The Development of Statistical Frameworks

*An investigation on the data needed to understand
the Computer Consultancy Services industry*

Statistics
NEW ZEALAND

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Introduction

Users of statistics frequently assume that at the most detailed level of industry classification, units in a specific industry are homogeneous in terms of the markets the businesses operate in and the factors driving these businesses. Detailed industry classifications (in terms of *standard industrial classification* codes) is a frequent analysis variable for business statistics.

In reality there can be a wide range of businesses within a given services industry code. The objective of this report is to investigate, a defined services industry and the factors which can describe and drive the diversity of businesses.

The output from this report will contribute to the development of service statistics being undertaken by the "Voorburg" group and will also contribute to the analysis being undertaken by users of *Information Technology* statistics within New Zealand. The output should help define other ways of analysing *service industries* which provide more meaningful data for users.

Industry Background

The *Computer Consultancy Services* industry has been selected for this study as an example of a service industry which is suspected to have a diversity of business types within the one industry. The industry is also the focus of a user interest as it is part of the rapidly expanding *Information Technology* industry.

The Computer Consultancy Industry is one classification (7834) in terms of the Australia and New Zealand Standard Industrial Classification (ANZSIC). ANZSIC 7834 is a combination of ISIC Rev. 3 7210 *Hardware Consultancy*, 7220 *Software Consultancy and Supply* and 7290 *Other Computer Related Activities*.

The ANZSIC industry 7834 consists of units mainly engaged in providing:

_ Computer consultancy service   _ Systems analysis service (computer)
_ Computer programming service   _ Software production service
                                                  (other than mass production)

The *Computer Consultancy Services* industry is characterised by a number of features (outlined below). These were obtained following discussions with Information Technology specialists at the *Ministry of Commerce and TradeNZ*.

_ There are a large number of small companies (one person units), a few medium sized and a minority of large companies.

_ There are a large number of consultants and software houses.

_ As well as companies that offer a range of computer services there are also niche market units. For example, those that offer computing services for advertising agencies or for particular retailers etc.

_ There is not much in the way of venture capital from lending institutions. This precludes the prevalence of innovators teaming up with lending institutions providing capital.

_ Companies for which software is not their main business activity often produce software as a secondary activity and sell it through another company. For example, Arthur Andersen is marketing the FIRST system from the *Inland Revenue Department* to other countries.

_ The large operators in New Zealand are the New Zealand arms of overseas multi-nationals.

_As well as software exports there is also some hardware exported by New Zealand companies.

_ There is a large amount of embedded software in manufactured products (the value of which is difficult to estimate). These days, the majority of complex machinery contains a certain amount of embedded software.

_ The industry is dominated by technical wizards with little business training or acumen.

_ The critical success factors are not significantly different from other industries ie. availability of finance, management expertise, marketing expertise and skilled work force.

Data Sources

A number of data sources were utilised for the analysis in this report. They include the *business directory*, the *business demography database*, and the *Inland Revenue Department*.

The *business directory* is a database of economic units in the New Zealand economy. Businesses on the directory are updated as at mid-February each year through the Annual Business Directory Update Survey. In addition, new businesses are included as they register for GST (Goods and Services Tax, a value added tax).

The *business demography database* was developed from the *business directory* to provide the opportunity to trace individuals and groups of economic units over time. This provides for a wider analysis of changes in particular unit rather than a "snapshot" of units at a particular point in time.

The IRD provides *Statistics New Zealand* with dollar data on the annual turnover of businesses as well as a monthly update of IRD registrations.

Characteristics of Businesses

This section of the paper analyses aspects of the composition and evolution of businesses (units) over the period 1988 to 1994 (at two yearly intervals). The data for this section was from the *business demography database*. The number of live units in ANZSIC 7834 and the associated number of *full-time equivalent* persons engaged (FTEs) for the period 1988 to 1994 is shown in Figure 2 below.

