qualification from 2002 to 2006, including comment on which subsectors contributed to completions at each level
- results from a model which assesses the extent to which completions may have met demand generated by occupational growth and retirements, and the extent to which immigration has provided an alternative source of qualified workers
- a comment on the possible impact of migration.

The information in the tables in each chapter is further described below. A quick guide to the tables is also provided in Appendix A. A fuller account of the methodology used to calculate the numbers is provided in Appendix B. Notes on data sources are provided in Appendix C.

The model

The model results are indicative only. The results are sufficiently robust to provide a broad picture of the extent to which the number of graduates was sufficient to fill the estimated number of places available in the workforce. They go about as far as it is possible to using aggregated statistical data on qualifications and the workforce. The model looks at:

- Supply: The estimated number of people who graduated within each field of study from 2002 to 2006 at each level and who moved into employment
- Demand: The estimated net number of job vacancies created during that period for people with those qualifications as a result of

- growth in related occupations
- retirements.

The model then shows the difference between the number of graduates entering the workforce and the estimated net vacancies. The difference is shown in two different ways.

- The first figure is a total number over the five-year period. This figure provides an indication of the absolute size of the difference in terms of the number of graduates.

- The second figure presents the five-year total number as a proportion of people employed with the qualification in the specified field and level of study as at 2006. This figure provides an indicator of the relative size of the difference with respect to the size of the workforce.

The results of the model for all fields of study are shown in Table 1 below. These figures provide an average picture against which the specific field of study pictures can be compared. All numbers have been rounded to the nearest 10 for presentation in the report.

Table 1:
Supply and demand for all fields of study (2002-2006)

	Supply	Demand			Supply-Demand	
	Graduates	Occupational growth	Retirements	Total	No.	% of employed
Level 4 certificate	81,640	17,460	22,400	39,850	41,790	19
Diploma	49,590	41,390	20,840	62,240	-12,640	-6
Bachelors/honours	115,850	54,650	15,640	70,290	45,560	15
Masters/doctorate	14,790	11,320	4,560	15,870	-1,080	-2

At first glance, the model would seem to suggest undersupply of diplomas, masters and doctorates and oversupply of level 4 certificates and bachelors. However, the model only shows demand due to employment growth and retirement. The model does not include demand for a greater proportion of the workforce overall to hold tertiary qualifications. This has been a significant factor in a number of occupations, where work is becoming more complex and there is a demand for a more highly skilled workforce. It is not possible to meaningfully estimate this effect from existing data.

Therefore, in absence of other evidence:

- if supply is less than demand, it can be inferred that the number of people who graduated did not keep up with employment growth and turnover due to retirement

- if supply is equal to demand, it can be inferred that the number of people who graduated was sufficient to fill new jobs and replace people who are retiring, but may not have been sufficient to meet increased skill demands in the workplace

- if supply is greater than demand, it can be inferred that the number of people graduating has resulted in a greater proportion of the workforce holding tertiary qualifications.

These results can then be considered alongside evidence from the earlier reports to assess whether there may be a shortfall or surplus of graduates relative to demand.

Accounting for migration

Inward and outward migration is a significant factor in considering the supply of skilled workers in New Zealand. New Zealand has one of the highest rates of both inward and outward skilled migration among developed countries. Overall, the volumes are roughly equal and cancel each other out (Dumont and Lemaître, 2005).

Because of the limited coverage of information on migration by field and level of study, migration has not been added into the overall model. Instead, each section includes a comment on the extent of inward migration by field and level of study. These comments are based on an analysis of the number and proportion of permanent and long-term migrants arriving in New Zealand for the first time in the period from 2002 to 2006. It doesn't include trends in return migration by New Zealand citizens and permanent residents.

Inward migration has the largest impact for people with a postgraduate qualification, where only half of people in employment in New Zealand in 2006 were New Zealand born. The period from 2002 to 2006 was marked by significant inward migration, with one in five employed people with postgraduate qualification and one in eight with a bachelors degree having migrated to New Zealand in that period.

Table 2

Distribution of people in employment by place of birth, time since arrival in New Zealand and highest qualification

	NZ born %	Overseas born			Total employed %
		10 years+ %	6 to 9 years %	up to 5 years %	
Level 4 certificate	81	11	2	5	100
Diploma	76	13	3	8	100
Bachelors/honours	67	15	5	13	100
Masters/doctorate	52	21	7	19	100

Source: Statistics New Zealand, Census of Population and Dwellings 2006.

The migration tables in each chapter look at the number of people in employment who were born overseas who arrived in New Zealand from 2002 to 2006 with the level and field of qualification specified. The first column provides the total number of people. The second column provides this number as a proportion of all people in employment with a qualification in that field and at that level. The third provides a comparison to the average proportion of people in employment who have arrived from 2002 to 2006 across all fields of study at that level. From these tables, it is possible to infer if a particular field of study has had a greater or lesser demand for new migrants than the qualified workforce overall.

There is no data available on outward migration by field and level of qualification. Dumont and Lemaître (2005) provide an overall count of New Zealand expatriates with bachelors degrees and above and show that the number is about equal to the number of immigrants in New Zealand with the same level of qualification. However, there are likely to be differences in the balance of inward and outward migration across fields of study.

Occupational movement

The model uses information on the total number of people with specified level and field of qualification in employment. It looks at how well the tertiary education system has performed in maintaining this 'stock' of qualified employees. It does not attempt to account for whether these people worked in occupations relevant to their qualifications. This is a fairly complex area to examine and clearer for some qualifications and occupations than for others.

The second report in this series provided some information on the extent to which people work in occupations related to their qualifications (Earle, 2008b). This is noted in each chapter as context for assessing the overall results for each field of study.

4 INFORMATION TECHNOLOGY

4.1 Previous findings

The first report found that while there was an adequate supply of people with diplomas in information technology, there was an unmet demand for people with bachelors degrees and above in this field.

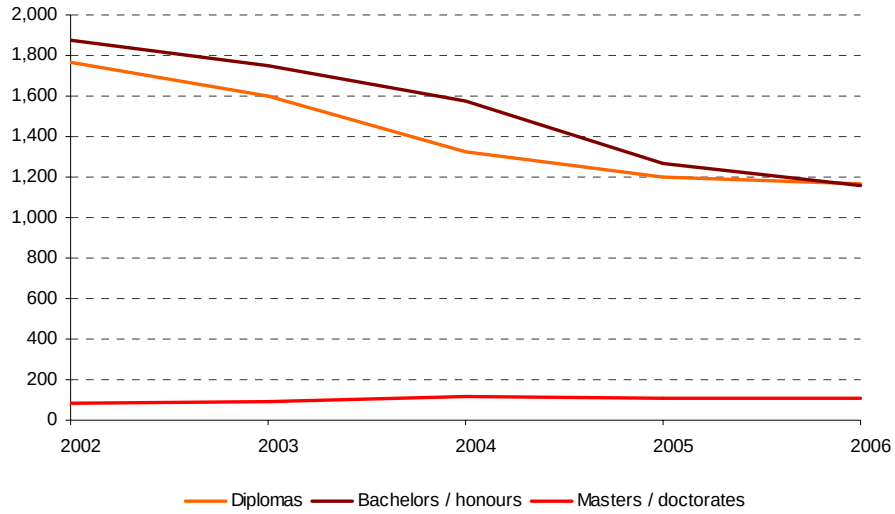
The second report found a moderate level of occupational matching for people with diplomas in information technology and a much stronger match for people with bachelors and above. People with information technology qualifications had much higher unemployment rates than others with the same level of qualification, particularly those with diplomas. They were likely to earn more than others with the same level of qualification in management and professional occupations, but less in technical and other occupations.

The second report concluded that increasing the number of people with bachelors and above qualifications may contribute to reducing skill shortages, but only if issues of quality and relevance of qualifications were also addressed. There was limited evidence that increasing the number of people with diploma-level qualifications would reduce skill shortages.

4.2 Trends in completion of qualifications

From 2002 to 2006 there was an overall decrease in the number of people completing diploma and bachelor-level qualifications in information technology. The numbers completing at masters and doctorate level stayed fairly constant.

Figure 1
Number of people completing information technology qualifications by level



In 2006, 63 percent of diploma level graduates graduated from a private training establishment and 32 percent from an institute of technology or polytechnic. At bachelors level, 72 percent graduated from universities and 25 percent from institutes of technology and polytechnics. For masters and doctorates, 94 percent of graduates were from universities.

4.3 Comparing supply and demand

The comparison of supply and demand suggests that there has been an oversupply of graduates at diploma level, adequate supply at bachelors level and a shortage at postgraduate level.

Table 3 below indicates that there has been declining demand for people with diplomas in information technology. The number of people employed in the related occupational group has decreased. The current workforce with diplomas in information technology is relatively young. Sixty-two percent were aged under 35 in 2006 and only 3 percent were aged 55 and over. Given the young age profile of the workforce, their average employment participation rates will increase with age over the next five years, while very few will retire. This results in a negative value for the retirement rate.

There has been a large number of graduates at diploma level in the period from 2002 to 2006 relative to the estimated size of the workforce. This oversupply fits with the finding in the second report of higher unemployment rates and lower occupational matching for people with diplomas in information technology.

