



The New Zealand Knowledge Economy

A REVIEW OF INTERNATIONAL METHODOLOGIES FOR MEASURING THE KNOWLEDGE ECONOMY, AND PRELIMINARY FINDINGS FOR NEW ZEALAND



Disclaimer: The Department of Labour has made every effort to ensure that the information contained in this report is reliable, but makes no guarantee of its accuracy or completeness and does not accept any liability for any errors. The Department may change the contents of this report at any time without notice.

ISBN 978-0-478-33365-7

May 2009

© **Crown copyright Year**

This material is Crown copyright unless otherwise stated and may be reproduced free of charge without requiring specific permission. This is subject to it being reproduced accurately and not being used in a derogatory manner or in a misleading context. The source and copyright status should be acknowledged. The permission to reproduce Crown copyright protected material does not extend to any material in this report that is identified as being the copyright of a third party.

Department of Labour
PO Box 3705
Wellington
New Zealand

www.dol.govt.nz

CONTENTS PAGE

1. INTRODUCTION.....	4
1.1 Background.....	4
1.2 Review of International Methodologies - Local Futures and the Work Foundation.....	5
1.3 Canterbury focus	8
2. PRELIMINARY FINDINGS	8
3. IMPLICATIONS OF RESULTS.....	10
4. FUTURE WORK.....	11
APPENDIX ONE – INTERNATIONAL METHODOLOGY APPLICATION TO NEW ZEALAND.....	12
APPENDIX TWO – THE CANTERBURY KNOWLEDGE ECONOMY.	32

1. INTRODUCTION

The 'Knowledge Economy' is a term that has been used widely both in New Zealand and internationally.

The United Nations notes that Knowledge Economy is not an agreed term *"...it must be said that there is no coherent definition, let alone theoretical concept, of this term: it is at best a widely used metaphor, rather than a concept."*¹

The term "knowledge based economy" was coined by the OECD and defined as an economy which is "directly based on the production, distribution and use of knowledge and information"² (OECD 1996).

While the meaning of 'knowledge economy' may differ slightly depending on the context, it is reasonable to say that the term refers to the influence of differently skilled individuals on performance of an area, be it social, economic or developmental performance. It is commonly reported that highly skilled people add more on average per person to the development and performance of an economy. While it is recognised that having all workers of an economy being highly skilled is not practical or even desired, most if not all OECD countries are attempting to raise average skill levels of their workers.

It is not the purpose of this report to give a complete analysis of Knowledge Economy literature. A wealth of research and analysis can be found of the topic of the Knowledge Economy using even the most basic web search.

1.1 Background

Measurement of the Knowledge Economy is important to the Department of Labour (DoL). In the current environment of historically low unemployment rates and historically high labour force participation, further development of the labour force is most likely achieved through skill enhancement of existing members of the labour force. The measurement of skills – at least partially measured by stocks of knowledge – is important in the understanding the characteristics of the current labour market. Without an idea of the current level of labour market skills across industries, occupations and regions, processes which target the improvement in skills would be inefficient if not misdirected.

The Department of Labour makes frequent reference to the importance of Productivity improvements. On the Introduction page of the DoL website it says that the role of DoL is to "support regions and industries and employers to develop a skilled, innovative and productive workforce"³. The importance of Productivity improvements is shown within the 'Buy, Make, Fix' presentation. This presentation shows that if New Zealand is to achieve GDP growth at a rate that moves New Zealand up the order of OECD countries, increasingly this development will be dependent on productivity improvements. With the pool of extra workers (generally unemployment) more or less absorbed into employment

1 "What is the Knowledge Economy? Knowledge Intensity and Distributed Knowledge Bases" Keith Smith, United Nations University, June 2002

2 "The Knowledge Based Economy", OECD, OCED/GD(96)102. Pg 7. www.oecd.org/dataoecd/51/8/1913021.pdf

3 <http://www.dol.govt.nz/about/index.asp>

over the last 5 years, the growth in output will need to come from improvements in output per worker hour (Productivity).

It is generally agreed that increased levels of knowledge, via formal training or on the job development increases the productivity of those workers. Highly productive workplaces are a particular focus of the DoL report, '*Better Work, Working Better*⁴'.

Also by improving skill levels of New Zealand employees, the jobs of these employees become decreasingly susceptible to replacement by lower wage economies. The measurement of knowledge and the change in the stocks of that knowledge are central to the development of desired levels of worker productivity and job security.

1.2 Review of International Methodologies - Local Futures and the Work Foundation

While the theoretical concepts involved in Knowledge economies are important, to be applied it is also important to have a definition that is able to be measured. This drive towards application and measurement can be seen internationally.

Amongst other international institutions, The World Bank has developed the 'Knowledge Assessment Methodology'⁵, and a variety of other agencies including the OECD have noted the importance of Research and Development (R&D) spend, Academic research and the number of Patents issued as indicators of knowledge intensity. Recently in Australia⁶, the overemphasis on measurement of R&D expenditure has been criticised. The Australian Business Foundation report notes that the contribution of 'non research and development' components of the innovation process "*such as engineering experimentation, skill development, design activities*"⁷ should not be underestimated. By assigning the responsibility for innovation growth to R&D processes, the costs of innovation are underestimated, and the returns to R&D spend are overestimated.

Two relatively recent examples of the drive to produce actual measurements of knowledge intensity come from the United Kingdom based organisations, [Local Futures](#)⁸, and [The Work Foundation](#)⁹.

Local Futures

"The Local Futures Group is a research and strategy consultancy that provides a geographical perspective on social and environmental change, set within a 21st century knowledge economy." – taken from the Local Futures website.

Local Futures bases their measurement of the Knowledge Economy on educational qualifications as a proxy for knowledge. Local Futures calculate the Knowledge Intensity of an Industry or an Occupation based upon the proportion of the relevant workforce that has University degrees or Higher.

4 Pg 9, Better Work, Working Better, Labour Market & Employment Strategy, Department of Labour New Zealand,

5 <http://www.worldbank.org/kam>

6 "Innovation and the Knowledge Economy in Australia", Australian Business Foundation, May 2006

7 Ibid, Pg 18

8 <http://www.localfutures.com/>

9 <http://www.theworkfoundation.com/index.aspx>

As part of their methodology Local Futures developed a Knowledge rating scale, as displayed in Table 1 below. The higher the proportion of employees in an industry with graduate or higher qualifications, the more knowledge intensive the industries were considered to be.

Table 1: Local Futures Knowledge Intensity groupings

Lower share	Upper share	Rating
0.00	0.15	K4
0.15	0.25	K3
0.25	0.40	K2
0.40	1.00	K1

Table 1 shows that the industries or occupations with the highest share of tertiary graduates (more than 40% of those employed) are assigned a rating of "K1". At the other end of the scale, any industries or occupations where less than 15% of the workforce are tertiary graduates is assigned a rating of "K4". It is the number of industries with each rating that is used to determine the knowledge intensity of a region, an industry or an occupation.

The Work Foundation

"The Work Foundation is a not-for-profit organisation that brings all sides of working organisations together to find the best ways of improving both economic performance and quality of working life." - taken from The Work Foundation website.

The Work Foundation bases their calculation of the Knowledge Economy using the proportion of occupation types within a labour force. The Knowledge Intensity of an area (industry, region, sector) is determined by the proportion of the workforce who are employed as Legislators, Administrators and Managers, Professionals or Technicians and Associated Professionals. A high share of these occupations within a labour force is interpreted as being Knowledge Intensive, while a low share of these occupations within a labour force is interpreted as having low knowledge intensity.

These three occupation groups are identified as those with the consistently highest stocks of knowledge, and the proportion of these occupations within an industry or region provides an indicator of the skills available.

This methodology is based upon an internationally followed categorisation of occupations, something easily replicated in other countries including New Zealand. The mapping used is shown in Table 2.

Table 2: The Work Foundation Knowledge Occupation groupings

New Zealand Standard Classification of Occupations	Knowledge Worker category
01 Legislators, Administrators and Managers	Knowledge Worker
02 Professionals	Knowledge Worker
03 Technicians and Associate Professionals	Knowledge Worker
04 Clerks	Other
05 Service and Sales Workers	Other
06 Agriculture and Fishery Workers	Other
07 Trades Workers	Other
08 Plant and Machine Operators and Assemblers	Other
09 Labourers and Related Elementary Service Workers	Other
Not Elsewhere Included	Other

By defining a measure for knowledge in an economy, both methodologies allow the analyst to apply these calculations to a range of other variables. For example, knowing the highest qualification of a range of people (say in a region) as well as their age and industry of employment, using the Local Futures methodology you can analyse how knowledge intensity in different industries change as the workers age. The Work Foundation methodology is similar. For example, knowing how many workers are in each occupation group along with their duration of time spent in New Zealand, using The Work Foundation methodology you can analyse how knowledge intensity in migrants changes as their length of stay in New Zealand increases.

Commonly stated objections to the application of these methodologies include a) possession of a tertiary qualification not necessarily being linked to knowledge work, and b) Knowledge worker occupations being subjectively measured and again not necessarily reflecting knowledge work. While there are assumptions within both methodologies that can be challenged, some element of pragmatism is required to define a measure that can be calculated and tracked over time.

