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Discussion Paper No. 03.03 – April 2003

Massey University

DEPARTMENT OF APPLIED AND INTERNATIONAL ECONOMICS

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Discussion Paper 03.03
ISSN.1174-2542
Price: $10

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ABSTRACT

This paper documents the size, composition and changes in New Zealand's information workforce over the period 1991 to 2001. The estimates are disaggregated into Maori/non-Maori, by gender, and by major occupational categories. The absolute as well as relative size of the information workforce has continued to grow during the period, though the relative growth rate is a lot lower than during the 1980s. While the findings for women in general are encouraging, those for Maori, and especially Maori men, are less so. Maori remain underrepresented in the information workforce. Although their participation has increased, the gaps in participation rates between Maori and non-Maori have changed little.

Introduction

New Zealand (NZ)'s push toward a 'knowledge (-based) economy' has received much political attention over the past few years. Debate has focused largely on the importance of creativity, innovation and learning in the economy and society in general. There is recognition that skilled labour is a corner stone of the new developments. Indeed, one major way of analysing the changes is to focus on shifts in the occupational composition of the workforce. More specifically, the trend in the workforce away from manual labour toward information-intensive work has been well documented internationally as being an integral component of a nation's shift toward a knowledge-based economy.

Originating mainly in the US, 'information workforce research' was taken up by the OECD and by researchers around the world (see, for example, Machlup, 1962, Bell, 1973, Porat, 1977, OECD, 1981, Katz 1986, Martin, 1998, Aoyama and Castells, 2002). Although the exact definitions of the information workforce vary, and classifications are somewhat subjective in nature, the different authors by and large apply similar fundamental principles to form individual definitions of information workers.

More than two decades ago Conway (1981) produced detailed estimates of NZ's information workforce for the 1971-76 period. In addition, he provided aggregate estimates for the census years from 1956 onwards. Conway's research indicated that in 1976, 35.9% of the NZ workforce was employed in information occupations. Engelbrecht (2000a,b, 2001) updated (to 1996) and extended this research. Whilst the classification of information workers essentially followed Conway's lead, additional depth was added through the inclusion of an analysis of both part-time and full-time employment, and the disaggregation of observed trends by gender. The statistical findings were related to the rapid and significant changes taking place in the NZ economy.

The research found a continuation of the trend toward an increasing proportion of the NZ workforce being engaged in information occupations. In contrast to the findings of Martin (1998) for the US information workforce, NZ's information workforce grew faster between 1986 and 1996 than it did between 1976 and 1986. The analysis also suggested a faster up-skilling of female workers through their increased participation in higher skilled occupational brackets. Meanwhile, the part-time information workforce statistics showed a relative de-skilling of male workers in this sector and a less marked increase in the highly skilled information workforce category.

The main objective of the current study is to document the size, composition, and changes within the NZ information workforce between 1991 and 2001. Our analysis is complementary to more standard analyses of occupational changes over the 1991-2001 period (see, for example, Department of Labour, 2002), providing an additional perspective derived from theories of the information economy and society. We use the commonly accepted OECD (1981) definition of the information workforce. It defines information occupations as those whose "primary purpose is an output of produced, processed or distributed information, or its infrastructure support" (ibid, 1981, p. 22).

A novel feature compared to the earlier studies is the separate analysis of Maori and non-Maori. As stated in Engelbrecht (2001), this is one of a long list of further research topics related to NZ's information workforce. Ensuring Maori success in the emerging knowledge economy is central to honouring the spirit of the Treaty of Waitangi (Frederick and McIllroy, 1999). The youthful demographics of the Maori populace and its rapid growth imply that a growing proportion of the workforce consists of those who identify themselves as Maori. In order then for the NZ economy to truly expand toward its full potential, Maori must be fully able to actively participate within the changing work environment. The extent to which Maori are employed in the information workforce can be seen as an indicator of NZ's national development and degree of social cohesion.