Table 3
Supply and demand estimates for information technology (2002-2006)

	Supply	Demand			Supply-Demand	
	Graduates	Occupational growth	Retirement	Total	No.	% of employed
Diploma	4,910	-600	-170	-770	5,680	82
Bachelors/honours	5,940	3,510	-180	3,330	2,610	19
Masters/doctorate	420	470	30	500	-80	-4

Occupational reference group for diplomas is computer equipment controllers. Occupational reference group for bachelors, masters and doctorates is computing professionals.

See Appendix A for a guide to interpreting the table.

The model suggests adequate supply at bachelors and honours level. There has been considerable occupational growth for computing professionals. The current workforce with bachelors in information technology is relatively young, which results in a negative retirement rate in the same way as for diplomas. The result of this situation is likely to be an increased proportion of the workforce with bachelors degrees in information technology. The first report highlighted this as the main area of demand.

At masters and doctorate level, the model suggests that supply is falling short of demand. While the numbers are relatively small, people with qualifications at this level play a critical role in innovation and leadership within the information technology industry, as well as providing the future pool of academics.

4.4 Effects of migration

The proportion of people employed with information technology qualifications who arrived in New Zealand from 2002 to 2006 was considerably higher than the average across all fields of study. These figures suggest that the strong supply from domestic graduates is also being supplemented by significant inward migration. The undersupply of domestic graduates at masters and postgraduate level appears to be made up for by a high reliance on migration.

Table 4

People in employment with information technology qualifications born overseas and arrived in NZ from 2002 to 2006

	With information technology qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Diploma	1,194	22	8
Bachelors/honours	2,061	18	13
Masters/doctorate	567	37	19

See Appendix A for a guide to interpreting the table.

5 ENGINEERING AND RELATED TECHNOLOGIES

Engineering and related technologies qualifications cover a wide range of areas including manufacturing, mechanical, industrial, civil and electrical/electronic engineering and technology. Qualifications at level 4 prepare people to work in the trades and as plant and machine operators. Diploma-level qualifications generally prepare people to work as engineering technicians, while degree and above qualifications generally prepare people to work as engineering professionals.

5.1 Previous findings

The first report identified unmet demand for people with engineering and technology qualifications at all levels. Demand has been driven by technology changes, as well as the growth in the construction industry.

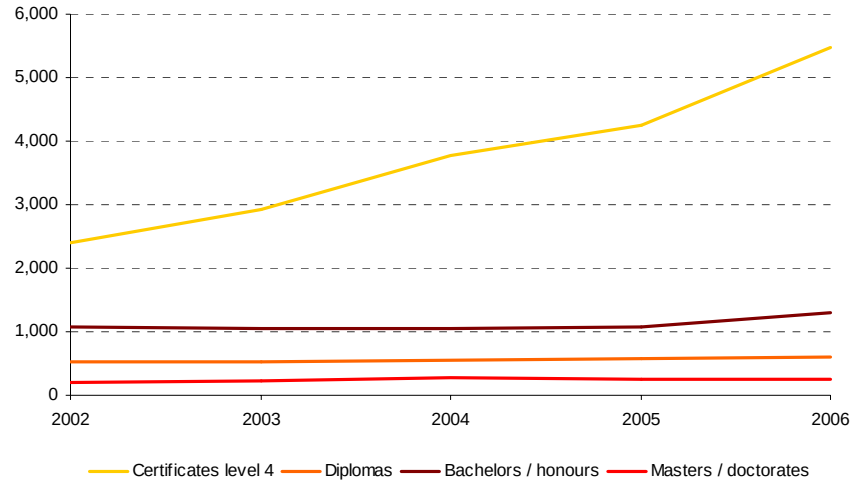
The second report found that people with engineering and technology qualifications were well matched to related occupations. Males with engineering and technology qualifications were less likely to be unemployed than males with other qualifications. However, unemployment rates were relatively higher for females with engineering and technology qualifications. There was clear evidence of income premiums being paid to people with engineering and technology qualifications occupations.

The second report concluded that there is a clear case that increasing the number of people with engineering and technology qualifications at all levels would contribute to reducing skill shortages.

5.2 Trends in completion of qualifications

From 2002 to 2006, there was a steady increase in the number of people completing level 4 certificates in engineering and technology. The number of people completing has been steady at higher levels, except for a small increase in bachelors completions in 2006.

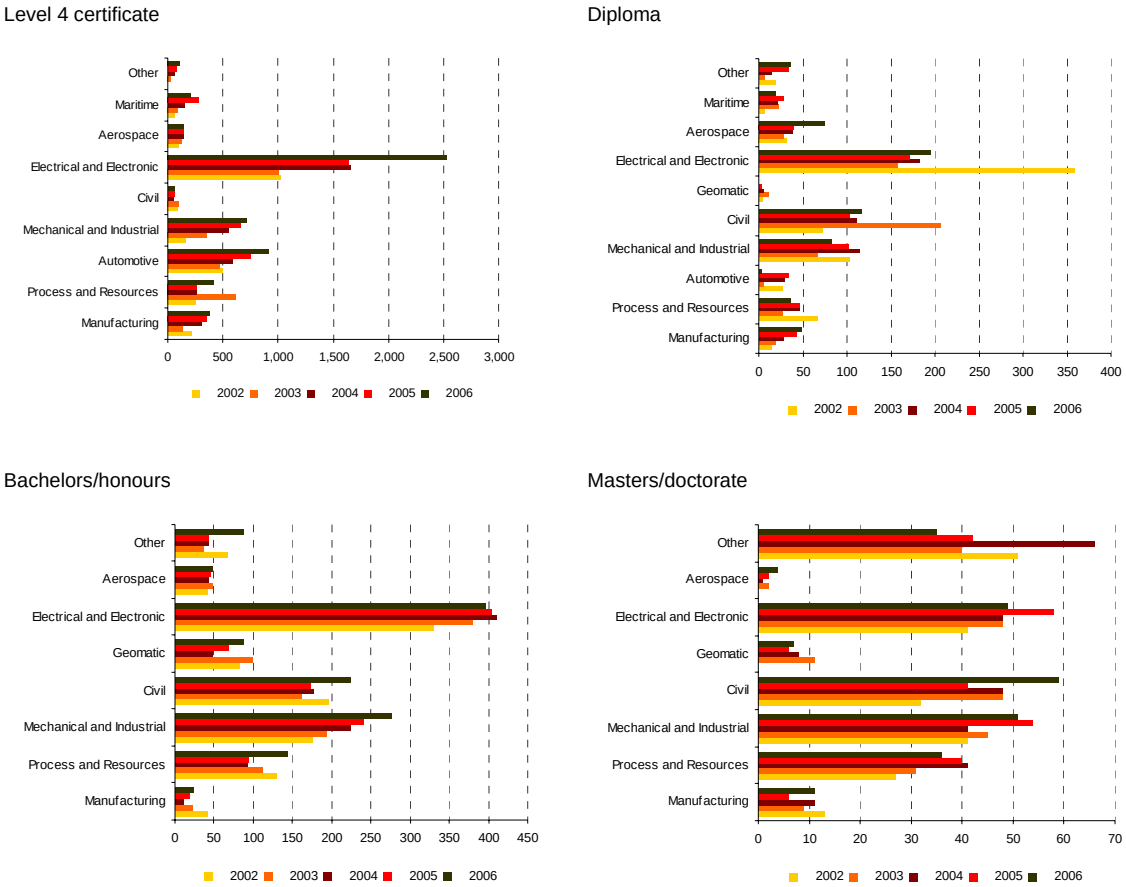
Figure 2
Number of people completing engineering and related technologies qualifications by level



Below degree level, the largest number of completions was in electrical and electronic engineering and technology, where there was an overall increase in graduates from 2002 to 2006. For level 4 certificates, the other main areas of completions were in mechanical and

industrial, automotive, process and resources and manufacturing engineering and technology. For diplomas, the other main areas were in civil, mechanical and industrial and manufacturing engineering and technology.

Figure 3
Number of people completing engineering and related technologies qualifications by level and narrow field[1]



Electrical and electronic engineering and technology was also the largest area of completions for bachelors and honours degrees, followed by mechanical and industrial engineering and technology, and civil engineering. Completions of masters and doctorates were fairly evenly spread across electrical and electronic, civil, mechanical and industrial, and process and resources engineering and technology.

In 2006, 94 percent of level 4 certificate graduates completed their qualification through an industry training organisation. The remainder completed at either an institute of technology or polytechnic or at a private training establishment. At diploma level, 43 percent of graduates were from institutes of technology and polytechnics, 28 percent from industry training, 23 percent from universities and 6 percent from private training establishments. The proportion from industry training has increased over the last four years, while the proportion from institutes of technology and polytechnics has decreased. The majority of bachelor degrees (93 percent) are completed at universities, with the remainder completed at institutes of technology and polytechnics. All masters and doctorates were completed at universities.

[1] 'Other' includes environmental engineering, biomedical engineering and fire technology and rescue services.