As part of the review of the methodologies used by Local Futures and The Work Foundation, a paper using each methodology was chosen for replication. By replicating the calculations, it was possible to determine whether the datasets were available in New Zealand to conduct the work. Additionally, the application to a New Zealand setting made it possible to review the assumptions and categorisations made in a practical setting. This review of assumptions will be discussed further in Phase 2 of the Knowledge Economy Project

The two papers that have been chosen are 'Understanding the Knowledge Economy'¹⁰ and 'Ideopolis: Knowledge City-Regions'¹¹. 'Understanding the Knowledge Economy' is a conference paper which uses the Local Futures measurement methodology, while the 'Ideopolis' paper is written by The Work Foundation, and uses the Work Foundation measurement methodology. Both of these papers have been selected based on the relatively introductory nature of the measurement methodology – reflecting the initial stage of this project within the Department of Labour.

Within New Zealand there are a range of datasets that produce labour market information. After reviewing the datasets (including the Household Labour Force Survey, Income Survey, Linked Employer Employee dataset and the Business Demography Survey) only the Population Census included the range of measured variables and quality of detailed data required to produce the calculations required.

The Population Census dataset combines the dual benefits of variety of questions, and the full coverage collection required for this analysis. The two international methodologies reviewed analyse knowledge stocks across a range of variables, as well as at a particularly detailed geographical level. The Population Census is the only New Zealand dataset able to generate multiple and disaggregated variables (be it detailed industry codes or detailed geographic breakdowns).

10 'Understanding the Knowledge Economy - From Theory to Practice', National RDA Research Conference paper, March 2004

11 'Ideopolis: Knowledge City – Regions'. The Work Foundation, March 2006.

1.3 Canterbury focus

Discussions commenced on the development of Knowledge Economy calculations in 2006. At around the same time, the Department was approached by [Canterbury Development Corporation \(CDC\)](#) who had some involvement with work conducted by The Work Foundation. In late 2006 DoL staff met with representatives of the CDC who expressed their interest in participating in this project. Due to this interest, results for Canterbury region and Christchurch City have been particularly 'highlighted' in the detailed analysis of Appendix One.

2. PRELIMINARY FINDINGS

Following the review of the two methodologies, the next step was to apply these methodologies in a New Zealand context. By applying these methodologies, an initial view of knowledge stocks within New Zealand could be developed.

Part of the value of measuring knowledge stocks is to identify how levels vary across different disaggregations, especially on a sub national basis. By showing how knowledge intensity varied across the United Kingdom, both papers provide interesting sub national content, able to be used by local level strategic decision makers.

Both methodologies were applied in this report using Regional Council boundaries. This has been done solely for the benefit of scale. While Regional Council data does show noticeable differences in knowledge intensity, the real value of these analyses is at the TA level. In the process of reviewing and applying the two methodologies, the calculations of the two chosen papers were replicated at both a regional council and TA basis. Regional Council analysis is contained within [Appendix 1](#), along with a selection of comment on the larger TA's. Equivalent data based on a TA breakdown is available from the author upon request.

At each extra level of industry disaggregation, a more complete story can be read. The initial dataset made available to DoL was at the one digit industry and occupation level. One digit industry data showed very few regional highly knowledge intensive industries, with the majority of results showing low knowledge intensity. As data at a 2 digit and 3 digit levels became available, noticeable differences in regional industry composition became more apparent. When disaggregated Industry or Occupation data is combined with disaggregated geographical data (TA results) a much wider range of knowledge intensity is shown.

While the methodologies of both Local Futures and The Work Foundations focus on slightly different indicators to determine the level of knowledge intensity, the results are quite similar.

When data is analysed at a Regional Council level, there are no areas which qualify as being highly Knowledge Intensive under the most basic evaluations of either methodology. Within New Zealand, each of the largest regions of New Zealand have a combination of strongly urban and strongly rural areas. It is this diversity that has meant that any knowledge intensity that does exist within a region is dispersed due to the lack of knowledge intensity elsewhere. By breaking the geographic data down further, to the TA level, consistent areas (fully urban or fully rural) are produced.

The analysis of results contained both here and in [Appendix 1](#), focuses on identifying the location of high levels of knowledge intensity. Locations of high levels of knowledge intensity help identify where programmes can be implemented which depend on high knowledge stocks. Equally important, although not addressed directly in this report, is the identification of lower levels of knowledge. This information could be used to a) identify whether this lower stock is a concern, and if it is to b) develop programmes to increase knowledge intensity.

At a TA level, results for Wellington City and Auckland City clearly stand out from the remainder of the cities and districts of New Zealand as the most concentrated stores of knowledge. Across each of the calculations of both the Local Futures and The Work Foundation methodologies, Wellington and Auckland consistently show the highest levels of Knowledge Intensity.

Throughout the analysis, Wellington and Auckland rated highest in the majority of calculations.

1. They are the TAs with the largest proportion of high knowledge industries.
2. They have the largest growth in this proportion between 2001 and 2006.
3. The public sector employment of the two TA's has the highest proportion of graduates.
4. The private sector employment of the two TA's has some of the fastest increase between 2001 and 2006.
5. They are the only two TAs with a share of graduates greater than their share of the working age population (a high concentration of graduates).
6. They have the highest share of knowledge workers in both 2001 and 2006
7. They have the highest share of knowledge intensive business units in both 2001 and 2006.
8. They have the highest share of employment in knowledge intensive industries in both 2001 and 2006.
9. Auckland and Wellington regions have the highest shares of employment of knowledge intensive occupations in knowledge intensive industries.

The main difference between the results for Wellington and Auckland cities is the difference of sector of employment. As shown by Table 6.1 in Appendix 1, 39.7% of all degree holders in Wellington City worked in Public Sector employment, while the equivalent figure for Auckland City was only 26.8%. The share of Auckland City degree holders in public sector employment is particularly low, with only Queenstown Lakes District being lower.

This result for Auckland City reflects the large volume of high knowledge employment in the Auckland Private sector. Auckland City employment is characterised by a combination of a smaller share of government industry and higher share of private sector employment in industries like Finance and Insurance, Property and Business Services and other 'high knowledge' private sector employment.

Outside of Auckland and Wellington Public sector employment of tertiary graduates is more prominent. Sixteen TA's in 2006 had more than half of their resident tertiary graduates employed in the Public sector. Of these sixteen TA's, the majority were smaller, rural and relatively isolated districts. Kawerau District had the highest share of public sector employment of graduates – with 85.7% of graduates employed by government agencies.

3. IMPLICATIONS OF RESULTS

The initial purpose of this investigation was to identify whether Knowledge Economy calculations as conducted elsewhere were feasible with New Zealand datasets. Of the two methodologies reviewed, all but one of the calculations required has been produced from data currently available. These calculations provide results that indicate the location and scale of the knowledge economy within New Zealand. The only calculation not currently able to be replicated is the analysis of knowledge intensity of employees by business size.

While the data is available to measure the New Zealand Knowledge Economy, the vast majority of the data comes from the Population Census. Given the timing of the conduction of the Census, this analysis will only be able to be updated every five years. While development of new knowledge may leap from discovery to discovery, the methodologies used here measure the dissemination of knowledge across the wider labour force – something that does not change significantly on an annual basis. Given the relatively slow rate of change, 5 yearly updates of these calculations are likely to be satisfactory.

The overriding result from this paper is the focus of knowledge workers and knowledge industries within Auckland and Wellington cities. As shown in the Preliminary Findings section, Wellington and Auckland cities generally have the strongest results across almost all of the calculations conducted.

The consistency of the results produced by this analysis shows that it is currently only Wellington and Auckland Cities that could currently be considered to be heading towards a 'knowledge economy' status. The importance of this finding is that if an industry is looking to locate to a site where widespread knowledge intensity is available, it is Wellington and Auckland that provide the most complete state available in New Zealand. On a partial basis several other TA's provide some of the knowledge environment, these TA's include (in no particular order) North Shore City, Christchurch City, Palmerston North City, Hamilton City and Dunedin City.

The focus of graduate employment in public sector jobs outside of Auckland and Wellington limits the potential for growth in knowledge stocks. For graduate employment to continue or to expand within these districts, dependence upon government agencies needs to decline. It cannot be expected that public sector employment will continue to grow to provide more regional vacancies for graduates. The focus of growth needs to come from private sector employment.

While the majority of New Zealand employment is in lower skilled industries, skill levels are increasing over time (this pattern is shown using both of the methodologies replicated). Consistently across the country and across industries, skill levels were higher in 2006 than they were in 2001. This pattern of increased skill levels is noted in each of the [Annual In Depth Regional reports](#) as well as the inter temporal analysis of this report.

It would appear that knowledge intensity in New Zealand is at a lower level than in the United Kingdom. With the exception of Auckland and Wellington cities, New Zealand based calculations produce lower results at both a region and TA level than for equivalent areas in the United Kingdom based reports. This result is especially significant as UK data is generally from 2001 while New Zealand data is for 2006 – United Kingdom knowledge intensity is likely to be higher in 2006 data. The validity of a direct comparison of results between New Zealand and other countries will be considered as part of Phase Two of the Knowledge Economy project.