Figure 2: Activity Units and FTEs in the *Computer Consultancy Services* Industry
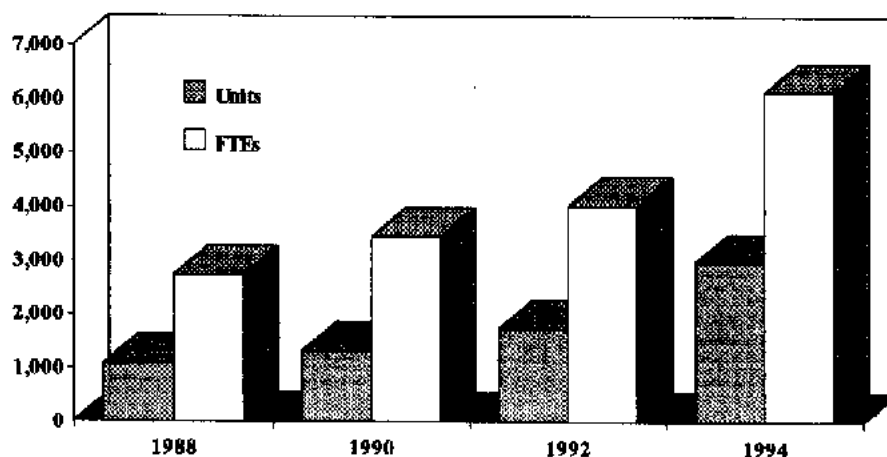
The number of units in the industry has increased from 1,072 in 1988 to 2,977 in 1994. The number of FTEs associated with these units increased from 2,732 to 6,134. There was a significant decline in the number of FTEs per activity unit between 1988 and 1994.

Analysis of Units by Employment Size Groups

Table 1: Analysis of Units by Employment Size Groups

Size Group	1988		1990		1992		1994	
	Units	% of Total	Units	% of Total	Units	% of Total	Units	% of Total
<=1	563	52.5	672	51.7	977	56.4	1,848	62.1
1.5 - 2	327	30.5	376	28.9	448	25.9	697	23.4
2.5 - 3	59	5.5	77	5.9	114	6.6	135	4.5
3.5 - 5	44	4.1	62	4.8	77	4.4	123	4.1
5.5 - 9.5	34	3.2	52	4.0	63	3.6	89	3.0
10 - 19.5	25	2.3	41	3.1	33	1.9	62	2.1
20+	20	1.9	21	1.6	19	1.2	23	0.8
TOTAL	1,072	100	1,301	100	1,731	100	2,977	100

From Table 1, it is clear that units with one or less FTEs dominate the industry, and this situation is more pronounced than was the case in 1988. The proliferation of small units evolved (at least partially) from the down-sizing of large companies (such as IBM) in recent years. These small companies comprise career minded single operators as well as people who are semi-retired but undertake the occasional contract.

The number of FTEs in units comprised of 2 or less FTEs has increased significantly over the period 1988 to 1994. Units with 20 or more FTEs have displayed a significant decrease in the number of FTEs. These trends have occurred during a period of considerable growth in both the number of units as well as FTEs in the industry.

Large operators still have a place in the market, but their predominance is not as significant as previously. For example, in the past computing companies often forced their customers to purchase all their computer equipment from them for reasons of compatibility. However, in recent years the communication between systems has advanced to the extent that companies do not have to be entirely reliant on one supplier.

Analysis of Units by Working Proprietor and Employees

Table 2: Working Proprietor and Employee Structure of Units

Working Proprietors/Employees	1988		1990		1992		1994	
	Units	% of Total	Units	% of Total	Units	% of Total	Units	% of Total
Full-time WPs with no employees	556	51.9	579	44.5	832	48.1	1,369	46.0
Part-time WPs with no employees	100	9.3	154	11.8	210	12.1	565	19.0
Full & Part-time WPs/no employees	148	13.8	204	15.7	249	14.4	376	12.6
WPs and Employees	181	16.9	241	18.5	320	18.5	502	16.9
Employees without WPs	65	6.1	78	6.0	80	4.6	122	4.1
No WPs and no employees	22	2.1	45	3.5	40	2.3	43	1.4
TOTAL	1,072	100	1,301	100	1,731	100	2,977	100

The most notable trend in Table 2 is the growth in the category *part-time working proprietors with no employees* (from 9.3 percent in 1988 to 19.0 percent in 1994). The table also shows that full- and part-time working proprietors with no employees have increased over the period to comprise 77.6 percent of the total by 1994.