The next section of the paper provides a brief introduction into some general trends in the labour market experiences of Maori. This is followed by a discussion of data issues. The subsequent section presents our empirical findings. Finally, we provide a summary and some concluding comments.

Some General Comments on Maori Labour Market Experiences

In 2001, one in seven New Zealanders identified themselves as being of Maori ethnicity (www.stats.govt.nz). The Maori population is relatively youthful with a median age of 22 in 2001. It is also growing quickly (by 21% between 1991 and 2001). In many respects Maori appear to have been a traditionally maligned minority within NZ society. Recent government reports including, among others, the widely publicised "closing the gaps" series (Te Puni Kokiri, 1998b, 2000b) have established that Maori are economically disadvantaged across a range of areas. Research generally acknowledges that although positive gains have been made in some sectors, the disparities between Maori and non-Maori are in many cases failing to diminish.

While, to the best of our knowledge, no research has so far been conducted into the ethnic composition of NZ's information workforce, a wide body of literature exists which examines more general labour force trends in relation to ethnicity. Much of this research relates explicitly to the Maori population.

Historically, the migration of many Maori from rural to urban areas subsequent to the Second World War and continuing into the 1950s in search of emerging employment opportunities, meant that Maori tended to enter into low-skilled occupations in industries such as manufacturing and construction (Te Puni Kokiri, 1998a). While employment opportunities for all continued to grow in the 1950s and 1960s, the 1970s saw a dramatic slowdown in economic growth and by the mid 1980s the reforms conducted in NZ were accompanied by dramatic job losses. Job losses for Maori were particularly severe as large segments of this population were employed in industries (including manufacturing, meat works, railways and post offices) that were particularly harshly impacted upon. Many of those who had migrated to urban areas were left inadequately skilled for this emerging environment (Waldegrave and Pole, 2001). Thus, job cuts and persistently high unemployment levels hit this sector of the community particularly hard.

A key investigation of Maori employment was the report by Nicol and Fisk (1991). It gave a detailed statistical profile of Maori participation in the labour market, incomes and unemployment. Amongst other things, it was noted that the three industrial sectors that experienced job growth during the 1986-1990 period (financing/insurance/real estate, wholesale/retail/trade and community/social/personal services) were the very three sectors in which Maori were underrepresented. Sutherland and Alexander (2002) found compelling evidence of occupational segregation of Maori using statistics from 1997 to 2000. They conclude that even after accounting for differences in age and qualification profiles, Maori are over-represented in lower occupational profiles and under-represented in higher ones.

A variety of explanations for the under-representation of Maori in key occupational groups have been proposed. One often cited factor is the youthful nature of the Maori population. Disparities in educational attainment, potential labour market discrimination and geographical location of large proportions of the Maori population are other characteristics proposed as explanations for the differences in the performance of Maori and non-Maori in the labour market (Te Puni Kokiri, 2000a). For example, Alexander and Jaforullah (2001) found that Maori suffer from discrimination in the labour market beyond that explained by the influence of observable characteristics including age, household type, marital status, occupational class and location.

Also of interest are substantial ethnic differences in school attainment. Education, it is widely agreed, has substantial impact on labour market and income prospects. Gibson (2000) investigated the sheepskin effects (i.e. wage returns specific to educational qualifications rather than years of education) on returns from education among minority groups, concluding that Maori enjoy larger sheepskin effects for signals of high productivity. Similarly, Maani (2002) found that income returns to qualifications were higher for Maori than for non-Maori.

In 1999, 43% of Maori school leavers had obtained sixth form certificate, compared with 66% for all school leavers. Only 4.5% of those Maori leaving school had received an A or B bursary, compared with 19.8% for all school leavers (Ministry of Education, 2001 cited in Waldegrave and Pole, 2001). Although the proportion of Maori in tertiary education has been climbing, and since 1999 has in fact out-numbered the proportion of the non-Maori population in tertiary education,[1] Maori continue to be much less likely to study at university compared to non-Maori. Just 3.4% of the Maori population aged 15 years or over were enrolled at university in July 2001, compared with 5.2% of non-Maori. For Maori, this proportion has recently been diminishing, despite small increases in the absolute number of people enrolled at university. Increases in the rate of Maori participation in tertiary education more generally, have been predominantly due to increases in enrolments in Wänanga and private providers (Ministry of Education, 2002).[2]

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1 As of July 2001, 13.3% of Maori were enrolled in tertiary education compared with 9.1% of non-Maori (Ministry of Education, 2002).