Results for Canterbury are consistently stronger under The Work Foundation methodology. This suggests that Canterbury has a slightly stronger focus on Knowledge Industries compared with highly skilled workers within those industries. Having said this, Canterbury and Christchurch in particular shows relatively strong results in both methodologies.

4. FUTURE WORK

While the work done so far has focussed on replicating the initial findings of the Local Futures and Work Foundation documents, both of these organisations have now evolved their measurement methods much further.

The next stage of the project (to be defined in the Phase Two Project Plan) will be for the investigation and potential replication of current Knowledge Economy methodologies. While there will be a particular focus of Local Futures and The Work Foundation, other sources of analysis will also be considered.

Phase Two will also include a review of the methodologies with a view to the customising of measures for a New Zealand environment. The impact of changing methods will be evaluated and 'New Zealand' solutions will be considered.

Given the insights available from the temporal analysis, Phase Two will also include an extension of the time series. Statistics New Zealand will be contacted to provide 3 digit 1996 and 1991 Population Census data based on an ANZSIC96 and NZSCO99 basis.

The vast majority of analysis has come from data based on the Usual residence of the Population Census respondent, rather than on a Workplace basis. Data on a 'Usual Residence' basis is much cleaner (there is less non response error) however data based on Workplace may be more meaningful. Phase Two will consider the replication of this work on a Workplace basis rather than a Usual Residence basis.

Wider stakeholder engagement will occur as part of the next stage of the Project. In particular, the Ministry of Economic Development (MED) and New Zealand Trade and Enterprise (NZTE) and internally the Employment and Skills team will be approached to provide input into the design of any methodology developed in the second phase of the project.

APPENDIX ONE – INTERNATIONAL METHODOLOGY APPLICATION TO NEW ZEALAND.

This section outlines the replication of both Local Futures and The Work Foundation methodologies.

The paper that used the Local Futures methodology proved straight forward to replicate with New Zealand data, with the exception of the Occupational Employment Forecasts. This forecast however was not a core part of the Knowledge Economy section of the analysis. At the time of writing this document, there is no accepted source of Occupational Forecasts in New Zealand.

While the Local Futures paper was based on data for a single time period, data available in New Zealand allowed the analysis to be expanded to compare results for both 2001 and 2006. Some of the most interesting findings of this report come from this inter temporal comparison. Given this finding it is likely that more Census time periods will be added to this analysis in Phase Two of this project.

As well as adding inter temporal analysis, The Local Futures paper was extended by the replication of the Local Futures tool, the 'Regional Economic Architecture' or REA. The REA produces a table which presents both supply and demand elements of Knowledge within a local area. The structure of the REA, along with colour coding of results allows readers a quick view of the knowledge intensity of the area chosen, a useful summary tool. A detailed explanation of the REA is available later in this report.

The Work Foundation paper was also relatively straight forward to replicate. While the vast majority of tables were taken from 3 digit industry and occupation Population Census datasets, one of the variables 'the proportion of businesses in knowledge intensive industries' was calculated from the Business Demography dataset. Fortunately, the Business Demography dataset was also available at the TA and 3 digit ANZSIC96 industry breakdown. The availability of the data meant that each of the tables within The Work Foundation report were able to be replicated within New Zealand at a TA level. The outputs of this report are primarily at the Regional Council level, with reference to results for some of the larger TA's included in commentary. The tabulated results for these larger TA's is included at the end of Appendix One. Results for all TA's are available on request.

Local Futures Approach

The Local Futures paper 'Understanding the Knowledge Economy' is a conference paper submitted in 2004 which takes Local Futures methodology and focuses on results for the East Midlands, and compares to other regions within Great Britain. Following the methodology used in the Paper, Industry data based on the 3 digit ANZSIC96 classification for both 2001 and 2006 were produced. An example of the methodology used in the production of this table is as follows:

Three digit ANZSIC industry data was gathered for each region. Within this information, the share of employment of people with Bachelor degrees or higher within the total industry employment was calculated. Using the assignment of Table 1 earlier in this report, each industry within each region was assigned a Knowledge Intensity rating. The proportion of that particular Knowledge Intensity rating within all of the industries in that region was calculated which gives the

percentage in Table 3. For example, in Northland, in the 2006 Population Census, 63 of the 237 people who reported working in the Computer Services industry¹² had a Bachelor Degree of higher. This means that the industry in Northland was assigned a Knowledge Intensity of K2. In Northland in 2006, 9 of the 159 industries were K2, giving K2 industries 5.6% of regional employment.

Table 3 shows results for 2006. The table shows that Wellington region had the highest share of K1 industries, at 17.5%. Wellington was followed by Auckland (11.3%), Otago (8.1%), Tasman (7.5%) and Canterbury (6.9%). New Zealand overall had a K1 share of 5.7%. The table shows that the majority of regions have between 70 – 80% of all employment within the K4 sector.

The scale of employment of Wellington and Auckland is clear – the relatively low shares of K4 industries in these regions pull the overall rate (62.3%) below that seen in most of the regions (70 – 80%).

Across each of the tables in the report, national level results have been generated from independent calculations. Regional coding of the data has caused multiple rounding, which when summarised produces significantly different results from data that is calculated independently at a national level.

Table 3 of this report gives a good example of the significance of this treatment. The National share of the K2 category was 18.2%. As can be seen from the remainder of Table 3, this does not reflect an average of the regions. In this instance, a sum of the regionally defined data would produce a K2 rating of 9.7%, much smaller than the independently calculated national data.

Table 3: Employment in Knowledge Intensive Industries in 2006

	K1	K2	K3	K4
New Zealand ¹³	5.7%	18.2%	13.8%	62.3%
Northland Region	3.1%	5.6%	12.5%	78.8%
Auckland Region	11.3%	19.4%	25.6%	43.8%
Waikato Region	3.1%	8.8%	15.6%	72.5%
Bay of Plenty Region	2.5%	6.9%	10.6%	80.0%
Gisborne Region	3.1%	8.8%	6.3%	81.9%
Hawke's Bay Region	5.0%	7.5%	12.5%	75.0%
Taranaki Region	2.5%	7.5%	12.5%	77.5%
Manawatu-Wanganui Region	3.8%	9.4%	7.5%	79.4%
Wellington Region	17.5%	13.8%	13.1%	55.6%
Nelson Region	3.8%	12.5%	10.6%	73.1%
Tasman Region	7.5%	10.6%	10.0%	71.9%
Marlborough Region	3.8%	6.3%	10.6%	79.4%
West Coast Region	1.9%	5.0%	9.4%	83.8%
Canterbury Region	6.9%	13.1%	13.8%	66.3%
Otago Region	8.1%	15.6%	17.5%	58.8%
Southland Region	2.5%	5.0%	8.8%	83.8%

Source: Census 2006, Statistics New Zealand

Sub regionally, Auckland City had the highest share of K1 industries at 31.6%, followed by Wellington City at 28.5%. The equivalent result for Christchurch was

¹² ANZSIC96 Industry L783 Computer Services.

¹³ Note: National data is calculated separately from regional data, and produces results quite different from regional summations due to rounding. More information is available in Appendix 2.

8.9%. A table showing the full K1 – K4 results for six of the largest TA's in 2006 is included later in Appendix 1.

With data also available for 2001, a comparison over time was available. This comparison as presented in Table 4 shows that with the exception of Nelson, every region increased their share of K1 employment between 2001 and 2006. Wellington region had the highest share of K1 employment in 2001 as well as the largest growth between 2001 and 2006.