Analysis of Units by Business Type

### Table 3: Activity Units Classified by Business Type

Business Type	1988		1990		1992		1994	
	Units	% of Total	Units	% of Total	Units	% of Total	Units	% of Total
Registered Private Company	543	50.7	739	56.8	896	51.8	1,326	44.5
Individual Ownership	425	39.6	438	33.7	665	38.4	1,338	44.9
Partnership	93	8.7	118	9.1	165	9.5	285	9.6
Other	11	1.0	6	0.4	5	0.3	28	1.0
TOTAL	1,072	100	1,301	100	1,731	100	2,977	100

From Table 3, *Registered Private Companies* and *Individual Ownership* have consistently accounted for 90 percent of businesses in ANZSIC 7834. An opposite trend within each of these categories has occurred over the period. Registered Private Companies increased from 1988 to 1990 (as a percentage of all units) and then declined by 12 percent by 1994. Individual Ownership units, on the other hand, declined from 1988 to 1990 (as a percentage of all units), but then increased over the period 1992 to 1994.

Analysis of Units with an Owning Enterprise

Figure 3 provides a graphical representation of the percentage of all units which are more than 50 percent owned by another company.

Figure 3: Percentage of Units with an Owning Enterprise
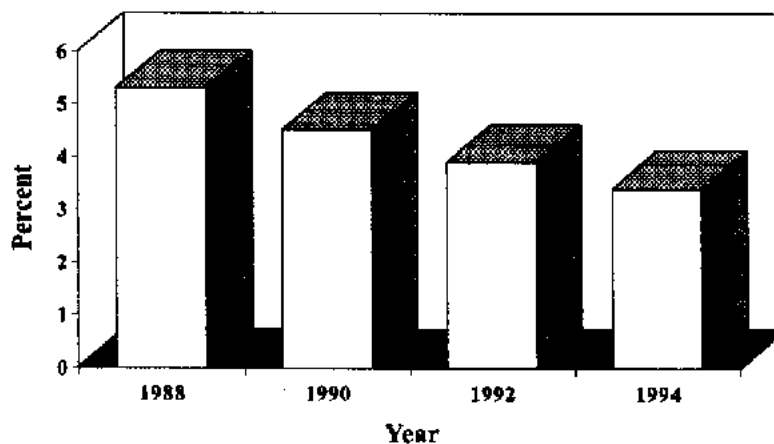
Since 1988, the number of units with an owning enterprise has been increasing, but at a slower rate than the total number of units in the industry has been increasing. The result has been a gradual decline in the percentage of all units which are more than 50 percent owned by another company (from 5.3 percent in 1988 to 3.4 percent in 1994). This trend is consistent with a greater proliferation of units with only one full or part-time person that are not owned by any other business.

Analysis by Changes in Size Over Time

Table 4 provides an analysis of the change in size of units over time. Specifically, it compares all live units in ANZSIC 7834 as at 1987 with their status in 1992. For selected FTE size groups, the table shows the number of units that were in the same size group in 1992, the number that had moved into a higher or lower size group, and the number of units that had ceased. It should be noted that for 1992, some units may have transferred to an ANZSIC classification other than 7834.