5.3 Comparing supply and demand

The comparison of supply and demand suggests shortages of engineering and technology graduates across all levels of study, with shortages being greatest at diploma level. This concurs with the findings in the second report.

Employment in engineering and technology related occupations grew from 2001 to 2006. Retirements also added to demand, particularly for people with level 4 certificates where the existing qualified workforce is older than average. Overall, the supply of graduates has not been sufficient to keep up with the demand.

Table 5

Supply and demand estimates for engineering and related technologies (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Level 4 certificate	15,170	5,210	11,300	16,510	-1,330	-2
Diploma	2,310	2,160	3,980	6,150	-3,840	-11
Bachelors/honours	4,530	3,500	1,610	5,105	-570	-3
Masters/doctorate	1,000	780	390	1,160	-160	-3

Occupational reference group for certificates is electricians, metal and machinery trades workers, precision trades workers, other craft and related trades workers (except food and related products processing) and industrial plant operators. Occupational reference group for diplomas is engineering technicians. Occupational reference group for bachelors, masters and doctorates is engineering professionals.

See Appendix A for a guide to interpreting the table.

It is possible that the demand for people with engineering and technology qualifications will reduce during the recession. However, once the country is out of recession, the demand is likely to pick up again.

A closer look at specific areas of engineering and technology reveals differences in supply and demand. In Table 6 below, some narrow fields of study have been combined where there is a cross-over of skills and/or occupational groups.

In manufacturing, process and resource engineering the largest number of graduates entering employment have had level 4 certificates. This is an area where there is demand due to retirement but very little net occupational growth evident. At diploma level, the occupational demand is decreasing and graduate numbers are more than enough to meet the losses due to retirement. So at both certificate and diploma level, the number of people graduating would appear to be more than the number of job available due to retirement and net occupational growth. However, at bachelors level, the number of graduates entering employment is just short of the estimates of jobs available due to net occupational growth and retirement.

In automotive, mechanical and industrial engineering, the number of graduates with certificates and diplomas entering the workforce hasn't matched the estimated number of retirements, on top of which there has also been occupational growth. At bachelors and above, the number of graduates entering employment has matched the number of retirements and estimated occupational growth.

In civil and geomatic engineering, the number of graduates entering employment has been insufficient to make up for the combined effects of occupational growth and retirements. This is true for both diplomas and bachelors.

In electronic and electrical engineering, the number of graduates entering employment with level 4 certificates has been more than the number of retirements and increased jobs due to occupational growth. At diploma and bachelors levels, there has been an overall shortfall.

In aerospace engineering there appears to be an oversupply of graduates with certificates. This is mostly due to a decreasing number of people working in related occupations. In maritime engineering there appears to be an undersupply of graduates with certificates and diplomas. These are relatively small fields and occupations at diploma and bachelor levels, making comparisons unreliable.

Table 6

Supply and demand estimates for engineering and related technologies narrow fields (2002-2006)

		Supply	Demand			Supply-Demand	
		No. of graduates	Occupational growth	Retirements	Total	No.	% of employed
Manufacturing, process and resource	Level 4 certificate	2,570	10	1,560	1,570	1,000	9
	Diploma	310	-130	360	230	75	3
	Bachelors/honours	540	370	240	610	-70	-2
Automotive, mechanical and industrial	Level 4 certificate	5,020	1,840	5,450	7,280	-2,260	-8
	Diploma	460	50	1,380	1,430	-970	-9
	Bachelors/honours	910	620	250	870	40	1
Civil and geomatic	Diploma	540	860	440	1,300	-760	-20
	Bachelors/honours	1,190	920	530	1,450	-260	-5
Electrical and electronic	Level 4 certificate	5,850	2,510	2,630	5,140	720	3
	Diploma	870	120	1,010	1,130	-250	-2
	Bachelors/honours	1,480	1,210	310	1,520	-40	-1
Aerospace	Level 4 certificate	570	-100	190	90	480	28
Maritime	Level 4 certificate	670	820	530	820	-150	-5

See Appendix A for a guide to interpreting the table.

5.4 Effects of migration

The proportion of people employed with below-degree-level qualifications in engineering and related technology qualifications who arrived in New Zealand from 2002 to 2006 has been about the same as the average across all fields of study. These figures suggest that migration has not had much effect in easing shortages of staff with qualifications at these levels.

Table 7

People in employment with engineering and related technologies qualifications born overseas and arrived in NZ from 2002 to 2006

	With engineering and related technologies qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Level 4 certificate	5,814	7	5
Diploma	2,574	7	8
Bachelors/honours	4,452	20	13
Masters/doctorate	1,212	25	19

See Appendix A for a guide to interpreting the table.

For degree and postgraduate qualifications, the proportion people employed who arrived in New Zealand from 2002 to 2006 is above the average across all fields of study. These figures suggest inward migration may have helped ease shortages of qualified staff.

A breakdown of inward migration by shows rates similar to the average across all fields of study in manufacturing, process and resource engineering and in maritime engineering. In all other narrow fields, the rates were higher than average at most levels.

Table 8

People in employment with engineering and related technology qualifications born overseas and arrived in NZ from 2002 to 2006, by narrow field

		With engineering and related technology qualifications		Average - all fields of study
		No	% of all employed	% of all employed
Manufacturing, process and resource	Level 4 certificate	516	5	5
	Diploma	198	7	8
	Bachelors/honours	633	19	13
	Masters/doctorate	210	27	19
Automotive, mechanical and industrial	Level 4 certificate	2,910	10	5
	Diploma	1,014	9	8
	Bachelors/honours	963	25	13
	Masters/doctorate	195	32	19
Civil and geomatic	Diploma	384	10	8
	Bachelors/honours	909	18	13
	Masters/doctorate	246	26	19
Electrical and Eeectronic	Level 4 certificate	1,650	8	5
	Diploma	891	8	8
	Masters/doctorate	240	23	13
	Bachelors/honours	1,170	22	19
Aerospace	Level 4 certificate	192	11	5
Maritime	Level 4 certificate	186	6	5

See Appendix A for a guide to interpreting the table.

6 ARCHITECTURE

6.1 Previous findings

The first report identified unmet demand for architects with bachelors degrees and above and draughters with diplomas. Demand was driven by growth in the construction industry.

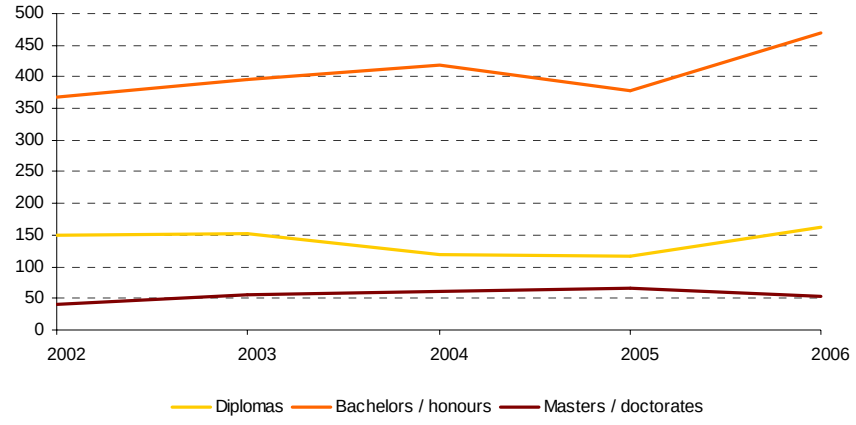
The second report showed that people with architecture qualifications were well matched to related occupations. Males with diplomas and bachelors degrees in architecture were less likely to be unemployed than people with qualifications at the same level in other field. People with diplomas and bachelors degrees in architecture were likely to earn more as managers and professionals, but less in other occupations.

The second report concluded that there was a clear case that increasing the number of people with diplomas in architecture would make a contribution to addressing skill shortages. At bachelors level, increased completions may also contribute to addressing skill shortages. However, the quality and relevance of provision may also be important to address.

6.2 Trends in completion of qualifications

From 2002 to 2006 the number of people completing bachelors degrees in architecture increased, while the number completing diplomas fluctuated. The number of masters and doctorates completed remained stable.

Figure 4
Number of people completing architecture qualifications by level



In 2006, 71 percent of diploma completions were from institutes of technology and polytechnics and 84 percent of bachelors completions were from universities. From 2002 to 2006 the number of people completing qualifications in architecture through institutes of technology and polytechnics decreased, while the numbers completing through universities increased.

6.3 Comparing supply and demand

The comparison of supply and demand confirms that the number of architecture graduates has not kept up with demand from occupational growth and retirements. This finding is consistent with the second report.

Table 9

Supply and demand estimates for architecture (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Diploma	580	450	270	710	-140	-4
Bachelors/honours	1,550	1,780	200	1,970	-420	-9
Masters/doctorate	240	320	30	350	-110	-14

Occupational reference group for diplomas is draughting technician. Occupational reference group for bachelors, masters and doctorates is architect, resource management planner and landscape architect.

See Appendix A for a guide to interpreting the table.

The model suggests that there are greater shortages at bachelors level and above than at diploma level. The demand for architects may drop in the short term in response to the recession. However, this is an area where there is likely to be ongoing demand in the medium- to long-term, particularly in response to demands for improved building design standards and reducing the environmental impact of buildings.