Table 4: Change in Knowledge Intensity of Employment – 2001 to 2006

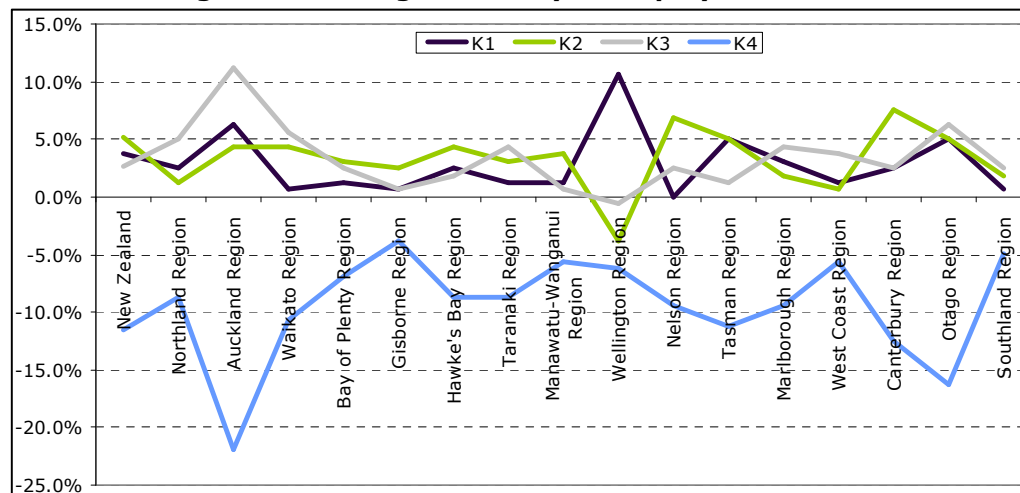
	K1	K2	K3	K4
New Zealand	3.8%	5.1%	2.6%	-11.5%
Northland Region	2.5%	1.3%	5.0%	-8.8%
Auckland Region	6.3%	4.4%	11.3%	-21.9%
Waikato Region	0.6%	4.4%	5.6%	-10.6%
Bay of Plenty Region	1.3%	3.1%	2.5%	-6.9%
Gisborne Region	0.6%	2.5%	0.6%	-3.8%
Hawke's Bay Region	2.5%	4.4%	1.9%	-8.8%
Taranaki Region	1.3%	3.1%	4.4%	-8.8%
Manawatu-Wanganui Region	1.3%	3.8%	0.6%	-5.6%
Wellington Region	10.6%	-3.8%	-0.6%	-6.3%
Nelson Region	0.0%	6.9%	2.5%	-9.4%
Tasman Region	5.0%	5.0%	1.3%	-11.3%
Marlborough Region	3.1%	1.9%	4.4%	-9.4%
West Coast Region	1.3%	0.6%	3.8%	-5.6%
Canterbury Region	2.5%	7.5%	2.5%	-12.5%
Otago Region	5.0%	5.0%	6.3%	-16.3%
Southland Region	0.6%	1.9%	2.5%	-5.0%

Source: Census 2001 and 2006, Statistics New Zealand

Of the TA's being evaluated, Auckland City had the largest increase in K1 ratings, up 14.6 percentage points, followed by North Shore City (up 11.4%) and Wellington City (up 8.9%). The equivalent result for Christchurch was 2.5%. A table showing the full K1 – K4 results for six of the largest TA's in 2006 is included later in Appendix 1.

Chart 1 shows a consistent pattern. Each region, with the exception of Wellington, increased their shares of K1, K2, and K3 employment at the expense of declining shares of K4 employment. The pattern for Wellington is quite different. The growth has been exclusively in K1 employment, with a corresponding decline in the share of K2, K3 and K4 employment. In the analysis conducted in this report, results for Wellington are frequently different from those of the rest of New Zealand, generally due to the particularly high share of highly knowledge intensive employment.

Chart 1: Change in Knowledge Intensity of Employment – 2001 to 2006



Source: Census 2001 and 2006, Statistics New Zealand

Overall Knowledge Intensity

As well as looking at the knowledge intensity of industries within regions and TA's, overall knowledge intensity of those employed in the region or TA can be observed. While this is not a direct replication of the Local Futures conference paper, it certainly aids analysis of the New Zealand environment.

Table 5: Overall Regional Knowledge Intensity rating

Regional Council	Knowledge Intensity	Knowledge rating	Rate of growth (change from 2001 – 2006)
Northland Region	11.0%	K4	41.2%
Auckland Region	23.4%	K2	38.9%
Waikato Region	14.3%	K4	38.4%
Bay of Plenty Region	12.3%	K4	40.4%
Gisborne Region	11.3%	K4	45.5%
Hawke's Bay Region	11.8%	K4	44.2%
Taranaki Region	10.7%	K4	39.5%
Manawatu-Wanganui Region	13.8%	K4	29.0%
Wellington Region	27.0%	K2	25.1%
Nelson Region	11.7%	K4	48.2%
Tasman Region	15.8%	K3	42.9%
Marlborough Region	10.6%	K4	49.5%
West Coast Region	8.9%	K4	39.2%
Canterbury Region	16.4%	K3	33.5%
Otago Region	18.4%	K3	32.9%
Southland Region	9.8%	K4	42.3%
New Zealand	18.5%	K3	35.6%

Source: Census 2006, Statistics New Zealand

Table 5 shows the impact of the level at which data is analysed. In Table 5, Regional Council results show that only two of the regions (Wellington and

Auckland) have a Knowledge Intensity rating of higher than K3, both at K2. When the data is presented at a TA level, more divergent results can be seen. The 'overall' knowledge intensity shows that, as measured by the 2006 Population Census, only Wellington City had an overall K1 rating, with 40.3% of workers having a tertiary qualification. The TA with the second largest share of graduates in employment was Auckland City (rated at K2 with 34.9%), followed by North Shore City (K2 with 25.9%) and Dunedin City (K3 with 22.5%).

While Christchurch City was at K3 with 19.4% of the employees having a tertiary qualification, the rate of growth in this variable (31.8% higher in 2006 than 2001) was higher than either Auckland or Wellington City. A table summarising these overall knowledge intensity calculations at the TA level is included later in Appendix 1.

Public Sector¹⁴ focus of Highly Skilled employment

Nationally, over a third (37.8%) of all University graduates worked in the Public Sector in 2006. This result varied across New Zealand, with the public sector generally being responsible for a higher share of graduate employment in areas with smaller financial operations. As shown in the first column of Table 6, the Auckland region, home of New Zealand's main financial hub, had the lowest share of graduate employment in Public sector organisations (29.9%). Contrast this result with that of Gisborne region, which has 53.6% of all employed graduates working for public sector organisations. Canterbury has a level of graduate employment in the public sector (37.8%) similar to the national average.

The remaining two columns of Table 6 show the share of graduate employment in the labour force of the regions. In each region graduates make up a much larger share of public sector jobs compared with private sector jobs. The large private financial sectors in Auckland and Wellington are clearly shown in the results with both of these regions having the largest share of graduates in their private sector employment (21.5% of Private Sector employment in Wellington were Graduates, 20.4% in Auckland). Within the data for Auckland and Wellington regions, this high level of private sector graduate employment is specifically related to people who live in Auckland City and Wellington City. Results for Christchurch City, while well ahead of the rest of the Canterbury, lag Dunedin City and Queenstown, as well as North Shore and Hamilton cities in the share of graduates in both public and private sector employment.

¹⁴ The definition of 'Public Sector' comes from the Local Futures Technical Annex. More information on the contents of this definition is available in the 'Knowledge Economy Working Document'.

Table 6: Employment of Graduates by Sector of employment

	Public sector share of Graduate employment	Graduates share of Public sector	Graduates share of Private Sector
New Zealand	37.8%	37.8%	14.6%
Northland Region	50.0%	28.8%	7.1%
Auckland Region	29.9%	42.5%	20.4%
Waikato Region	44.3%	35.4%	10.1%
Bay of Plenty Region	46.6%	30.9%	8.3%
Gisborne Region	53.6%	28.6%	7.1%
Hawke's Bay Region	44.6%	30.1%	8.2%
Taranaki Region	46.9%	29.2%	7.2%
Manawatu-Wanganui Region	51.1%	31.1%	8.8%
Wellington Region	41.3%	45.8%	21.5%
Nelson Region	38.2%	30.8%	8.7%
Tasman Region	41.5%	33.1%	12.0%
Marlborough Region	39.0%	25.8%	7.9%
West Coast Region	48.4%	26.4%	5.7%
Canterbury Region	38.7%	35.5%	12.6%
Otago Region	43.4%	41.1%	13.3%
Southland Region	49.3%	31.0%	6.1%

Source: Census 2006, Statistics New Zealand

While Table 6 showed the 2006 pattern of Graduate employment, this pattern is changing over time. Table 6 shows the change between 2001 and 2006, with public sector employment of graduates declining consistently. The public sector decline in share (or otherwise stated Private Sector increase) is consistent across New Zealand (with the exception of the 'Government focussed' Wellington Region, and to a lesser extent Nelson).

Table 7 shows that while share of graduates in Public sector employment has grown (8.9% nationally), the growth is relatively smaller than the Private sector growth (4.4%), causing the share of public sector employment to decline (-2.3%). A table showing the full results for six of the largest TA's in 2006 is included later in Appendix 1.

Table 7: Change in Graduate employment – 2001 to 2006

	Change in Public sector share of Graduate employment	Public sector	Private Sector
New Zealand	-2.3%	8.9%	4.4%
Northland Region	-3.0%	7.4%	2.4%
Auckland Region	-2.4%	9.8%	6.4%
Waikato Region	-3.4%	8.5%	3.3%
Bay of Plenty Region	-2.0%	8.5%	2.7%
Gisborne Region	-0.7%	8.9%	2.4%
Hawke's Bay Region	-3.2%	9.1%	2.8%
Taranaki Region	-1.1%	8.7%	2.3%
Manawatu-Wanganui Region	-4.3%	6.4%	2.5%
Wellington Region	1.4%	8.9%	4.7%
Nelson Region	0.2%	9.3%	2.8%
Tasman Region	-4.7%	7.4%	4.6%
Marlborough Region	-3.0%	8.8%	2.9%
West Coast Region	-4.6%	7.7%	2.0%
Canterbury Region	-2.7%	8.3%	3.5%
Otago Region	-7.3%	8.7%	4.4%
Southland Region	-0.5%	8.7%	1.9%

Source: Census 2001 and 2006, Statistics New Zealand

Nationally, while Education has a particularly high Knowledge Intensity (47.5% of the workforce has a tertiary qualification), it does not hold the largest stock of tertiary qualifications. The Property and Business Services industry employs 83,000 of Tertiary graduates, 22.6% of the total stock, compared to Education's 66,000 workers and 18% of the graduate workforce.