2 The choice of tertiary institute determines to some extent the type of qualification studied toward. In 2001, 59% of all students were studying at sub-degree (certificate or diploma) level, up from 51% in 1999. Maori students are considerably more likely to be studying at a sub-degree level (approximately 75% of all Maori students enrolled) than non-Maori (55%) (Ministry of Education, 2002).

Census Data, Maori Ethnicity, and Occupational Classification

The employment data used in our analysis are from Statistics NZ's five-yearly Census of Population and Dwellings reports. They pertain to people aged 15 years or over, usually residents of New Zealand, who indicated that on census night they were gainfully employed.[3] The novel feature of our analysis is the disaggregation into Maori and non-Maori. Ethnicity is currently defined by Statistics NZ as the ethnic group or groups an individual *feels* they identify with or belong to. One's ethnicity is a self-perceived depiction of belonging to one or more ethnic groups. Statistics NZ further defines an ethnic group as a social unit whose members share not only a sense of solidarity and common origins but also claim a common and distinctive history and destiny (Lang, 2002).[4] The subjective nature of one's ethnicity has led to some problems with the comparability of census data between 1996 and both the preceding census in 1991 and the subsequent census in 2001. While the concepts and definitions remained the same for the 1996 census, wording and layout of the questionnaire differed in ways, which substantially impacted on the nature of data collected.[5]

The converse of the Maori ethnic category, the non-Maori ethnic group, consists of all respondents who identified an ethnicity, excluding those who indicated they were of Maori ethnicity.[6] The figures provided by Statistics NZ also included the categories 'response unidentifiable', 'response outside scope' and 'not stated'. For the purposes of occupational classification in this study, all responses in these categories were excluded from the information workforce. However, these responses were included within the total workforce, as respondents had indicated they were employed full or part-time. The number of respondents included under these three categories combined has increased over the past decade, to account for over 5% of the total workforce in 2001.

The occupational groupings of respondents are classified according to the NZ Standard Classification of Occupations (NZSCO99 for the 2001 census and NZSCO90 for the 1991 and 1996 censuses) which has been developed from the 1988 International Standard

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[3] A person is classified by Statistics NZ as being employed if they worked for one hour or more in the previous week for the purposes of pay or profit. Alternatively, they may have worked for one hour or more without pay, but contributed directly to the operation of a family owned or operated farm, business or professional practise. The definition of employed persons also extends to those people who have a job, yet were absent from work in the previous week owing to a variety of possible circumstances such as illness or holiday (see Statistics NZ at: http://www.stats.govt.nz). To preserve the anonymity of the data, the count of each category was randomly rounded by Statistics NZ to a base of three. This means that in the data, "Total" will not necessarily equal the sum of males and females.

[4] Respondents who identify themselves as belonging to more than one ethnic group are counted in the statistics for all the ethnic groups they identified. For example, a person who identifies with Maori, Samoan and NZ European ethnic groups will be included in the statistic for each of these groups. Statistics NZ includes respondents in up to six different ethnic groups.

[5] In 1996 there was a marked increase in the number of multiple responses to the ethnicity question (15.5% of respondents gave more than one ethnicity response compared to 9% in 2001) which resulted in a higher than expected increase in the Maori ethnic group population (Lang, 2002). Statistics New Zealand advises that when measuring change over time, ethnicity data from the 1996 census are not comparable.