Table 4: Employment Size Changes of Activity Units, 1987 - 1992

Employment Size (FTEs) in 1987		Employment Size (FTEs) in 1992								
		0 to 1	1.5 to 2	2.5 to 3	3.5 to 5	5.5 to 9.5	10 to 19.5	20+	Ceased	Total
0 to 1	No. of activity units	126	27	6	2	1	0	1	254	417
	Employment in 1987	116.5	26.5	6	.C	.C	0	..C	225.5	378.5
	Employment in 1992	111	46.5	16.5	..C	..C	0	..C	-	209.5
1.5 to 2	No. of activity units	33	78	11	5	3	3	0	108	241
	Employment in 1987	56.5	136	19	9.5	6	6	0	183.5	416.5
	Employment in 1992	28	132	29.5	21	22.5	35	0	-	268
2.5 to 3	No. of activity units	5	9	6	7	4	2	0	19	52
	Employment in 1987	14	24.5	17.5	19.5	.C	.C	0	54	146.5
	Employment in 1992	4.5	17.5	17.5	28.5	.C	..C	0	-	123.5
3.5 to 5	No. of activity units	1	1	9	2	6	3	1	18	41
	Employment in 1987	.C	..C	36.5	..C	26.5	14.5	..C	75	174
	Employment in 1992	..C	..C	25	..C	44	30	..C	-	138.5
5.5 to 9.5	No. of activity units	1	4	1	4	4	5	1	14	34
	Employment in 1987	..C	27.5	.C	30	26	37	..C	99	239
	Employment in 1992	..C	7	..C	17.5	37	77.5	..C	-	154.5
10 to 19.5	No. of activity units	0	2	0	1	2	5	3	10	23
	Employment in 1987	0	..C	0	..C	..C	64.5	42	137.5	298
	Employment in 1992	0	..C	0	..C	..C	74.5	177.5	-	276
20+	No. of activity units	0	0	0	1	0	1	6	9	17
	Employment in 1987	0	0	0	..C	0	..C	213.5	283.5	550
	Employment in 1992	0	0	0	..C	0	..C	357	-	378
Total	No. of activity units	166	121	11	22	20	19	12	432	825
	Employment in 1987	198	239	85	113.5	92	148.5	268.5	1,058	2,202.50
	Employment in 1992	145.5	208	91.5	92.5	146	259	605.5	-	1,548

The FTE size group with units most likely to have ceased by 1992 is the smallest (0 to 1 FTEs) with 60.9 percent of units ceased by 1992. This is followed by the largest FTE size group (20+ FTEs) with 52.9 percent of units that were alive in 1987 being ceased by 1992. The remaining cessation rates are between 36.5 percent and 44.8 percent.

The two FTE size groups alluded to above are also among the most likely to contain the same number of units in both 1987 and 1992 (30.2 percent for 0 to 1 FTEs and 35.3 percent for 20+ FTEs). The size group 1.5 to 2 FTEs is also relatively high with 32.4 percent of units in the same size group for 1987 and 1992.

The size group for which units proved the least likely to remain the same size is the group 3.5 to 5 FTEs. For this employment size group, only 4.9 percent of units in 1987 were also in this group in 1992. By 1992, 43.9 percent of these units had ceased, and of the remaining live units, half had increased in size and the other half had decreased in size.

Businesses in the smallest employment size group (0 to 1 FTEs) are shown to either remain small or cease. Large businesses (20+ FTEs) are more likely to remain large or cease. The businesses between these two employment size groups proved more likely to increase or decrease in size over time.

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Analysis of Units by Birth Date

Table 5: Birth Dates of Units by Selected Time Periods

Period	Units
before 1980	62
1980 - 1984	152
1985 - 1987	440
1988 - 1989	372
1990 - 1991	580
1992 - 1993	1,165
1994	172
Not Specified	34
TOTAL	2,977

From Table 5, 64.4 percent of company births in the *Computer Consultancy Services* industry have occurred since 1990. Of these, businesses with one or less full-time equivalents (FTEs) account for 67.2 percent of the new births and businesses with 2 or less FTEs account for 88.8 percent of new births. These statistics indicate the large increase in small units to the industry in recent years.

Analysis of Units that Export

Table 6 provides a break-down of units that either export or are involved in both exporting and importing. Within this category a further break-down is provided on the basis on ownership status and whether the unit has overseas dealings. A unit is deemed to have overseas dealings if during the past 12 months it was involved in any of the following activities with an individual, business or enterprise located overseas.