Sub regionally, North Shore and Auckland cities showed the largest growth in Public and Private sector shares of Graduate employment. The employment of North Shore resident Graduate employment in Public sector jobs grew by 10.9%, and Private sector jobs grew by 7.1%. The equivalent figures for Auckland City were 9.8% and 8.3%. A table showing the full results for six of the largest TA's in 2006 is included later in Appendix 1.

Regional Knowledge Intensity of employment

Table 8 shows that across New Zealand, graduates make up a higher than representative share of the working age population in only two regions, Auckland and Wellington. While Auckland accounts for 31.6% of the nations working age population, it accounts for 40.1% of graduate employment. Wellington region accounts for 11.8% of the working age population, and 17.2% of graduate employment.

Table 8: Proportion of New Zealand’s Graduate employment compared with Working age Population

	Regions share of graduates	Regions share of the WAP
Northland Region	1.9%	3.2%
Auckland Region	40.1%	31.6%
Waikato Region	7.2%	9.4%
Bay of Plenty Region	4.0%	6.0%
Gisborne Region	0.6%	1.0%
Hawke's Bay Region	2.4%	3.7%
Taranaki Region	1.5%	2.6%
Manawatu-Wanganui Region	4.1%	5.5%
Wellington Region	17.2%	11.8%
Nelson Region	0.7%	1.2%
Tasman Region	0.9%	1.1%
Marlborough Region	0.7%	1.1%
West Coast Region	0.4%	0.8%
Canterbury Region	12.1%	13.6%
Otago Region	5.0%	5.0%
Southland Region	1.3%	2.4%

Source: Census 2006, Statistics New Zealand

Sub regionally, Auckland and Wellington cities have the highest share of graduates in New Zealand, at 19.3% and 11.3% of New Zealand’s graduates respectively. Both of these results exceed their shares of the working age population. Christchurch City had 9.4% of the nation’s graduates, marginally higher than its share of the working age population. A table showing the full results for six of the largest TA’s in 2006 is included later in Appendix 1.

Regional Economic Architecture

As part of the development of the Local Futures methodology, a presentation form called ‘Regional Economic Architecture’ or REA was developed¹⁵. The REA is used to graphically show the level of Knowledge intensity across the core measured variables on both a supply and demand basis. As noted in the Local Futures report “The REA is an attempt to create a unified, simple view of the knowledge economy using human capital ‘building blocks’ – employment on one side and skills measured by qualifications on the other.”¹⁶

This construction has been replicated for Christchurch City, Wellington City and Auckland City, with the tables included as Appendix 1.

Results for the REA are unfortunately incomplete. The omission is the lack of a New Zealand based dataset that will produce Knowledge Intensity of employees disaggregated by the size of their employer. The Business Demography Survey does produce employee counts by size of business, but does not capture information on the qualifications held by those employees. The other main source of data in this project is the Population Census, however it captures qualification data for people in employment but does not include any information on the size of the employers.

The Regional Economic Architecture tables for Auckland, Wellington and Christchurch cities are available over the next three pages:

¹⁵ The REA is described in ‘A Regional Perspective on the Knowledge Economy in Great Britain’, The Local Futures Group, Pg 6 – 9, downloadable here - <http://www.trainingfoundation.com/research/default.asp?PageID=1126>.

¹⁶ Ibid Pg 6.

[Results for Auckland City](#)

[Results for Wellington City](#)

[Results for Christchurch City](#)

Regional Economic Architecture, Auckland, Wellington and Christchurch cities.

Auckland City

				Region is:	Auckland City										
				Average Weekly Earnings NZ=100		64.8%	Employment Rat								
Total Employment				Total Employment											
Knowledge Intensity															
	K1	K2	K3	K4	Bachelor Degree or Higher	Level 4, 5, or 6 Post School	Level 1, 2 or 3 Post School	School based	No Qualification						
% of Total Employment	31.4%	20.8%	28.3%	18.3%	27.4%	15.5%	3.6%	33.0%	14.1%						
Average earnings					Average Earnings										
% of Private Sector Employment	27.8%	20.8%	31.3%	20.1%	Employment										
Average earnings					Employment Rate	82.6%	74.9%	67.9%	60.1%	42.2%					
				Unemployment Rate	3.4%	3.9%	7.6%	7.2%	9.6%						
Occupational Structure				Inactivity (NILF) Rate	14.5%	22.1%	26.6%	35.2%	53.3%						
Legislators, Administrators and Managers	66.7%	33.3%	0.0%	0.0%	Gender - Employed										
Professionals	100.0%	0.0%	0.0%	0.0%	Male	Female	Male	Female	Male	Female	Male	Female			
Technicians and Associate Professionals	37.5%	50.0%	12.5%	0.0%	33.9%	36.1%	18.8%	17.0%	3.5%	4.1%	29.9%	31.5%			
Clerks	0.0%	50.0%	50.0%	0.0%											
Service and Sales Workers	0.0%	0.0%	50.0%	50.0%											
Agriculture and Fishery Workers	0.0%	0.0%	50.0%	50.0%											
Trades Workers	0.0%	0.0%	7.1%	92.9%	Age Cohorts										
Plant and Machine Operators and Assemblers	0.0%	5.0%	10.0%	85.0%	15-24	10.8%	16.1%	8.0%	8.1%	3.6%	4.3%	64.1%	60.1%	13.4%	10.6%
Labourers and Related Elementary Service Workers	0.0%	0.0%	0.0%	100.0%	25-44	35.8%	38.9%	17.3%	15.0%	3.5%	4.2%	34.0%	33.7%	8.5%	7.0%
Not Elsewhere Included	0.0%	66.7%	0.0%	33.3%	45-64	27.7%	22.5%	19.1%	17.4%	2.6%	3.1%	41.5%	47.4%	15.6%	17.5%
Business Structure				Human Capital Indices											
1-5 Employees					Overall	2.16		Employment Rates							
6-9 Employees															
10-19 Employees															
20-49 Employees															
50-99 Employees					All Ages	2.73	2.75	All Ages							
100+ Employees					15-24	2.27	2.41	15-24							
					25-44	3.00	3.02	25-44							
					45-64	2.93	2.81	45-64							

Christchurch City

				Region is:	Christchurch City										
				Average Weekly Earnings NZ=100		64.4%	Employment Rat								
Total Employment Knowledge Intensity				Total Employment											
	K1	K2	K3	K4	Bachelor Degree or Higher	Level 4, 5, or 6 Post School	Level 1, 2 or 3 Post School	School based	No Qualification						
% of Total Employment	8.8%	11.3%	22.6%	57.2%	15.6%	18.6%	3.5%	33.7%	21.8%						
Average earnings					Average Earnings										
% of Private Sector Employment	5.6%	9.0%	24.3%	61.1%	Employment										
Average earnings					Employment Rate	79.9%	76.0%	72.7%	65.8%	47.8%					
				Unemployment Rate	3.1%	2.5%	5.4%	5.1%	6.8%						
Occupational Structure				Inactivity (NILF) Rate	17.5%	22.1%	23.1%	30.7%	48.8%						
Legislators, Administrators and Managers	16.7%	50.0%	33.3%	0.0%	Gender - Employed										
Professionals	34.1%	5.9%	0.0%	0.0%	Male	Female	Male	Female	Male	Female	Male	Female			
Technicians and Associate Professionals	12.5%	43.8%	31.3%	12.5%	18.2%	20.8%	24.4%	19.3%	3.6%	4.4%	32.2%	37.0%	17.3%	15.0%	
Clerks	0.0%	0.0%	33.3%	66.7%											
Service and Sales Workers	0.0%	0.0%	25.0%	75.0%											
Agriculture and Fishery Workers	0.0%	0.0%	0.0%	100.0%											
Trades Workers	0.0%	0.0%	7.1%	92.9%											
Plant and Machine Operators and Assemblers	0.0%	0.0%	0.0%	100.0%											
Labourers and Related Elementary Service Workers	0.0%	0.0%	0.0%	100.0%											
Not Elsewhere Included	0.0%	0.0%	66.7%	33.3%											
Business Structure				Age Cohorts											
1-5 Employees					15-24	6.1%	9.6%	8.4%	9.0%	4.1%	5.4%	73.3%	69.1%	20.6%	17.0%
6-9 Employees					25-44	21.3%	25.2%	23.5%	18.1%	3.7%	4.5%	45.0%	46.9%	15.4%	12.5%
10-19 Employees					45-64	16.7%	14.4%	26.0%	19.8%	2.6%	2.8%	47.3%	55.6%	22.2%	25.3%
20-49 Employees															
50-99 Employees															
100+ Employees															
				Human Capital Indices				Employment Rates							
				Overall	1.81										
				Male		Female		Male		Female					
				All Ages	2.80	2.70	All Ages	70.5%	58.8%						
				15-24	2.38	2.46	15-24	59.0%	53.9%						
				25-44	2.95	2.93	25-44	86.7%	73.0%						
				45-64	2.96	2.82	45-64	84.0%	73.2%						

The Work Foundation Approach

The Work Foundation approach is, like Local Futures, motivated by the attempt to actually provide a measurement for the concept of the 'Knowledge Economy'. While the Local Futures work is based on the measurement of Degree Level qualifications across a range of other labour market results, The Work Foundation has based much of their analysis on the measurement of the proportion of workers in highly skilled occupations across a range of other labour market results.