[6] In a self-administered questionnaire such as a census not all indicate an affinity with an ethnic group. This leads to the total NZ population being the sum of three categories, i.e. 'Maori', 'non-Maori' and 'not elsewhere included'. The third category includes a relatively small proportion of the population (less than 1% in 1991 and 2001, and a little over 1% in 1996).

Classification of Occupations (ISCO-88) (Statistics New Zealand, 1999b). The NZSCO is a skills-based classification of occupations and jobs where the skills are considered to be an attribute associated with the occupation rather than a quality affiliated with an individual. An occupation is specified accordingly as "a set of jobs which involve the performance of a common set of tasks" while a job is characterized as "a set of tasks performed or designed to be performed by one individual" (ibid, p.11). The average skill level or vocational requirement is the major characteristic used to differentiate between major groupings of occupations.

In an effort to retain comparability with the measurement of the NZ information workforce for years prior to 1991, we have continued to use the occupational classifications employed by Engelbrecht (2000a,b, 2001). Application of this definition leads to the inclusion of a diverse range of occupations. The information workforce is not strictly limited to white collar occupations, nor does it encompass but a select few occupations (see Appendix). It should be noted that although the results of the 1991 and 1996 censuses were available from Statistics NZ catalogued according to NZSCO90 classifications, this option was not available for the 2001 census data (for the latter, data were only available according to the recent NZSCO99 classification scheme). Information occupations have been divided into five substrata with the first two of these (professional & technical, and administrative & managerial) encompassing what are regarded as high-skilled occupations, and the remainder considered low-skilled occupations.

Empirical Estimates

We report our information workforce estimates for 1991, 1996 and 2001 at an increasing level of disaggregation. First, overall estimates for the total full-time information workforce are presented. Next, differences and similarities between the Maori and non-Maori segments of the information workforce are discussed. Then the gender dimension is added. Finally, the information workforce data are disaggregated by major occupational category, as well as by ethnicity and gender. We also briefly comment on developments in the part-time information workforce.

New Zealand's full-time information workforce

The vast majority of all those undertaking paid work in NZ are employed full-time, i.e. for more than 30 hours per week. Table 1 presents the overall estimates of the size of the information workforce over the two decades from 1981 to 2001. Not only has the absolute size of the information workforce been growing steadily, but so has its relative size. The absence of a downturn in information work similar to that experienced by other types of work during the recession of the early 1990s (note the fall in the total workforce between 1986 and 1991) seems to indicate the relative stability, at least at the aggregate level, of information- compared to non-information work.[7]

[7] The picture is quite mixed at the disaggregated level. The 10 fastest growing and declining occupations over the period were a mixture of information and non-information occupations (see Department of Labour, 2002, for details).

Table 1:
Total Full-Time Information Workforce

Year	Total Workforce	Information Workforce	% Information Workers
1981	1,272,087	430,917	35.0%
1986	1,278,204	490,098	38.3%
1991	1,151,199	513,804	44.6%
1996	1,252,767	569,109	45.4%
2001	1,328,118	630,297	47.5%

Notes: 1981 and 1986 data are taken from Engelbrecht (2000b, Table 1, p. 268). Data for other years are calculated for this study from the 1991, 1996 and 2001 NZ Department of Statistics Census of Population and Dwellings reports.

Comparing the estimates for 1991-2001 with those for 1981 and 1986, it is apparent that the proportion of workers employed in information occupations (in contrast to the actual number of people employed) has not increased as dramatically over the past decade compared to the previous one: Between 1981 and 1991, there was a 9.6% growth in the proportion of people employed in information occupations, between 1991 and 2001, the increase was just 2.8%. This growth slowdown is similar to, but less extreme than, the experience of the US, where growth in the relative size of the information workforce has been very small since about 1980 (Martin, 1998).