6.4 Effects of migration

The proportion of people employed with architecture qualifications who arrived in New Zealand from 2002 to 2006 has been below the average across all fields of study. This suggests that inward migration may not have been sufficient to ease the shortage of domestic graduates.

Table 10

People in employment with architecture qualifications born overseas and arrived in NZ from 2002 to 2006

	With architecture qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Diploma	225	6	8
Bachelors/honours	459	10	13
Masters/doctorate	141	18	19

See Appendix A for a guide to interpreting the table.

7 BUILDING

7.1 Previous findings

The first report identified unmet demand for people with qualifications in building. Considerable demand was evident in the building trades for people with diplomas and level 4 certificates in building. This demand was driven largely by growth in the construction industry.

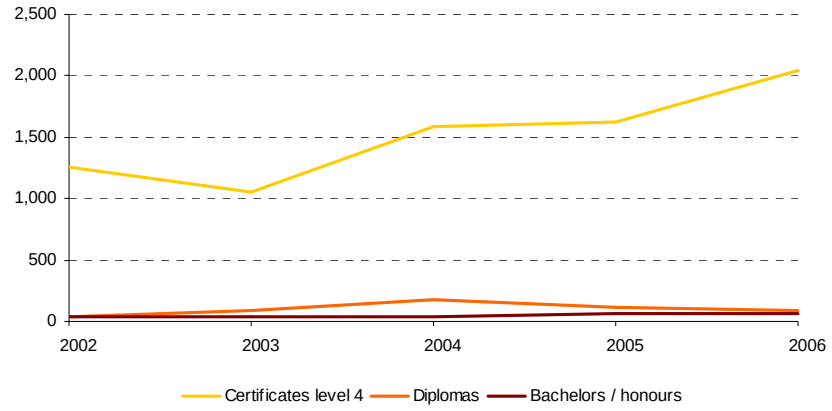
The second report found that there was a good match of people with building qualifications to related occupations. Males with building qualifications are less likely to be unemployed than males with qualifications in other fields. Significant premiums are paid to people with building qualifications across management, professional and associate professional occupations, but not in the trades.

The second report concluded that there was good evidence that increasing the number of people with level 4 certificates and diplomas in building would make a contribution to reducing skill shortages.

7.2 Trends in completion of qualifications

From 2003 to 2006, the number of people completing level 4 certificates in building doubled. At the same time, the numbers completing diplomas and bachelors degrees remained low and stable.

Figure 5
Number of people completing building qualifications by level



In 2006, 65 percent of people completing level 4 certificates in building did so though an industry training organisation, 25 percent completed at an institute of technology or polytechnic and 10 percent at a private training establishment. The major growth at this level has been within industry training.

For diplomas, 77 percent were completed at an institute of technology or polytechnic in 2006 and 20 percent at a private training establishment. Over the four-year period from 2003 to 2006, 59 percent of bachelors completions have been at institutes of technology and polytechnics and 41 percent at universities.

7.3 Comparing supply and demand

The comparison of supply and demand suggests that the supply of graduates with certificates and diplomas in building has not kept up with demand resulting from occupational growth and retirements. This confirms the findings in the second report.

Demand has been generated almost equally by occupational growth and retirements. While occupational growth is likely to decrease during the recession, there will continue to be a need to replace qualified workers nearing retirement. The introduction of licensing requirements, increasing demand for registered builders and improvements in building technology and standards will also increase the demand for current workers to gain recognised qualifications.

Table 11

Supply and demand estimates for building (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Level 4 certificates	8,360	8,630	4,970	13,400	-5,240	-14
Diploma	560	1,120	620	1,740	-1,180	-24
Bachelors/honours	260	100	40	150	120	8

Occupational reference group for certificates and diplomas is building frame and building finishers and related trade workers.
Occupational reference group for bachelors is physical science and engineering technicians.

See Appendix A for a guide to interpreting the table.

7.4 Effects of migration

The proportion of people employed with building certificates and diplomas who arrived in New Zealand from 2002 to 2006 was lower than the average across all fields of study. At bachelors level, the proportion of employed people who settled in New Zealand over the five-year period was considerably higher than the average across all fields of study. These figures suggest that the shortages of graduates with certificates and diplomas in building were not made up for by migration.

Table 12

People in employment with building qualifications born overseas and arrived in NZ from 2002 to 2006

	With building qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Level 4 certificate	1,362	4	5
Diploma	243	5	8
Bachelors/honours	348	25	13

See Appendix A for a guide to interpreting the table.

8 MEDICAL STUDIES

Medical studies cover the qualifications required to be a medical doctor, including both general practitioners and specialists. Recognised qualifications in this field of study are all at bachelors level and above. Medical studies are looked at in total in this report due to the limitations of available census data. Nursing and other health disciplines are covered in the subsequent chapters.

In this section, bachelors qualifications have been separated from postgraduate certificates and diplomas to differentiate between initial medical training through bachelors of medicine/ bachelors of surgery and further medical training.[2]

8.1 Previous findings

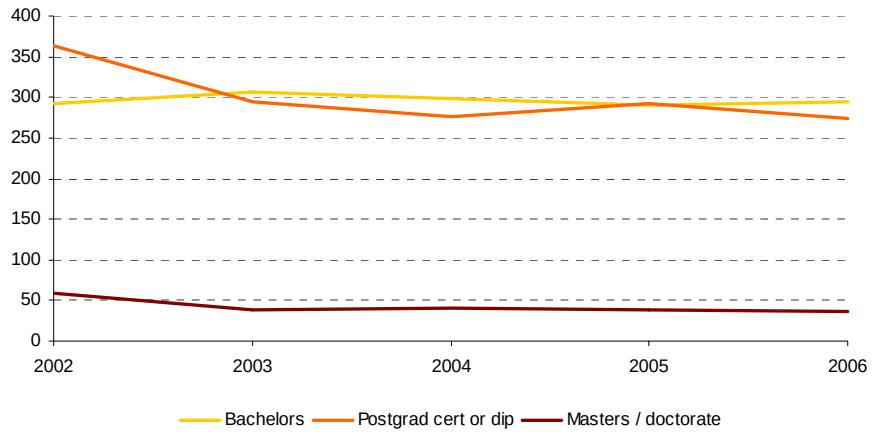
The first report identified unmet demand for people with medical qualifications at bachelors level and above. This was being driven by greater demand for health services, in part due to an aging population.

The second report confirmed this picture. It showed that people with medical qualifications are most likely to work in the health professions. They have very low rates of unemployment and distinct income premiums.

8.2 Trends in completion of qualifications

The number of people completing bachelors qualifications were steady from 2002 to 2006. This reflects funding limits on the undergraduate intake of medical students. While the limits were been increased in 2004, these increases will only flow through to completion from 2009. The number of people completing postgraduate qualifications and masters and doctorates has also been fairly steady since 2003.

Figure 6
Number of people completing medical qualifications by level



8.3 Comparing supply and demand

The comparison of supply and demand suggests that the number of graduates entering employment with bachelors and postgraduate certificates and diplomas in medicine was

[2] The University of Auckland's Bachelor in Human Biology has not been included, as it is an intermediate qualification and was discontinued in 2004.

sufficient to meet demand from occupation growth and retirements. However, the supply of people with masters and doctorates fell short of demand.

For medicine, these results only provide an overall picture. The data doesn't provide a detailed picture of which areas of medical practice graduates are qualified to enter. Underneath the general trends there may be distinct differences between medical disciplines. Also the data doesn't take account of higher-level medical education that is undertaken outside of New Zealand.

The general conclusion that can be drawn from the model is that the overall number of graduates was probably about right up to postgraduate certificate and diploma level. However, further analysis would be required to quantify possible mismatches within specific areas of medicine.

At postgraduate level, the apparent shortfall may reflect the extent to which New Zealand relies on overseas providers to provide these qualifications.

Table 13

Supply and demand estimates for medical studies (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Bachelors	1,140	530	250	780	360	9
Postgraduate certificate /diploma	1,360	650	320	970	390	10
Masters/doctorate	200	530	420	950	-760	-24

Occupational reference group for bachelors is general practitioner and resident medical officer. Occupational reference group for postgraduate certificates and diplomas and masters and doctorates is surgeon, physician, gynaecologist and obstetrician, radiologist, radiation oncologist and anaesthetist.

See Appendix A for a guide to interpreting the table.

8.4 Effects of migration

The proportion of people employed with bachelors in medical studies who arrived in New Zealand from 2002 to 2006 was greater than the average across all fields of study. However, the proportions with higher level qualifications in medicine were lower than the average across all levels of study. These figures suggest there was a reliance on migration to fill medical jobs in New Zealand. However, there may be difficulties in attracting more highly trained medical specialists from overseas.

Table 14

People in employment with medical studies qualifications born overseas and arrived in NZ from 2002 to 2006

	With medical studies qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Bachelors	753	20%	12
Postgraduate certificate/diploma	444	12%	17
Masters / doctorate	450	16%	19

See Appendix A for a guide to interpreting the table.