The Work Foundation paper 'Defining the Knowledge Economy'¹⁷ reviewed a range of methods for measuring the 'Knowledge Economy' including the method using the Local Futures approach of highly qualified workers. The paper notes that in earlier work by The Work Foundation including the 'Ideopolis papers'¹⁸, Knowledge Workers were identified by the proportion of workers who were in the first three one digit occupation groups (Legislators Administrators and Managers, Professionals, and Technicians and Associate Professionals). The findings of this recent paper from The Work Foundation suggests ongoing use of the 'top three' occupational groups and the predefined 'knowledge intensive industries' as the basis for their future work.

To replicate calculations of The Work Foundation paper, Population Census data for 2001 and 2006 was disaggregated by region and TA of residence to produce estimates that measure Knowledge Intensity. As with the Local Futures work, results of a particular paper were chosen for replication, in this case '*Ideopolis: Knowledge City-Regions*'¹⁹. This paper presents the concept of Knowledge Cities, whereby Knowledge Intensive Cities are the basis for economic growth for the wider city – region. The paper outlines the concept of the Ideopolis and the secondary Ideopolis, as well as defining a set of measurements to identify progress towards becoming an Ideopolis. It is this set of measurements that will be replicated for the regions and TAs of New Zealand. On Page 28 of the 'Knowledge City-Regions report, The Work Foundation presents "Box D: How do you measure knowledge intensity in an Ideopolis?". The four measures are:

- 1) Proportion of the Labour Force working in Knowledge Intensive occupations across all Businesses
- 2) Proportion of total businesses that are in knowledge intensive sectors (industries)
- 3) Proportion of Labour force employed in knowledge intensive sectors
- 4) Proportion of labour force working in knowledge intensive occupations in knowledge intensive industries.

The definitions used in New Zealand to replicate these measures are based on as close as possible to the definitions used in the UK. In fact, for the fourth point above where knowledge intensive occupations in knowledge intensive industries were attempted, the data available to DoL was superior in its detail to that presented by The Work Foundation.

17 'Defining the Knowledge Economy – Knowledge Economy Programme Report, Ian Brinkley, The Work Foundation, July 2006.

18 Ibid Pg 17

19 Ideopolis: Knowledge City – Regions. The Work Foundation, March 2006.

Replication of results:

In the Ideopolis paper, following the definition of the four measures, the measures are applied to the largest cities within the United Kingdom²⁰. The following four tables recreate these calculations based on results for New Zealand's regions.

Proportion of the Labour Force working in Knowledge Intensive occupations across all Businesses

Table 9: Number and share of Knowledge Intensive Occupations 2001 to 2006

	2001		2006		Change 01 - 06	
New Zealand	645,444	37.5%	815,442	41.1%	169,998	26.3%
Northland Region	15,642	33.2%	20,499	38.3%	4,857	31.1%
Auckland Region	216,276	45.9%	281,979	51.5%	65,703	30.4%
Waikato Region	45,540	34.9%	58,254	39.7%	12,714	27.9%
Bay of Plenty Region	30,717	35.3%	41,205	40.2%	10,488	34.1%
Gisborne Region	4,953	33.0%	5,841	36.6%	888	17.9%
Hawke's Bay Region	17,736	32.0%	22,560	36.2%	4,824	27.2%
Taranaki Region	12,966	31.4%	15,486	35.9%	2,520	19.4%
Manawatu - Wanganui Region	29,133	34.2%	34,533	37.6%	5,400	18.5%
Wellington Region	92,019	48.7%	110,151	54.0%	18,132	19.7%
Tasman Region	3,831	25.5%	5,283	31.6%	1,452	37.9%
Nelson Region	7,569	40.1%	9,873	45.0%	2,304	30.4%
Marlborough Region	5,106	30.5%	6,447	34.0%	1,341	26.3%
West Coast Region	3,702	30.2%	4,560	32.9%	858	23.2%
Canterbury Region	76,926	38.0%	97,986	42.2%	21,060	27.4%
Otago Region	27,411	35.2%	34,257	40.0%	6,846	25.0%
Southland Region	10,956	27.1%	12,792	31.8%	1,836	16.8%

Source: Census 2001 and 2006, Statistics New Zealand

Table 9 shows that the majority of growth (in volume of knowledge workers) has occurred in Auckland region, with nearly 66,000 more knowledge workers in 2006 than there were in 2001. The next highest volume growth was for Canterbury region, with 21,000 more knowledge workers in 2006 than there were in 2001, representing a growth of 4.2%. Strong percentage growth was recorded across much of the country, especially amongst some of the more rural regions like Northland, Bay of Plenty, and Tasman, although much of this growth comes from a low base.

Results presented in the 'Knowledge City-Regions' paper are not directly comparable as results from The Work Foundation are based on location of residence, while the DoL data shows location of workplace. This is likely to show places with high inward commuting for work to have higher than average knowledge intensity, with locations with high outward commuting for work having lower than average knowledge intensity.

Setting this aside, results for New Zealand are quite similar to the results shown in Table 2²¹ of the of The Work Foundation paper. While New Zealand regional

20 The cities for which data is presented are: Edinburgh, Bristol, Leeds, Glasgow, Manchester, Sheffield, Birmingham, Newcastle – Gateshead, Bradford and Liverpool.

21 Pg 27, Ideopolis: Knowledge City – Regions.

results are quite variable, any result of over 40% of employment compares well the UK results which are generally between 35 – 40% share of employment.

Sub regionally, Wellington City had the highest share of Knowledge Workers in their workforce, at 61.9%. This was followed by Auckland City at 57.5% and North Shore City at 53.0%. In terms of growth, Auckland City had the largest increase in number of Knowledge Workers, up 32,000 workers, while North Shore City grew by the largest proportion, up 38.2%. A table showing the full results for six of the largest TA's in 2006 is included later in Appendix 1.

Proportion of total businesses that are in knowledge intensive sectors (industries)

Table 10: Number of Knowledge Intensive Business Units, Change and Share of all Businesses by Region

	Knowledge Intensive Business Units		Chg 01 - 06	Share of KI Business Units	
	2001	2006		2001	2006
New Zealand	77,777	98,458	20,681	25.7%	26.0%
Northland Region	1,881	2,389	508	18.2%	17.9%
Auckland Region	32,181	41,620	9,439	29.8%	31.1%
Waikato Region	5,185	6,593	1,408	20.4%	20.5%
Bay of Plenty Region	3,734	5,041	1,307	19.8%	20.7%
Gisborne Region	528	608	80	19.5%	17.9%
Hawke's Bay Region	2,102	2,621	519	21.3%	20.5%
Taranaki Region	1,473	1,741	268	21.0%	20.2%
Manawatu-Wanganui Region	2,819	3,287	468	19.0%	18.6%
Wellington Region	13,239	15,526	2,287	36.0%	36.6%
Tasman Region	440	649	209	14.8%	15.7%
Nelson Region	901	1,165	264	23.5%	24.6%
Marlborough Region	531	728	197	15.8%	15.5%
West Coast Region	399	441	42	17.1%	15.9%
Canterbury Region	8,234	10,793	2,559	22.9%	23.2%
Otago Region	2,966	3,950	984	21.7%	21.4%
Southland Region	1,163	1,304	141	18.3%	15.9%

Source: Business Demography Survey 2001 and 2006, Statistics New Zealand

Table 10 is based in Workplace address. It shows that in each of the regions of New Zealand there were more Knowledge Intensive business units in 2006 than there were in 2001, with almost half of the increase due to Auckland region. The definition of Knowledge intensive industries was taken directly from The Work Foundation paper²².

Wellington Region is again the location of the largest share of Knowledge Intensive employment at 36.6% of all business units, and with Auckland Region (31.1%) were the only two regions above the national average rate of 26.0%.

When compared to the results of The Work Foundation²³, most New Zealand regional results are fairly low. Amongst the cities measured in the UK, almost all had between 30 – 40% of businesses in Knowledge Intensive Industries, while in New Zealand, only Wellington and Auckland regions were in this category.

Sub regionally, results for Auckland City and Wellington City are largest. In 2006, 47.8% of Wellington City's business units were in Knowledge Intensive industries,

²² See Box J on Pg 104 of The Work Foundation paper.