_ financial arrangements such as:
    borrowing, lending, repayment of debt
    leasing
    the sale or purchase of securities, bonds, shares etc

_ revenue from, or expenditure to any individual, business or enterprise located overseas for subscription fees or royalties (eg., patents, copyrights, licences, franchises)
_ revenue from, or expenditure to any individual, business or enterprise located overseas for services such as:

transportation	computer
management	professional
insurance	consultancy
construction	agency

Table 6: Exporting Units within the *Computer Consultancy Services* Industry

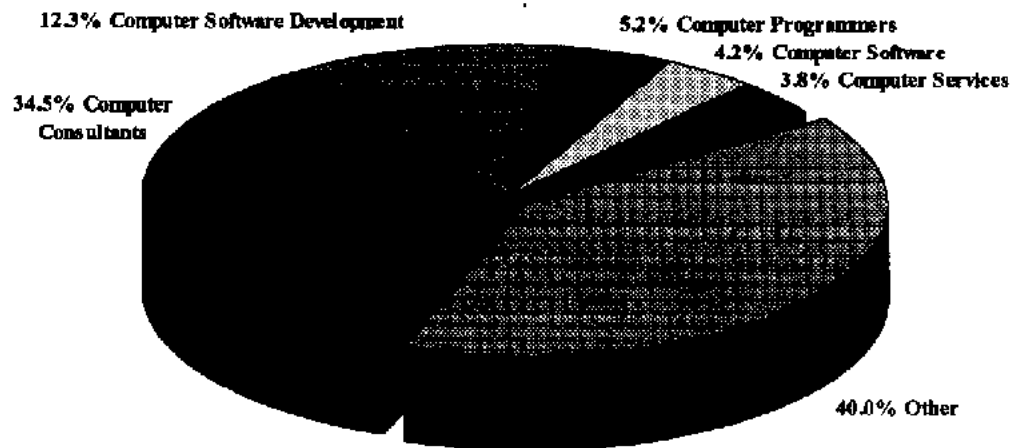| *Units that Export*	1988	1990	1992	1994
No overseas ownership, export but don't import, have overseas dealings	39	28	34	59
No overseas ownership, export but don't import, don't have overseas dealings	-	26	26	27
No overseas ownership, export and import, have overseas dealings	28	25	44	73
No overseas ownership, export and import, don't have overseas dealings	-	11	19	..C
1 - 49% overseas ownership, export but don't import, have overseas dealings	3	..C	..C	..C
1 - 49% overseas ownership, export but don't import, don't have overseas dealings	-	-	-	..C
1 - 49% overseas ownership, export and import, have overseas dealings	5	7	..C	..C
1 - 49% overseas ownership, export and import, don't have overseas dealings	-	..C	-	..C
50+% overseas ownership, export but don't import, have overseas dealings	-	-	3	3
50+% overseas ownership, export but don't import, don't have overseas dealings	-	-	-	..C
50+% overseas ownership, export and import, have overseas dealings	-	-	7	9
50+% overseas ownership, export and import, don't have overseas dealings	-	-	..C	-
UNITS THAT EXPORT	75	101	137	178
PERCENTAGE OF UNITS THAT EXPORT	7.0	7.8	7.9	6.0

There has been a large increase in the number of businesses that export over the period 1988 to 1994. This was reflected in the percentage of all units that export from 1988 to 1992 (7 percent to 7.9 percent). However, this has since decreased to 6 percent due to the relatively faster rate of increase of businesses in the industry. The vast majority of exporting units do not have any overseas ownership, but do have overseas dealings. Software comprises the majority of exports.

GST Client Registration Data

Analysis of Units by GST Registration Description

When companies register for GST they are required to provide a description of the main activity of the business. A descriptive analysis of this information was performed for the 2,809 units on the IRD FIRST Client Registration System. The most common business descriptions are provided in Figure 4 below, followed by the number of units in each category.