9 NURSING

Nursing qualifications cover registered and enrolled nurses, midwives and health care assistants.

9.1 Previous findings

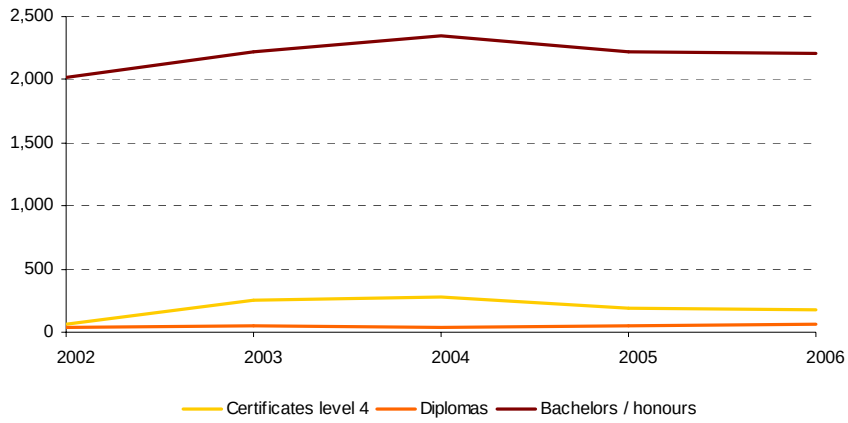
The first report noted shortages for registered nurses and midwives. Registered nursing shortages were possibly more due to recruitment and retention than to undersupply of graduates, but graduate undersupply was noted as an issue for midwives. Shortages of enrolled nurses appeared evident in 2007. Increased demand for people with nursing qualifications is being driven by greater demand for health services, including demand due to an aging population.

The second report found that people with nursing qualifications were more likely to work in health professions than other occupations. They were also less likely to be unemployed. However, as at 2006, people with nursing qualifications were likely to be paid less than others in the same broad occupational group with the same level of qualification. Nurses' salaries have increased substantially since then. The report concluded that increasing the supply of nursing graduates may contribute to reducing skill shortages.

9.2 Trends in completion of qualifications

From 2002 to 2006, the number of people completing bachelors qualifications in nursing was fairly steady. Diplomas in nursing are no longer provided. The diploma completions shown below cover diplomas in midwifery and certificate courses to prepare for registration as a New Zealand nurse. Completions of level 4 certificates in nursing have dropped off somewhat since 2004.

Figure 7
Number of people completing nursing qualifications by level



In 2006, nearly all level 4 certificate and diploma graduates were from institutes of technology and polytechnics. Around 38 percent of bachelors graduates were from universities, and the rest from institutes of technology and polytechnics. This proportion was fairly steady from 2003 to 2006.

9.3 Comparing supply and demand

The comparison of supply and demand suggests that the supply of graduates with level 4 certificates in nursing was insufficient to keep up with occupational growth and retirements, and

the supply of graduates with bachelors degrees was about even with occupational growth and retirements.

Level 4 certificates enable people to work as health care assistants in hospitals, rest homes and other health care facilities. The major driver of demand is the proportion of the current trained workforce nearing retirement. The number of people graduating has been sufficient to meet estimated occupational growth, but did not cover retirements.

The numbers for diplomas and bachelors have been combined in the model, as bachelors qualifications have largely replaced diplomas. However, the workforce is still fairly evenly split between nurses with bachelors degrees and those with diplomas.

The model suggests that the current supply of nurses graduating with bachelors degrees was about sufficient to cover occupational growth and retirement. The effect of this is not captured in the model. Also, the data doesn't provide detail about areas of nursing specialisation where there may be greater or lesser supply and demand.

Table 15
Supply and demand estimates for nursing (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Level 4 certificate	720	740	1,230	1,970	-1,250	-14
Diploma/bachelors	9,350	4,010	4,670	8,680	670	2

Occupational reference group for certificates level 4 is hospital orderly, health assistant, nurse aid and care giver. Occupational reference group for diploma and bachelors is nursing and midwifery professional, enrolled nurse and Karitane nurse.

See Appendix A for a guide to interpreting the table.

9.4 Effects of migration

The proportion of people employed with level 4 certificates in nursing who arrived in New Zealand from 2002 to 2006 was the same as the average across all fields of study. However, the proportions with diplomas and bachelors were lower than the averages across all levels of study. These figures suggest that migration is not helping ease the shortage of people with level 4 certificates.

Table 16
People in employment with nursing qualifications born overseas and arrived in NZ from 2002 to 2006

	With nursing qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Level 4 certificate	456	5%	5%
Diploma/bachelors	3,444	9%	11%

See Appendix A for a guide to interpreting the table.

10 OTHER HEALTH

The fields of study included here in other health are pharmacy, dental studies, optical science, public health, radiography and rehabilitation therapies.[3]

10.1 Previous findings

The first report noted that there was a high demand for health associate professionals across these areas, particularly retail dispensary assistants, dental therapists, physiotherapists and occupational therapists. In the professional health occupations, supply and demand seemed to be more evenly matched for these areas.

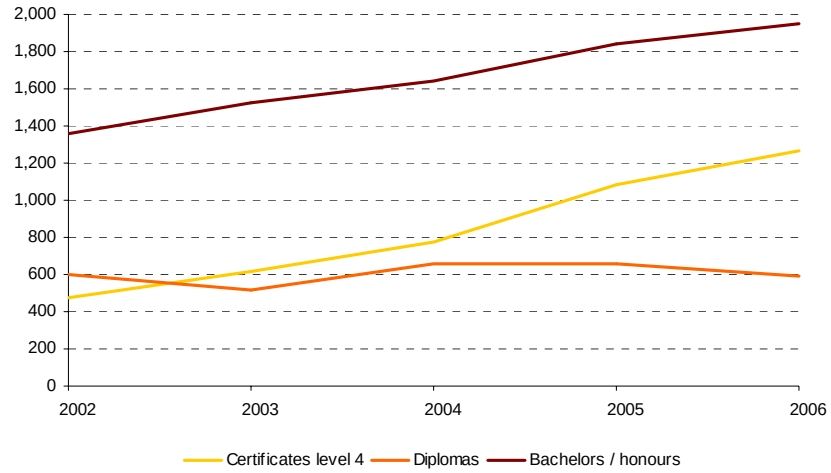
The second report found that people with other health qualifications were more likely to work as health professionals or associate professionals. Those with qualifications at diploma level and above had relatively low unemployment rates. People with bachelors in other health areas were generally paid more than others with the same level of qualification.

The report concluded that increasing the number of people with bachelors in other health areas could contribute to addressing skill shortages. For people with qualifications below degree level there may also be issues about conditions and attractiveness of employment.

10.2 Trends in completion of qualifications

From 2002 to 2006, there was a steady increase in the number of people completing level 4 certificates and bachelors degrees in other health fields. The number of completions at diploma level remained steadier.

Figure 8
Number of people completing other health qualifications by level



In level 4 certificates, the largest number of completions was in ‘other health’, which covers paramedic and first aid trainer certificates. This was also where there was the most growth. The other areas are rehabilitation therapies and public health.

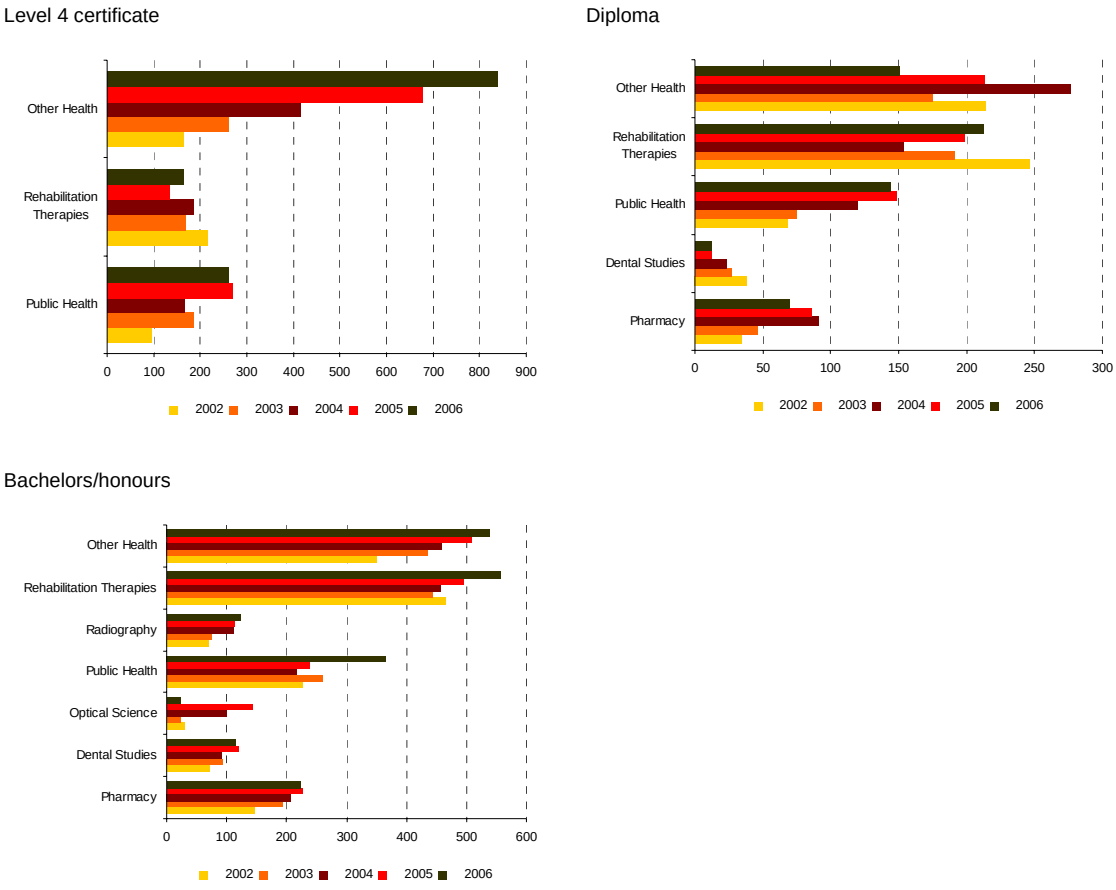
[3] Veterinary studies and complementary health (naturopathy, acupuncture and traditional medicine) have not been included.