²³ See Table 2 on Pg 27

while Auckland City had the largest increase in the number of Knowledge Intensive Business Units, up over 4,100 units between 2001 and 2006. Christchurch City had the second largest growth in Knowledge Intensive Business Units, up over 1,800, and had 26.3% of all business units defined as Knowledge Intensive, marginally above the national average of 26.0%. A table showing the full results for six of the largest TA's in 2006 is included later in Appendix 1.

The data used to produce the New Zealand results in Table 10 come from the Business Demography Survey. This survey excludes industries in the Agriculture sub division. Given that none of the Knowledge Intensive Industries come from the Agriculture Industry, the shares produced will be overestimates of the New Zealand results (the numerator in the share is unaffected, while the denominator is under counted). This overestimation is not likely to be large in either Auckland or Wellington given the relatively low levels of these industries in the regions.

Proportion of Labour force employed in knowledge intensive sectors

Table 11: Employment in Knowledge Intensive Industries – 2001 to 2006

	Share of employment in Knowledge Intensive Industries		Change 2001 - 06
	2001	2006	
New Zealand	30.9%	31.4%	0.5%
Northland Region	24.2%	24.5%	0.3%
Auckland Region	34.0%	35.6%	1.6%
Waikato Region	26.1%	26.4%	0.3%
Bay of Plenty Region	25.2%	25.7%	0.5%
Gisborne Region	25.4%	25.7%	0.3%
Hawke's Bay Region	23.4%	23.1%	-0.3%
Taranaki Region	23.7%	23.5%	-0.2%
Manawatu-Wanganui Region	29.7%	28.0%	-1.7%
Wellington Region	44.5%	45.1%	0.6%
Tasman Region	18.1%	19.3%	1.2%
Nelson Region	28.8%	28.9%	0.1%
Marlborough Region	21.8%	20.9%	-1.0%
West Coast Region	22.5%	20.6%	-1.9%
Canterbury Region	28.5%	28.7%	0.2%
Otago Region	28.0%	26.7%	-1.3%
Southland Region	20.6%	21.0%	0.4%

Source: Census 2001 and 2006, Statistics New Zealand

Table 11 shows that the focus of Knowledge Intensive employment is in Auckland and Wellington regions. In Auckland, results are highest for Auckland City and North Shore City (42.8% and 41.1% respectively), while in Wellington Region, the high intensity is focussed on Wellington City (55.2% of employment), with strong results for Porirua and Lower Hutt cities (41.0% and 39.7%). Interestingly, the comparative figure for Christchurch City was 32.1%, only marginally higher than the New Zealand average.

Over the period 2001 to 2006, the share of employment in Knowledge Intensive industries has increased by 0.5%. In ten of the sixteen regions the share of employment in Knowledge Intensive industries grew. A particularly large decline in this share was seen in the West Coast, Manawatu-Wanganui and Otago regions, while the strongest growth in Knowledge Intensive industry employment was seen in Auckland region.

While the pattern at the regional level is mixed, the actual number of workers in knowledge intensive industries grew in each of the regions, with Auckland increasing by almost 43,000 workers. Because this data is presented as a share, it does not mean that knowledge intensive employment declined between 2001

and 2006, only that it grew at a slower rate than non Knowledge Intensive employment.

When compared to the results of The Work Foundation²⁴, many of the New Zealand regional results are quite low. The results for Wellington and Auckland regions compare well to the UK findings, and the results cited earlier for the cities within Auckland and Wellington compare particularly well (Wellington at 55.2% exceeds the results for Edinburgh and Manchester at 53% and 52% respectively). It is particularly important to note that New Zealand figures are for 2006 while UK figures are for 2001 and are therefore likely to be higher in 2006. A table showing the full results for six of the largest TA's in 2006 is included later in Appendix 1.

Proportion of labour force working in knowledge intensive occupations in knowledge intensive industries.

Table 12: Number and share of Knowledge Intensive Occupations in Knowledge Intensive Industries - 2006

Knowledge Intensive Occupations in Knowledge Intensive Industries		
	Number	Share of employment
Northland Region	10,131	18.9%
Auckland Region	147,147	27.1%
Waikato Region	29,439	19.5%
Bay of Plenty Region	19,443	19.6%
Gisborne Region	3,222	20.2%
Hawke's Bay Region	10,650	17.1%
Taranaki Region	7,587	17.7%
Manawatu-Wanganui Region	17,955	19.7%
Wellington Region	70,806	34.7%
Nelson Region	2,001	11.8%
Tasman Region	5,109	23.3%
Marlborough Region	2,742	14.3%
West Coast Region	2,175	15.7%
Canterbury Region	47,187	20.3%
Otago Region	17,115	20.2%
Southland Region	6,300	15.7%
Not Elsewhere Included	21,828	7.4%
New Zealand	420,897	21.2%

Source: Census 2006, Statistics New Zealand

Again, the results of Auckland, and more significantly Wellington show through in Table 12. While Auckland Region has the highest number of Knowledge Workers in Knowledge Intensive Industries, this sub group makes up a larger share of those employed in Wellington Region. Results for Tasman and Gisborne regions are relatively high with Tasman results exceeding the national average by over 2%.

When compared to the results of The Work Foundation²⁵, a clear difference in levels is apparent. Results for the ten UK cities show an average share of those employed between 20 – 30%. In New Zealand, results are generally lower than this, at around 15 – 20%. In the Work Foundations report, Edinburgh had the

²⁴ See Figure 1 on Pg24, and Table 2 on Pg27.

²⁵ See Table 2 on Pg27.

highest level of Knowledge Workers in Knowledge intensive industries at 36%, well in excess of the other surveyed cities. The results of Wellington, and to a lesser extent Auckland, compare well to these UK results.

At the time of reporting, Territorial Authority level data is unavailable due to difficulties being experienced by Statistics New Zealand. Should this data become available, this analysis will be conducted in Phase Two of this project.

Territorial Authority analysis:

Throughout Appendix One, the primary analysis has been based on regional council boundaries, with a selection of comment on some of the larger TA's of New Zealand. The following tables give the results for these larger TA's. The numbering of the tables reflects the Table numbers in the earlier part of Appendix One.

Local Futures calculations

Table 3.1: Employment in Knowledge Intensive Industries in 2006

	K1	K2	K3	K4
New Zealand	5.7%	17.6%	13.8%	62.9%
North Shore City	15.1%	17.0%	32.1%	35.8%
Auckland City	31.4%	20.8%	28.9%	18.9%
Hamilton City	8.8%	17.0%	20.1%	54.1%
Wellington City	28.3%	17.6%	23.3%	30.8%
Christchurch City	8.8%	11.3%	22.6%	57.2%
Dunedin City	10.7%	14.5%	16.4%	58.5%

Table 4.1: Change in Knowledge Intensity of Employment – 2001 to 2006

	K1	K2	K3	K4
New Zealand	3.8%	4.4%	2.5%	-10.7%
North Shore City	11.3%	-0.6%	15.1%	-25.8%
Auckland City	14.5%	2.5%	0.6%	-17.6%
Hamilton City	4.4%	6.3%	8.2%	-18.9%
Wellington City	8.8%	1.9%	7.5%	-18.2%
Christchurch City	2.5%	5.0%	8.2%	-15.7%
Dunedin City	6.3%	3.1%	4.4%	-13.8%

Table 5.1: Overall TA Knowledge Intensity – 2001 to 2006

Territorial Authority	Knowledge Intensity	Knowledge rating	Rate of growth (change from 2001 – 2006)
North Shore City	25.9%	K2	42.0%
Auckland City	34.9%	K2	30.8%
Hamilton City	22.0%	K3	32.0%
Wellington City	40.3%	K1	20.8%
Christchurch City	19.4%	K3	31.8%
Dunedin City	22.6%	K3	26.1%
New Zealand	18.4%	K3	35.2%

Table 6.1: Public sector share of Graduate employment 2006

	Share of all graduates in the Public Sector	Proportion of the Public sector who are Graduates	Proportion of the Private sector who are Graduates
New Zealand	37.9%	37.8%	14.6%
North Shore City	29.6%	43.3%	22.6%
Auckland City	26.8%	55.3%	32.0%
Hamilton City	45.5%	42.6%	16.2%
Wellington City	39.7%	59.3%	34.1%
Christchurch City	38.4%	39.0%	15.2%
Dunedin City	49.1%	44.1%	15.8%

Table 7.1: Change in Graduate employment – 2001 to 2006

	Change in Public Sector share of Graduates	Change in Proportion of the Public sector who are Graduates	Change in Proportion of the Private sector who are Graduates
New Zealand	-2.2%	8.8%	4.1%
005 North Shore City	-2.1%	10.9%	7.1%
007 Auckland City	-3.5%	9.8%	8.3%
016 Hamilton City	-4.6%	8.9%	4.8%
047 Wellington City	1.6%	9.4%	5.7%
060 Christchurch City	-3.2%	8.6%	4.1%
071 Dunedin City	-6.5%	8.2%	4.6%

Table 8.1: Proportion of New Zealand's Graduate employment compared with Working age Population