Figure 4: Business Activity Descriptions (*Respondent Generated*) from GST Registrations

12.3% Computer Software Development   5.2% Computer Programmers
                                      4.2% Computer Software
                                      3.8% Computer Services
34.5% Computer
Consultants

40.0% Other

1. *Computer Consultants* (969 units)
2. *Computer Software Development* (345 units)
3. *Computer Programmers* (146 units)
4. *Computer Software* (incl. support, consultants, sales, service, systems, marketing, exporting - 117 units)
5. *Computer Services* (108 units)

There would be considerable overlap between some of the occupations despite the different descriptions provided on the IRD Client Registration System. However, in addition to the descriptions with multiple occurrences, the "other" category (comprising 40 percent of the total) contains a significant number of unique descriptions. Selected examples are provided below.

Table 7: Diversity of Business Descriptions from GST Registrations

Analyst Photographer	*Database Consultant*
Computer and Video Services	*Ergonomic Consultancy*
Computer Security Systems	*Mail Order Software*
Computer Tuition	*Music Production/Sound Engineer*
Data Analyst	*Roading Technician*

The range of business activity in Table 7 indicates a wide diversity within the *Computer Consultancy Services* industry.

GST Dollar Data

Analysis of Units by GST Dollar Data

Table 8 provides the number of units and associated value of Total Sales for selected income ranges acquired from GST dollar data.

Table 8: Analysis of Units by Selected Income Ranges

Annual Income	% of Units	Total Sales ($)
≤ $30,000	37.1	6,600,000
$30,000 - $99,999	30.8	41,000,000
$100,000 - $499,999	23.9	100,700,000
$500,000 - $999,999	3.4	52,600,000
>= $1,000,000	4.8	331,000,000
TOTAL	100	531,900,000

Thirty seven percent of units reported total sales less than $30,000. This category would contain units that are registered for GST but do not earn above the GST threshold as well as units that are only reporting for a part-period (ie., they would earn more than $30,000 over a full year). Companies earning more than $1,000,000 account for 62.2 percent of total sales for all units.

A further analysis of the GST dollar data revealed that the ten largest units represented 27.4 percent of total sales for all units covered by GST dollar data. Six of these ten largest units were involved in *Software Development* while the remaining four were involved in *Computer Consultancy*.

Income of Working Proprietor Only Businesses

The IRD number of businesses was used to link units on the *Business Directory* with GST dollar data. This analysis was performed for working proprietor only businesses. That is, any business that had at least (ie., they could have more than) one part-time working proprietor with no employees. A frequency distribution for selected ranges of *Total Sales* (for the period June 1992 to June 1993) is provided in Figure 5 below.

Figure 5: Distribution of Total Sales for Working Proprietor Only Businesses

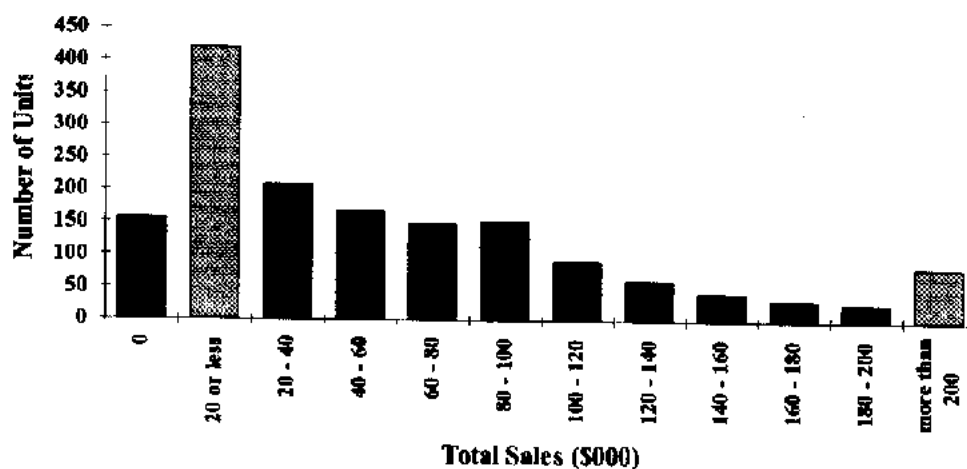
Figure 5 indicates a relatively flat distribution for businesses with *Total Sales* greater than $20,000. The distribution is skewed to the right with a few businesses reporting very high *Total Sales*.