The full-time Maori versus Non-Maori information workforce

Table 2 reports the division of the total workforce and of the information workforce into Maori and non-Maori. Although, as noted earlier, the 1996 census results with regards to ethnicity are not considered directly comparable with those for 1991 and 2001, they have nonetheless been included. In 2001, although Maori made up 10.7% of NZ's total full-time workforce, they accounted for only 7.8% of its information workforce. Under-representation of Maori in the information workforce has been persistent throughout the 1991-2001 period. However, having stated this it is also apparent that Maori are experiencing increasing employment in the information sector. This trend is observed in spite of the somewhat distorted statistics for 1996.

Table 2:
Total Maori and Non-Maori Full-Time Information Workforces

	Total Workforce		Information Workforce		% Information Workforce	
Year	Maori	Non-Maori	Maori	Non-Maori	Maori	Non-Maori
1991	96,942	1,051,470	29,724	482,871	30.7%	45.9%
1996	133,929	1,103,733	42,927	522,807	32.1%	47.4%
2001	141,597	1,173,852	49,311	577,458	34.8%	49.2%

In 1991 there was a 15% difference between the proportion of Maori and non-Maori employed in information occupations. By the end of the decade this gap had decreased by only one percentage point. However, there was a 66% increase in the absolute size of the Maori information workforce, compared with only a 20% increase for non-Maori. Clearly, the Maori information workforce is growing much faster than the non-Maori information workforce. However, combined with rapid growth in the total Maori workforce, the gap between the proportion of Maori and non-Maori in information occupations remains little changed.

Adding the gender dimension

Disaggregating the data in Table 2 by gender provides important additional insights into the composition of the Maori versus non-Maori full-time information workforce (see Table 3). In particular, the very low proportion of the male Maori full-time workforce employed in information occupations stands out (about 25% in 2001 compared to about 43% for non-Maori men, and 49.2% for Maori females). Moreover, although for non-Maori alike the gender differences are pronounced, they are greater for Maori.

Table 3:
Full-time Maori and Non-Maori Information Workforces (total and by gender)

		Male		**Female**		**Total**	
		Maori	**Non-Maori**	**Maori**	**Non-Maori**	**Maori**	**Non-Maori**
1991	Total Workforce	60,657	671,898	36,288	379,566	96,942	1,051,470
	Information Workforce	13,260	268,968	16,440	213,897	29,724	482,871
	% Information Workforce	***21.9%***	***40.0%***	***45.3%***	***56.4%***	***30.7%***	***45.9%***
1996	Total Workforce	81,873	687,375	52,056	416,355	133,929	1,103,733
	Information Workforce	19,308	286,290	23,574	236,487	42,927	522,807
	% Information Workforce	***23.6%***	***41.7%***	***45.3%***	***56.8%***	***32.1%***	***47.4%***
2001	Total Workforce	84,630	718,413	56,967	455,439	141,597	1,173,852
	Information Workforce	21,270	307,824	28,029	269,382	49,311	577,197
	% Information Workforce	***25.1%***	***42.9%***	***49.2%***	***59.2%***	***34.8%***	***49.2%***

Maori women are significantly more likely to participate in the information workforce than Maori men. This may be in direct correlation with the growth in enrolments among Maori women in tertiary institutions. Between 1991 and 1996 female enrolments more than doubled, with women comprising 58.8% of all Maori tertiary students in 1996 (Statistics New Zealand, 1998). The flow-on effect of these tertiary trained women entering the workforce may have helped boost the proportion of Maori women in the information workforce.

The full-time information workforce by ethnicity, gender and major occupational categories

The disaggregation of our information workforce data by five major categories of information occupations is shown in Table 4. Ignoring first the gender split of the data, it can be seen that for the high-skilled information occupation category 'professional & technical', the percentage of the information workforce accounted for by Maori and non-Maori has been very similar.[8] There are larger, but slowly shrinking differences, in the proportion of Maori and non-Maori in the other major occupational categories.

The administrative & managerial component of the Maori information workforce is considerably smaller than that for non-Maori. One possible reason for this could be the youthful nature of the Maori population. One may speculate that administrative and managerial positions are often obtained through length of service within a company rather than because of technical ability or education. Other trends in the data are the fall in the relative size of the clerical category for both Maori and non-Maori, and the rise of the proportion of Maori information workers in sales occupations (in contrast to non-Maori).