Diplomas cover ‘other health’, rehabilitation therapies, public health and pharmacy. The most significant growth has been in public health, while there has been a decline in diplomas in dental studies.

There is a large and growing group of bachelors degrees that have been coded to the ‘other health’ detailed field. These were mostly bachelors in health science where courses had not been coded to a specific health area. The largest specific area of completion has been rehabilitation therapies. There has been overall growth in completions in all areas except optical science. (Note that dental studies is subject to a funding cap).

Figure 9

Number of people completing other health qualifications by level and narrow field



In 2006, 67 percent of level 4 certificates were completed at a private training establishment, 14 percent at an institute of technology or polytechnic and 10 percent through an industry training organisation. At the diploma level, 39 percent were completed at a private training establishment, 37 percent at an institute of technology or polytechnic and 24 percent at a university. Eighty-two percent of bachelors degrees were completed at a university and the rest at an institute of technology or polytechnic. These proportions have been fairly stable over the last four years.

10.3 Comparing supply and demand

The comparison of supply and demand suggests that the overall supply of graduates in other health areas was at least sufficient to cover occupational growth and retirements. Supply was particularly strong for level 4 certificates. This may reflect efforts to extend the proportion of the workforce with recognised qualifications.

Table 17

Supply and demand estimates for other health (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Level 4 certificate	3,220	1,450	150	1,600	1,610	46
Diploma	2,370	1,100	650	1,750	620	8
Bachelors/honours	7,000	3,480	1,410	4,900	2,110	14

Occupational reference group for level 4 certificates is health inspector, safety inspector, massage therapist and ambulance officer. Occupational reference group for diplomas is dispensing optician, dental therapist, physiotherapist, occupational therapist, osteopath, orthotist and/or prosthesist, podiatrist, chiropractor, hospital dispensary assistant, retail dispensary assistant, other health associate professional and dental technician. Occupational reference group for bachelors and honours is dentist and dental surgeon, hospital pharmacist, retail pharmacist, dietician and public health nutritionist and optometrist.

See Appendix A for a guide to interpreting the table.

A further breakdown by narrow field reveals considerable variation. Pharmacy and dentistry appear to be undersupplied with graduates. Both areas have had occupational growth and have a number of employees nearing retirement. Public health and other health would appear to be significantly oversupplied, particularly at level 4. Rehabilitation therapies is meeting demand, with a shift towards more people attaining bachelors degrees in this area.

These figures need to be interpreted with some caution. The demand figures rely on coding of qualifications in the census. This coding may differ at the narrow field level from the coding of qualifications by tertiary education organisations. This is likely to be a problem with public health and other health qualifications in particular.

Table 18

Supply and demand indicators for other health narrow fields (2002-2006)

		Supply	Demand			Supply-Demand	
		No of graduates	Occupational growth	Retirements	Total	No.	% of employed
Pharmacy	Diploma	260	60	60	120	140	12
	Bachelors/honours	840	880	290	1,170	-330	-10
Dental studies	Diploma	90	170	60	220	-140	-18
	Bachelors/honours	430	360	750	1,110	-680	-20
Optical science	Bachelors / honours	250	70	40	110	150	33
Public health	Level 4 certificate	660	110	20	130	530	250
	Diploma	430	70	50	120	310	97
	Bachelors/honours	1,100	240	100	340	760	65
Radiography	Bachelors/honours	460	180	70	250	210	30
Rehabilitation therapies	Level 4 certificate	610	210	20	230	390	13
	Diploma	750	420	240	670	80	3
	Bachelors/honours	2,150	510	170	680	1,470	41
Other health	Level 4 certificate	1,800	220	40	260	1,540	119
	Diploma	660	230	60	350	300	22
	Bachelors/honours	1,770	620	60	680	1,090	31

See Appendix A for a guide to interpreting the table.

10.4 Effects of migration

The proportion of people employed with other health qualifications who arrived in New Zealand from 2002 to 2006 was less than the average across all fields of study.

Table 19

People in employment with other health qualifications born overseas and arrived in NZ from 2002 to 2006

	With other health qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Level 4 certificate	192	5	5
Diploma	393	5	8
Bachelors/honours	1,608	10	13

See Appendix A for a guide to interpreting the table.

Looking at the narrow fields of study, generally the proportion of people employed who arrived from 2002 to 2006 was lower than the average across all fields of study. The exceptions were diplomas in public health and certificates and bachelors degrees in rehabilitation therapy.

Table 20

People in employment with other health qualifications born overseas and arrived in NZ from 2002 to 2006 by narrow fields

		With other health qualifications		Average - all fields of study
		No	% of all employed	% of all employed
Pharmacy	Diploma	18	3	8
	Bachelors/honours	174	6	13
Dental studies	Diploma	63	8	8
	Bachelors/honours	234	7	13
Optical science	Bachelors/honours	39	9	13
Public health	Level 4 certificate	30	8	5
	Diploma	39	12	8
	Bachelors/honours	153	12	13
Radiography	Bachelors/honours	78	10	13
Rehabilitation therapies	Level 4 certificate	48	8	5
	Diploma	147	5	8
	Bachelors/honours	570	16	13
Other health	Level 4 certificate	30	2	5
	Diploma	78	6	8
	Bachelors/honours	261	9	13

See Appendix A for a guide to interpreting the table.

11 OTHER FIELDS OF STUDY

11.1 Accountancy

The first report noted that there appeared to be some shortages of accountants, particularly auditors. The second report concluded that there was evidence to suggest that increasing the number of accounting graduates could help reduce shortages in this area.

From 2002 to 2006, around 800 to 1000 people graduated each year with bachelors degrees or above in accountancy. The model suggests that this number has been insufficient to meet the effect of occupational growth and retirements, leaving an overall shortfall of supply compared with demand.

Table 21

Supply and demand estimates for accountancy (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Bachelors and above	3,780	4,750	1,950	6,700	-2,920	-11

Occupational reference group is accountants and auditors.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a bachelors degree or above in accountancy who arrived in New Zealand from 2002 to 2006 was 16 percent, compared with 14 percent for all fields of study. These figures suggest that the shortage from New Zealand graduates may have been partly met by inward migration.

11.2 Finance and sales

In the first report, shortages of finance and sales associate professionals were noted. The second report concluded that there was no clear evidence that increasing the number of graduates would address skill shortages in this area.

From 2002 to 2006, around 2,000 people a year graduated with bachelors degrees in the area of finance and sales and about 250 to 300 with diplomas. The model suggests that there could be a shortage of people with diplomas in finance and sales. However, this is more than made up for by a strong supply of people with bachelors degrees.

Table 22

Supply and demand estimates for finance and sales (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Diploma	1,010	1,390	280	1,670	-660	-4
Bachelors and above	7,850	2,980	150	3,130	4,710	34

Occupational reference group for diplomas is finance and sales associate professionals. Occupational reference group for bachelors and above is financial advisors.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a diploma in finance or sales who arrived in New Zealand from 2002 to 2006 was 13 percent, compared with 8 percent for all fields of study. For bachelors and above, the proportion was 8 percent, compared with 13 percent for all fields of

study. This suggests that the shortfall at diploma level is being balanced by higher inward migration.

11.3 Human and welfare studies and services

The first report found that there was an ongoing shortage of social workers due to low graduate supply, recruitment and retention difficulties and the demands of study on the current workforce to upgrade their qualifications to meet the new registration requirements. The second report concluded that there was no clear evidence that increasing the number of graduates would address skill shortages in this area.

The number of people completing a diploma in human and welfare studies and services increased from 500 people in 2002 to 750 in 2006. The number completing a bachelors degree increased from 420 to 580. The model suggests that the supply of graduates has been more than enough to cover occupational growth and retirements. Some of the extra supply will be due to current employees upgrading their qualifications to meet registration requirements. Even so, there is no evidence from the model to suggest that further increasing the number of graduates would address occupational shortages.