	TA's share of graduates	TA's share of the WAP
North Shore City	7.3%	3.9%
Auckland City	18.4%	9.8%
Hamilton City	3.3%	2.7%
Wellington City	9.2%	3.4%
Christchurch City	8.1%	7.1%
Dunedin City	3.1%	2.5%

The Work Foundation Estimates

Table 9.1: Number and share of Knowledge Intensive Occupations 2001 to 2006

	2001		2006		Change 01 - 06	
New Zealand	645,444	37.5%	815,442	41.1%	169,998	26.3%
North Shore City	30,684	47.1%	42,390	53.0%	11,706	38.2%
Auckland City	115,656	51.7%	147,642	57.5%	31,986	27.7%
Hamilton City	22,593	45.0%	30,231	49.7%	7,638	33.8%
Wellington City	56,709	56.4%	69,078	61.9%	12,369	21.8%
Christchurch City	59,676	42.5%	77,310	46.6%	17,634	29.5%
Dunedin City	18,597	40.3%	22,254	44.7%	3,657	19.7%

Table 10.1: Number of Knowledge Intensive Business Units, Change and Share of all Businesses by TA

	Knowledge Intensive Business Units		Chg 01 - 06	Share of KI Business Units	
	2001	2006		2001	2006
New Zealand	77,777	98,458	20,681	25.7%	26.0%
North Shore City	5,722	7,477	1,755	31.4%	32.6%
Auckland City	17,626	21,791	4,165	37.1%	38.3%
Hamilton City	2,359	2,960	601	26.3%	26.8%
Wellington City	8,778	10,094	1,316	46.9%	47.8%
Christchurch City	6,320	8,157	1,837	25.7%	26.3%
Dunedin City	1,892	2,219	327	25.7%	25.6%

Table 11.1: Employment in Knowledge Intensive Industries – 2001 to 2006

	Share of employment in Knowledge Intensive Industries		Change 2001 - 06
	2001	2006	
New Zealand	30.9%	31.4%	0.5%
North Shore City	39.8%	41.4%	1.5%
Auckland City	41.2%	42.8%	1.6%
Hamilton City	36.9%	35.9%	-1.0%
Wellington City	54.3%	55.2%	1.0%
Christchurch City	32.1%	32.1%	0.1%
Dunedin City	35.6%	33.2%	-2.4%

APPENDIX TWO – THE CANTERBURY KNOWLEDGE ECONOMY.

The Knowledge Intensity of industries varies across the regions of New Zealand. Comparing results for Canterbury against the national average shows some interesting differences.

The industries with the highest levels of knowledge intensity (those with a K1 rating) are quite similar in Canterbury and New Zealand overall. The main differences are that Canterbury does not have a significant Government Administration industry, and the Canterbury Mining, Tobacco Product and Recorded Media industries having a higher than average skill level (although it must be noted that these industries are quite small in Canterbury, combining to employ only 33 people).

The major differences in knowledge intensity between Canterbury and the national average occur in the composition of the K2 and K3 industries²⁶. Nationally, the majority of Finance and Insurance sub industries (ANZSIC96 Division K) are coded with a K2 rating, while in Canterbury, most of these sub industries have a K3 rating. Nationally, most of the Finance and Insurance sub industries had a graduate employment rate of between 30 – 35%, while the corresponding figure for Canterbury was a step lower at between 15 – 25%. A table showing 3 digit ANZSIC96 industries by their knowledge intensity for both New Zealand and Canterbury is included at the end of this section.

The difference in qualification levels may be due to the majority of regional employment in the finance and insurance industries being in branch offices, with the assumption being that the more highly skilled jobs in these industries being located in the Head Offices, generally based in Auckland and Wellington.

This assumption is supported by the comparison of results between Canterbury and Wellington regions. Canterbury has one of the eight Finance and Insurance sub industries within the K1 and K2 categories (K751 Services to Finance and Investment is rated K2), while Wellington has seven of the eight Finance and Insurance sub industries within the K1 and K2 categories. This shows that Wellington employment in these industries is generally more highly qualified. Results at the two digit level show the same basic pattern.

While the knowledge intensity of these sub industries for Canterbury trail the national average, inter temporal analysis show recent improvement. Results from the Annual In Depth Regional report (AIDR) for Canterbury²⁷ show that employment and Hours worked in ANZSIC Division K (Finance and Insurance) grew faster than the New Zealand average between 2001 and 2006. Also, the share of university graduates in the Canterbury workforce has increased markedly in this industry between 2001 and 2006. On average, the share of graduates in the eight Finance and Insurance sub industries has grown by around 5% each, with 5 of the sub industries having a K4 rating in 2001, declining to only one K4 rating in 2006.

²⁶ K2 Industries had between 25- 40% of their workforces as graduates, while K3 industries have between 15-25% of their workforces as graduates

²⁷ The Annual In Depth Regional report for Canterbury is available from the DoL website, here - <http://www.dol.govt.nz/publications/lmr/regional/indepth/canterbury/index.asp>.

Canterbury, and in particular Christchurch City, has a well known Electronics cluster. It is interesting to note that the results for Canterbury and Christchurch City for both 'C283 Photographic and Scientific Equipment Manufacturing' and 'C284 Electronic Equipment Manufacturing' industries are marginally less skilled than the New Zealand average levels. This result was not expected and is certainly worthy of further discussion with stakeholders. One reason for lower than average qualification levels in the Canterbury electronics industries might be that there is a higher share of production line workers than product developers in Canterbury. Alternatively, the employment of the highly skilled staff in the Canterbury Electronics cluster may have been coded to industries other than the ones identified above.

Comparing Canterbury's industries of Knowledge Intensity with the New Zealand averages

New Zealand	Canterbury
K1 Industries	
L781 Scientific Research	B142 Mining nec
L782 Technical Services	C219 Tobacco Product Manufacturing
L783 Computer Services	C243 Recorded Media Manufacturing and Publishing
L784 Legal and Accounting Services	L781 Scientific Research
M811 Government Administration	L782 Technical Services
M813 Foreign Government Representation	L783 Computer Services
N842 School Education	L784 Legal and Accounting Services
N843 Post School Education	M813 Foreign Government Representation
O864 Veterinary Services	N842 School Education
	N843 Post School Education
	O864 Veterinary Services
K2 Industries	
C242 Publishing	B110 Coal Mining
C243 Recorded Media Manufacturing and Publishing	C283 Photographic and Scientific Equipment Manufacturing
C283 Photographic and Scientific Equipment Manufacturing	C284 Electronic Equipment Manufacturing
C284 Electronic Equipment Manufacturing	D361 Electricity Supply
D362 Gas Supply	I661 Services to Road Transport
D370 Water Supply, Sewerage and Drainage Services	K751 Services to Finance and Investment
I661 Services to Road Transport	L785 Marketing and Business Management Services
J712 Telecommunication Services	M811 Government Administration
K731 Central Bank	M812 Justice
K733 Other Financiers	N841 Preschool Education
K734 Financial Asset Investors	N844 Other Education
K741 Life Insurance and Superannuation Funds	O861 Hospitals and Nursing Homes
K751 Services to Finance and Investment	O862 Medical and Dental Services
L773 Non-Financial Asset Investors	O863 Other Health Services
L785 Marketing and Business Management Services	P921 Libraries
M812 Justice	P922 Museums
N844 Other Education	P923 Parks and Gardens
O861 Hospitals and Nursing Homes	P924 Arts
O862 Medical and Dental Services	P925 Services to the Arts
O863 Other Health Services	Q961 Religious Organisations
P911 Film and Video Services	Q962 Interest Groups
P912 Radio and Television Services	

P921 Libraries
P922 Museums
P923 Parks and Gardens
P924 Arts
P925 Services to the Arts
Q961 Religious Organisations
Q962 Interest Groups

K3 Industries

B120 Oil and Gas Extraction	B151 Exploration
B151 Exploration	C242 Publishing
C218 Beverage and Malt Manufacturing	C254 Other Chemical Product Manufacturing
C253 Basic Chemical Manufacturing	D370 Water Supply, Sewerage and Drainage Services
C254 Other Chemical Product Manufacturing	G524 Recreational Good Retailing
D361 Electricity Supply	G525 Other Personal and Household Good Retailing
F461 Machinery and Equipment Wholesaling	I630 Water Transport
F472 Textile, Clothing and Footwear Wholesaling	J712 Telecommunication Services
F479 Other Wholesaling	K731 Central Bank
G525 Other Personal and Household Good Retailing	K732 Deposit Taking Financiers
I630 Water Transport	K733 Other Financiers
K732 Deposit Taking Financiers	K734 Financial Asset Investors
K742 Other Insurance	K741 Life Insurance and Superannuation Funds
K752 Services to Insurance	K742 Other Insurance
L771 Property Operators and Developers	L771 Property Operators and Developers
L772 Real Estate Agents	L772 Real Estate Agents
L786 Other Business Services	L773 Non-Financial Asset Investors
N841 Preschool Education	O871 Child Care Services
O871 Child Care Services	P911 Film and Video Services
P931 Sport	P912 Radio and Television Services
P932 Gambling Services	P931 Sport
P933 Other Recreation Services	