Businesses within the shaded bars on the chart were further analysed. For businesses in the $20,000 or less category (note that this category excludes businesses with zero *Total Sales*), a frequency distribution was constructed with $2,000 ranges. Businesses were most prevalent in the less than $2,000 category. The frequency declined with successive *Total Sales* ranges. This suggests that businesses with *Total Sales* less than $20,000 are either non-trading or have very little business activity (ie., they are clustered at the lower end of the $0 to $20,000 range of *Total Sales*).

Half the businesses with *Total Sales* greater than $200,000 were between $200,000 and $300,000. The remaining businesses were isolated in higher ranges with four reporting *Total Sales* over $1m.

The results of this analysis indicate that for working proprietor only units, there are a significant number of businesses in the *Computer Consultancy* industry with little or no business activity. There are also a number of businesses with very high *Total Sales* figures. Between these two extremes, a uniform distribution exists across ranges of *Total Sales*.

Conclusions and Industry Profile

The available data sources utilised in this report largely support the industry description provided by the experts at the *Ministry of Commerce and TradeNZ*.

There are a few large units that dominate the industry in terms of dollar turnover. These units have a broad range of business activities. The industry is characterised by many small units that tend to have specialist business activities. Other industry characteristics to emerge from the

analysis in this report are outlined below.

— GST dollar data indicated that the largest 5 percent of businesses (in terms of total sales) account for 62 percent of total sales for all units.

— The industry is dominated (in terms of the number of businesses) by small units (1 person businesses) and the number of these units has been increasing over time. There is approximately a 50 percent survival rate for these units over a 5 year period. A large number of these units describe themselves as a *Consultant*.

— The number of units and full-time equivalents (FTEs) in the industry have been increasing over time.

— Small units (2 FTEs or less) have shown the greatest rates of increase.

— The most significant increase has occurred for part-time working proprietors with no employees.

— *Registered Private Companies* and *Individual Ownership* units are the most common business types in the industry.

— The smallest and largest units (when measured in terms of FTEs) are more likely to either remain the same size or cease over time. Medium sized units are more likely to either increase or decrease in size over time.

— A significant number of births have occurred in the industry since 1990.

— The number of units exporting goods and services has been increasing over time.

— The business activity descriptions from GST registrations revealed considerable diversity in the industry.

The preceding profile demonstrates the information that is available about the *Computer Consultancy Services* industry. This paper is being circulated to potential users for comment on the usefulness of the analysis and what other factors should be measured to help understand the industry. As such it needs to be seen as a first attempt to identify factors needed to develop a framework which extends the factors normally considered by central statistical offices.

There are many factors not included in this paper which could be covered in future work. This includes the characteristics and backgrounds of the owners. Because the *Computer Consultancy* industry is comprised of small businesses, the interests, skills and background of the owner(s) are particularly important. Enthusiastic owners will be involved in a range of activities including business, technology, and marketing of their services. Which of these makes the business successful is a question we need to answer.

Potential Data Source for Future Analysis

The issues raised above for further analysing the industry could be explored with data from the

Census of Population. Individuals' workplaces are classified to an ANZSIC based on the description of business activity. This provides the opportunity to analyse the characteristics of individuals working in the *Computer Consultancy* industry. The range of characteristics is potentially as large as the number of questions asked in the *Census*, but the more important ones for this type of study are described below.

Gender: A breakdown between males and females
Age: The age structure of males and females in the industry
Education: Schooling and Tertiary qualifications
Income: A frequency distribution across a range of income categories
Occupation: The 5 digit NZSCO occupation classification
Employment Status: Working for wages or salary, self-employed and not
employing others, an employer of others in own
business or working without pay in a family business.

The previous analysis in this report has focused on the structure and characteristics of businesses in the *Computer Consultancy Services* industry. The inclusion of data from the *Population Census* would provide the opportunity to focus on the characteristics of individuals who own and are employed in these businesses.