Table 23

Supply and demand estimates for human and welfare studies and services (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Diploma	2,260	830	290	1,120	1,140	13
Bachelors and above	2,180	1,030	210	1,250	940	23

Occupational reference group for diplomas is social work associate professionals. Occupational reference group for bachelors and above is counsellors.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a diploma in human and welfare studies and services who arrived in New Zealand from 2002 to 2006 was 4 percent, compared with 8 percent for all fields of study. For bachelors and above, the proportion was 9 percent, compared with 13 percent for all fields of study.

11.4 Behavioural science

The first report found that there were ongoing shortages of psychologists. The second report found that there was no clear evidence that increasing the number of people with qualifications related to this occupation would reduce skill shortages.

From 2002 to 2006, around 1,250 people a year graduated with bachelors degrees or above in behavioural science. The model suggests that this is more than enough to cover occupational growth and retirements.

Table 24

Supply and demand estimates for behavioural science (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Bachelors and above	4,840	2,430	500	2,930	1,910	17

Occupational reference group is psychologists.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a bachelors degree or above in behavioural science who arrived in New Zealand from 2002 to 2006 was 11 percent, compared with 14 percent for all fields of study.

11.5 Law

The first report found that there was some evidence of shortages of qualified barristers and solicitors. The second report found that there was clear evidence to suggest that increasing the number of people qualifying in law could help address skill shortages. The shortages were probably driven by demand for legal services in property and resource management as the construction industry grew.

From 2002 to 2006, around 1,800 people a year graduated with bachelors and above in law. The model suggests that the current supply of law graduates at bachelors and above is more than sufficient to cover occupational growth and retirements.

Table 25

Supply and demand estimates for law (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Bachelors and above	6,417	2,494	964	3,457	2,959	22

Occupational reference group is legal professionals.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a bachelors degree or above in law who arrived in New Zealand from 2002 to 2006 was 7 percent, compared with 14 percent for all fields of study.

11.6 Food and hospitality

The first report identified that there were shortages of butchers, bakers and chefs and that low levels of training in these areas may be a contributing factor. The second report concluded that there was no evidence to suggest that increasing the number of graduates would help reduce skill shortages.

From 2002 to 2005, the number of people completing level 4 certificates in food and hospitality increased from 740 to nearly 1,200. In 2006, the number dropped back to 1,050. The model suggests that the number of people completing level 4 certificates is more than enough to meet demand from occupational growth and retirements.

Table 26

Supply and demand estimates for food and hospitality (2002-2006)

	Supply	Demand			Supply-Demand	
	No of graduates	Occupational growth	Retirement	Total	No.	% of employed
Level 4 certificate	3,540	1,450	650	2,100	1,440	12

Occupational reference group is restaurant service workers and food and related products trade workers.

See Appendix A for a guide to interpreting the table.

The proportion of people employed with a level 4 certificate in food and hospitality who arrived in New Zealand from 2002 to 2006 was 4 percent, compared with 5 percent for all fields of study.

12 SUMMARY

Table 27 below summarises the findings for each field of study discussed in this report. It shows whether the trend in the number of graduates decreased, remained the same or increased, and then shows if graduate numbers entering the workforce were less than, equal to or greater than the net number of vacancies in related occupations, as set out in the model. The shaded boxes indicate the fields and levels where the number of graduates has fallen short of the estimated demand from occupational growth and retirements.

Table 27
Summary of trends and supply and demand across fields of study (2002-2006)

		Level 4 certificate	Diploma	Bachelors/honours	Masters/doctorate
Information technology	Graduates		↘	↘	→
	Supply-demand		⇧⇧	⇧	⇩
Engineering and related technologies	Graduates	↗↗	→	→	→
	Supply-demand	⇩	⇩⇩	⇩	⇩
Architecture	Graduates		→	→	→
	Supply-demand		⇩	⇩	⇩⇩
Building	Graduates	↗	→	→	
	Supply-demand	⇩	⇩⇩	⇔	
Medical studies	Graduates			→	→
	Supply-demand			⇔	⇩⇩
Nursing	Graduates	→	→	→	
	Supply-demand	⇩	⇔	⇔	
Other health	Graduates	↗	→	↗	
	Supply-demand	⇧⇧	⇧	⇧	
Accountancy	Graduates			→	
	Supply-demand			⇩	
Finance and sales	Graduates		→	→	
	Supply-demand		⇔	⇧⇧	
Human and welfare studies and services	Graduates		↗	↗	
	Supply-demand		⇧	⇧	
Behavioural science	Graduates			→	
	Supply-demand			⇧	
Law	Graduates			→	
	Supply-demand			⇧	
Food and hospitality	Graduates			↗	
	Supply-demand			⇧	

The analysis in this report both confirms and modifies the conclusions from earlier reports.

The areas where all three reports have consistently found evidence of a shortage of graduates are **engineering and technologies**, **architecture** and **building**. A closer examination of the engineering and technology area revealed particular shortages in civil engineering and across industrial, manufacturing and mechanical engineering and technology. All three of these broad areas have had increased demand due to the construction and infrastructure boom from 2000 to 2007. Demand for qualified employees has also increased within these areas due to developments in technology. There is also a reasonably large proportion of the current

workforce nearing retirement age. The only increase in graduates in these areas has been at level 4, mostly through industry training. Provider-based training does not appear to have grown to meet increased demand for diploma and degree-level qualifications. Shortages of people with bachelors qualifications and above have been met by inward migration.

In the **medical studies**, **nursing** and **health** fields the overall supply of graduates has been sufficient to meet occupational growth and retirements. Inward migration has been similar to other fields of study. These findings modify the conclusions in earlier reports about skill shortages being driven by insufficient graduates. However, there are likely to be graduate shortages within some specialist areas. There is evidence of a shortage of graduates with level 4 certificates in nursing to work as health-care assistants. Closer examination of the 'other health' area found particular shortages in pharmacy and dental studies. There may be also be shortages within some medical and nursing specialisations that are not captured in the data used in this report. Other areas may be oversupplied. However, the data in this report is insufficient to draw a definite conclusion.

This report suggests a shortage of people with postgraduate qualifications in **information technology.** There has been high reliance on migration to fill shortages at this level. However, this report confirms the findings in the earlier reports of an oversupply of people with lower-level qualifications in this field. The other area of shortage suggested in this report is **accountancy.** This strengthens the findings in the earlier reports of a shortage in this area. There is no evidence in this report of a shortage of graduates in **law**, which was highlighted as an area of shortage in the second report.

APPENDIX A GUIDE TO THE TABLES

Comparing supply and demand

Estimated number of graduates entering employment from 2002 to 2006

Estimated additional jobs available for people with qualifications in this field of study from 2002 to 2006

Difference in supply over demand from 2002 to 2006

	Supply	Demand			Supply-Demand	
	Graduates	Occupational growth	Retirement	Total	No.	% of employed
Diploma	4,910	-600	-170	-770	5,680	82
Bachelors/honours	5,940	3,510	-180	3,330	2,610	19
Masters/doctorate	420	470	30	500	80	-4

Occupational reference group for diplomas is computer equipment controllers. Occupational reference group for bachelors, masters and doctorates is computing professionals.

List of related occupations used to estimate growth

Estimated additional jobs for people with these qualifications from growth in related occupations

Estimated jobs that need to be filled by people with these qualifications from retirements

Occupational growth + retirements

Total number of supply over demand

Supply over demand as proportion of people employed in 2006 with qualifications in this field of study

Effects of migration

People in employment who arrived in NZ from 2002 to 2006 with qualifications in this field of study

People in employment who arrived in NZ from 2002 to 2006 with qualifications across all fields of study

	With information technology qualifications		Average - all fields of study
	Number.	% of all employed	% of all employed
Diploma	1,194	22	8
Bachelors/honours	2,061	18	13
Masters/doctorate	567	37	19

Total number arriving 2002 to 2006

Number arriving as proportion of people employed in 2006 with qualifications in this field

Proportion for all fields of study of people who arrived from 2002 to 2006

APPENDIX B MODELLING SUPPLY AND DEMAND

There is no information available that can be used to directly match the supply of graduates from tertiary education with the amount of demand in the workforce.

The tertiary education statistics provide information on the number of people graduating each year by field and level of study. However, information is not currently available on how many of these graduates take up employment in New Zealand and in which areas. The 2006 census provides detailed information on the current population, including level and field of highest qualification and employment status. However, the qualification question used in 2006 is not directly comparable with that used in the 2001 census. This limits the ability to show trends over time for specific levels and fields of qualifications.

To get around these limitations, we have developed a simple, closed-system model that uses information from tertiary education statistics and the 2006 Census to estimate the likely supply and demand for people with qualifications in each field and level. The model is designed to provide indicative measures of the extent to which the number of people graduating reflects demand in the workplace.

The model looks at:

- Supply: The estimated number of people who graduated within each field of study at each level and who moved into employment

- Demand: The estimated net number of job vacancies created during that period for people with those qualifications as a result of

    - growth in related occupations
    - retirements

The model then shows the difference between the number of graduates entering the workforce and the estimated net vacancies. The difference is shown in two different ways. The first is the total number over the five-year period. This figure provides an indication of the absolute size of the difference in terms of the number of graduates. The second figure presents the five-year total number as a proportion of people employed with the qualification in the specified field and level of study as at 2006. This figure provides an indicator of the relative size of the difference with respect to the size of the workforce.