Table 4:
Maori and Non-Maori Information Workforces by Major Occupational Categories
(in actual numbers and in percentages)

		1991			1996			2001		
		Female	**Male**	**Total**	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**
A: Professional & Technical	**Maori**	4,428 *(26.9%)*	4,425 *(33.4%)*	8,865 *(29.8%)*	6,726 *(28.5%)*	6,264 *(32.4%)*	13,017 *(30.3%)*	9,417 *(33.6%)*	7,497 *(35.2%)*	16,911 *(34.3%)*
	Non-Maori	53,007 *(24.8%)*	89,841 *(33.4%)*	142,854 *(29.6%)*	63,741 *(26.9%)*	95,397 *(33.3%)*	159,159 *(30.4%)*	84,576 *(31.4%)*	109,482 *(35.5%)*	194,058 *(33.6%)*
B: Administrative & Managerial	**Maori**	1,446 *(8.8%)*	2,550 *(19.2%)*	4,005 *(13.5%)*	2,466 *(10.5%)*	4,083 *(21.2%)*	6,555 *(15.3%)*	3,519 *(12.5%)*	4,608 *(21.7%)*	8,127 *(16.4%)*
	Non-Maori	25,623 *(12.0%)*	76,395 *(28.4%)*	102,024 *(21.1%)*	32,283 *(13.7%)*	80,436 *(28.1%)*	112,719 *(21.6%)*	44,241 *(16.4%)*	88,806 *(28.8%)*	133,047 *(23.0%)*
C: Clerical	**Maori**	8,565 *(52.1%)*	2,727 *(20.6%)*	11,307 *(38.0%)*	10,947 *(46.4%)*	4,155 *(21.5%)*	15,114 *(35.2%)*	10,818 *(38.6%)*	4,314 *(20.3%)*	15,144 *(30.7%)*
	Non-Maori	101,571 *(47.5%)*	31,656 *(11.8%)*	133,227 *(27.6%)*	99,495 *(42.1%)*	35,661 *(12.5%)*	135,150 *(25.8%)*	95,268 *(35.4%)*	38,673 *(12.6%)*	133,935 *(23.2%)*
D: Sales	**Maori**	1,530 *(9.3%)*	1,941 *(14.6%)*	3,468 *(11.7%)*	2,754 *(11.7%)*	3,240 *(16.8%)*	5,991 *(14.0%)*	3,552 *(12.7%)*	3,219 *(15.1%)*	6,783 *(13.8%)*
	Non-Maori	29,709 *(13.9%)*	55,383 *(20.6%)*	85,083 *(17.6%)*	36,501 *(15.4%)*	59,577 *(20.8%)*	96,087 *(18.4%)*	40,701 *(15.1%)*	56,853 *(18.5%)*	97,545 *(16.9%)*
E: Production	**Maori**	471 *(2.9%)*	1,617 *(12.2%)*	2,079 *(7.0%)*	681 *(2.9%)*	1,566 *(8.1%)*	2,250 *(5.2%)*	723 *(2.6%)*	1,632 *(7.7%)*	2,346 *(4.8%)*
	Non-Maori	3,987 *(1.8%)*	15,693 *(5.8%)*	19,683 *(4.1%)*	4,467 *(1.9%)*	15,219 *(5.3%)*	19,692 *(3.8%)*	4,599 *(1.7%)*	14,268 *(4.6%)*	18,873 *(3.3%)*
Information Workforce	**Maori**	16,440 *(100%)*	13,260 *(100%)*	29,724 *(100%)*	23,574 *(100%)*	19,308 *(100%)*	42,927 *(100%)*	28,029 *(100%)*	21,270 *(100%)*	49,311 *(100%)*
	Non-Maori	213,897 *(100%)*	268,968 *(100%)*	482,871 *(100%)*	236,487 *(100%)*	286,290 *(100%)*	522,807 *(100%)*	269,385 *(100%)*	308,082 *(100%)*	577,458 *(100%)*

[8] In absolute terms there has been a 91% increase in the number of Maori employed in the professional & technical category over the 1991-2001 period, compared to a 38% increase for non-Maori.