Interpreting the results

At first glance, the model would seem to suggest balanced supply and demand for diplomas, masters and doctorates and oversupply for level 4 certificates and bachelors. However, the model only shows demand due to employment growth and retirement. The model does not include demand for a greater proportion of the workforce to hold tertiary qualifications as occupations become more complex and more reliant on higher-level skills. The model also doesn't consider migration in and out of the country. Therefore, in absence of other evidence:

- if supply is less than demand, it can be inferred that the number of people who graduated did not keep up with employment growth and turnover due to retirement

- if supply is equal to demand, it can be inferred that the number of people who graduated was sufficient to fill new jobs and replace people who are retiring, but may not have been sufficient to meet increased skill demands in the workplace

- if supply is greater than demand, it can be inferred that the number of people graduating has resulted in a greater proportion of the workforce holding tertiary qualifications.

These results can then be considered alongside evidence from the earlier reports to assess whether there may be a shortfall or surplus of graduates relative to demand.

Comparison of model to actual changes

The 2001 and 2006 censuses used different classifications for level of qualification. This limits the comparability of data between the two censuses and means that we can only have a general sense of the extent to which the model matches actual changes in the workforce.

In order to have reasonable comparability between the two censuses, it is necessary to look at diplomas through to doctorates as a single group. Table 28 below provides a comparison of equivalent results from the model and the census for the population with qualifications from diploma level through to doctorate.

The first row shows the estimated increase in people with qualifications from diploma to doctorate in the workforce. For the model, this is the estimated number of new graduates. For the census it is the difference in the number of people employed with qualifications at this level in 2006 and the number employed in 2001.

However, from 2001 to 2006 both the number of people employed and the proportion of people employed with a diploma or higher increased. The effects of these two increases can be separated by applying the 2001 distribution of qualifications to the number of people employed in 2006. This provides the number in the second row of the table, that is, how many more people would be employed with diplomas and above the proportion with diploma and above had stayed constant. The difference between this number and the total increase (row 3) provides the increase due to upskilling, that is, a greater proportion of the population being tertiary qualified. This figure can be compared with row 4, which is the excess of supply over demand from the model.

Table 28:
Comparison of model results with census data

	Model	**Census**
Increased number in employment	144,014	114,053
Increase due to expanded employment		78,169
Increase due to upskilling		35,884
Supply-demand	25,293	

Two conclusions can be drawn from this comparison. The first is that the model is a reasonable approximation of reality. The second is that across all fields of study the apparent excess in supply is consistent with the trend towards a larger proportion of the workforce holding tertiary qualifications.

Limitations of the model

The main limitation of the model is that it does not consider migration. The model assumes all graduates will remain in New Zealand and all employment places will be filled by people currently resident in New Zealand. Current data on graduates moving overseas and people migrating to New Zealand is insufficient to meaningfully add detail to the model. These factors have been left out on a working assumption that the effects cancel each other out. However, this may not be the case for some fields of study.

The model also assumes that:

- age- and gender-specific employment participation rates are static and not subject to change over time
- the number of people retiring in a five-year period is constant (enabling estimation of actual retirements from 2001 to 2006 to be based on predicted retirements from 2006 to 2011).

Elements of the model

Number of graduates

This is the estimated number of people graduating at each level who will be employed following graduation. This estimate is derived from the total number of people who graduated between 2002 and 2006 for each level and field of study multiplied by the age-, level- and field-specific employment rate in 2006. Census 2006 data was used to generate the employment rate. This was calculated separately for males and females.

This can be represented in the following equation:

$$N = \sum_{x=f15\text{–}19/m15\text{–}19}^{x=f65+/m65+} G_x * ER_x$$

Where:

- N is the estimated number of graduates entering employment
- G is the actual number of graduates in each five-year age group over the period from 2002 to 2006 inclusive
- ER is the employment rate for each five-year age group, calculated as

$$ER_x = \frac{E_x}{T_x}$$

  Where:

  - E is the number of people in employment in 2006 in the specified age group with the specified level and field of qualification
  - T is the total number of people in the population in 2006 in the specified age group with the specified level and field of qualification.

The key assumption in this calculation is that recent graduates have the same participation rates as other people of the same gender and age group in the population with the same level and field of qualification.

Occupational growth

This is the estimated number of new jobs created in a five-year period which would attract people with specified level and field of qualification. Occupational growth is estimated by taking the proportional growth in occupations that are clearly related to the level and field of study and applying this to the total number of people employed with that level and field of qualification. This estimates the additional number of people employed in 2006 compared with 2002.

This can be represented in the following equation:

$$N = E * \Delta O$$

Where:

- N is the estimated number of new jobs
- E is the number of people employed with the specified level and field of qualification in 2006
- ΔO is the proportion of jobs in the related occupations that were created since 2001, calculated as:

$$\Delta O = \frac{O_{2006} - O_{2001}}{O_{2006}}$$

  Where:

  - O_{2006} is the number of people employed in the related occupations in 2006
  - O_{2001} is the number of people employed in the related occupations in 2001.

The key assumption in this calculation is that the rate of growth in the related occupations is equal to the rate of growth in jobs for people with the specified qualification.

Retirement

Retirement is an estimate of the number of people employed with a specific field and level of qualification who would retire over a five-year period. The estimate is derived by comparing the number of people employed with that qualification in 2006 with the number who would be employed five years later, given no change in age-specific employment rates.

To estimate the number who would still be employed in five years time, the 2006 employment rates were calculated for each five-year age group. The number of people holding that level and type of qualification in 2006 in each age group was then multiplied by the employment rate for the next five-year age group and by the survival rate, taken from life tables.

The retirement estimate can be represented in the following equation:

$$N = E \; - \sum_{x=f15\text{–}19/m15\text{–}19}^{x=f65+/m65+} E_x * ER_{x+1} * SR_x$$

Where:

- N is the estimated number of people retiring in a five-year period with the specified field and level of qualification
- E is the number of people employed with the specified field and level of qualification in 2006

- ER_{x+1} is the employment rate in 2006 for people in the next five-year age group, calculated as:

$$ER_{x+1} = \frac{E_{x+1}}{T_{x+1}}$$

  Where:

  - *E* is the number of people employed in 2006 in the specified age group with the specified level and field of qualification
  - *T* is the total number of people in the population in 2006 in the specified age group with the specified level and field of qualification
- *SR* is the probability of survival to the next five-year age group, calculated as:

$$SR = \frac{I_{x+1}}{I_x}$$

  Where:

  - *I* is the estimated number of people alive at the beginning of the five-year age group, taken from the Statistics New Zealand life tables.

Supply-demand

Two figures are provided to compare supply with demand. The first is the difference between the total supply and total demand figures. This shows an estimated absolute number of people. The second is the difference in supply and demand as a proportion of people in employment in 2006 with that level and field of qualification. This provides a relative estimate of the difference.

APPENDIX C DATA SOURCES

Qualifications completions

Information on provider-based completions is returned to the Ministry of Education through the Single Data Return. The field of study for provider-based completions has been created using course data, based on the largest field of study undertaken by the student at the highest level of the qualification. These figures differ from those presented in Scott (2009) and on the Ministry of Education's Education Counts website. The latter allow for more than one specialisation per completed qualification.

Completions for 2007 and 2008 were not available at the time of publication due to technical changes in the way the data was collected.

Industry training completions are drawn from information supplied to the Tertiary Education Commission. A field of study has been assigned to each qualification by the Ministry of Education.

Census

The information on qualifications held by people in the workforce is taken from the 2006 Census of Population and Dwellings conducted by Statistics New Zealand.

The 2006 census asked each person to identify their highest school and highest post-school qualifications. Post-school qualifications were coded to levels and fields of study based on the information provided. Qualifications are formally recognised awards requiring at least three-months' full-time equivalent study.

Only the highest qualification a person has obtained is recorded. The data doesn't capture the extent of multiple qualifications. In some cases, the highest qualification held may not be the qualification that is most relevant to a person's current employment.

The level of post-school qualification was coded by Statistics New Zealand using a classification of qualification level that is closely aligned with the New Zealand Register of Quality Assured Qualifications. The main difference from the way the Ministry of Education reports qualification level is that level 7 diplomas are included with bachelors degrees in the census data. In the Ministry data, level 7 diplomas are included with level 5 and 6 diplomas.

The field of study was coded by Statistics New Zealand using the New Zealand Standard Classification of Education. This is the same classification system as used by the Ministry of Education.

The census asks if people were employed during the week the census was conducted. The figures used in this report for the number of employed people include both full- and part-time employment, that is, employment for at least one hour a week.

The census also asks if people were born in New Zealand or overseas. For those born overseas, it asks which year they first arrived in New Zealand as a permanent or long-term resident. The figures on migration presented in this report show the number of people born overseas who first arrived in New Zealand in the five years prior to the 2006 census. This is shown as a total number and as a percentage of all those employed with the specified level and field of qualification.

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