When the Maori information workforce data are separated by gender, it is apparent that the larger proportion of women in the information workforce (in 2001, women made up 59% of the Maori information workforce) has had a strong influence on the observed overall trends. Maori women mirror the trends for females in the non-Maori information workforce in all categories with the possible exception of sales workers. The percentage of the female and male Maori information workforce employed in the administrative & managerial and the sales category was consistently less than that of non-Maori throughout the decade.

As is the case for the total NZ information workforce, Maori men do not exhibit the same degree of concentration in a single category (i.e. clerical) that is displayed in the female information workforce. Still, in other respects, the male Maori information workforce differs significantly from the male non-Maori information workforce. Maori have experienced a much more rapid decline in the proportion of production workers, particularly between 1991 and 1996, although it should be noted Maori began the decade with a much higher proportion of the information workforce employed in this category. This may be attributable to the economic recession of the early 1990s, when many Maori men, whose employment was concentrated in manufacturing industries, lost their jobs as protectionist measures were removed (Statistics New Zealand, 1998). The changes in clerical workers are similar for the two population strata, but clerical workers constitute a far greater proportion of the information workforce for Maori males than for non-Maori.

When one aggregates all high-skilled and low-skilled occupations, which correspond to major occupation categories A plus B versus C plus D plus E (see Table 5), it can be seen that the proportion of highly skilled Maori and non-Maori information workers has both increased over time, but that the gap between the two groups has shrunk little. For both Maori and non-Maori, by 2001 more that half of their information workforces were made up of highly skilled people. However, as mentioned elsewhere (Engelbrecht, 2001), there might well be inequalities hidden within any of the occupational categories, i.e. Maori might on average be employed at lower levels within occupations compared to others. This possibility cannot be assessed with the data used in this study, but should be kept in mind when interpreting the results.

Table 5:
High and Low-Skilled Information Workers (in percentages)

		1991			1996			2001		
		Female	**Male**	**Total**	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**
High-skilled:	**Maori**	35.7%	*52.6%*	*43.3%*	*39.0%*	*53.6%*	*45.6%*	*46.1%*	*56.9%*	*50.7%*
	Non-Maori	*36.8%*	*61.8%*	*50.7%*	*40.6%*	*61.4%*	*52.0%*	*47.8%*	*64.3%*	*56.6%*
Low-skilled:	**Maori**	64.3%	*47.4%*	*56.7%*	*61.0%*	*46.4%*	*54.4%*	*53.9%*	*43.1%*	*49.3%*
	Non-Maori	*63.2%*	*38.2%*	*49.3%*	*59.4%*	*38.6%*	*48.0%*	*52.2%*	*35.7%*	*43.4%*

The growth in the proportion of highly skilled information workers applied to both males and females, although it has been stronger for the latter, continuing the trend observed in Engelbrecht (2001). Despite this, in 2001, the proportion of the male information workforce classified as highly skilled was greater than the proportion for females. The majority of the female information workforce (both Maori and non-Maori) continues to consist of low-skilled workers. In comparison to the non-Maori information workforce, Maori females appear to have approximately the same distribution of high- and low-skilled workers in the information workforce. Maori males, however, have a consistently higher proportion of low-skilled workers compared to non-Maori males, although the difference has slowly diminished over the 1991-2001 period.

Some comments on part-time employment

Finally, we report some general observations on the part-time information workforce. Engelbrecht analysed its changes over the 1986-96 period. It was shown that the proportion of information workers in the part-time workforce, which were mostly women, had changed little over time, despite the general rise of part-time relative to full-time employment. The conclusion drawn was that the trend toward part-time employment was much weaker for the information workforce compared to non-information work. Estimates reported by Mahon (2002) confirm this trend to the year 2001.

Despite inconsistent growth in the relative size of the part-time information workforce, there has been continual up-skilling of this sector, although low-skilled workers remained in the majority in 2001. Moreover, the proportion of the total part-time workforce employed in information occupations remains considerably less than the equivalent statistic for the full-time information workforce.

Like its non-Maori counterpart, the Maori part-time information workforce experienced fluctuations in employment throughout the 1991-2001 period. A noticeably larger proportion of the Maori part-time workforce was employed in professional & technical occupations compared to non-Maori. Despite this, the profiles of the Maori and non-Maori information workforces by skill level demonstrated that differences within the part-time workforce are more marked than those in the full-time workforce. Maori of both genders are considerably more likely to be employed in low-skilled part-time jobs than non-Maori.[9]

[9] For further details, see Mahon (2002).

Summary and Concluding Comments

We have documented the continued trend in the NZ workforce toward employment in information occupations. Both the absolute as well as the relative size of the information workforce has grown during the 1990s, and there has been continued up-skilling, with highly skilled information workers now accounting for more than 50% of the full-time information workforce. However, compared to the previous decade, there has been a noticeable decline in the rate of information workforce growth. It remains to be seen whether this trend will continue in future.

Our findings with regard to women in the information workforce are encouraging. Even though NZ men continue to dominate the highly skilled portion of the information workforce, the gender balance is less asymmetric now than it was at the beginning of the 1990s. Women are continuing to be more involved in the information workforce in general, despite a decreasing reliance within this sector on clerical occupations, traditionally a domain dominated by females. The particularly strong growth of women in professional & technical occupations may be tentatively attributed to their increased participation in tertiary education.

Our research has shown that Maori, and especially Maori men, are under-represented in the information workforce. The disparities between the relative sizes of the Maori and non-Maori information workforces are cause for concern. Particularly concerning is the absence of any significant closing of the gaps in the participation in the information workforce between Maori and non-Maori of both genders. Although increasing proportions of the male and female Maori information workforces are employed in highly skilled occupations, these proportions again continue to be less than for non-Maori, especially in the case of Maori men. Also concerning is the low participation by Maori in "high level" tertiary education, i.e. studying for a bachelors degree and beyond. This may act as a limitation for further expansion of involvement in highly skilled information occupations by Maori.

The subdued tendency toward information work in the part-time workforce is of some interest. Further research is required to investigate the reasons for this finding, and to explore whether this trend is likely to persist in future.

Although our information workforce estimates are useful in the sense that they give a broad indication of the size, composition and trends of NZ's information workforce, they raise many questions, the answers to which lie beyond the scope of the current paper. First, further trends in the information workforce should be documented. For example, it would be of interest to dissect more fully the ethnic composition of the information workforce to ascertain if targeted government immigration during the 1990s in favour of highly skilled migrants has contributed to information workforce growth. Also, whilst we have focused solely on the occupational dimension of the information workforce, it would be of interest to investigate information employment by industry in order to more explicitly assess the impact of structural changes in the economy. Secondly, measurement of the information workforce is not the same as explaining the changes in the occupational structure. While some potential explanations were put forward, there is a need to closely relate the observed changes in the information workforce to the many (often interacting) economic, technological, organisational, social, demographic, cultural and policy factors that caused them.

Appendix

Table A.1: List of Information Occupations

A: Professional & Technical
2111 Physicists and Astronomers
2112 Meteorologists
2113 Chemists
2114 Geologists and Geophysicists
2121 Mathematicians, Statisticians and Related Professionals
2131 Computing Professionals
2141 Architects, Town and Traffic Planners
2142 Civil Engineers
2143 Electrical Engineers
2144 Electronic and Telecommunications Engineers
2145 Mechanical Engineers
2146 Chemical Engineers
2147 Mining Engineers, Metallurgists and Related Professionals
2148 Cartographers and Surveyors
2211 Biologists, Botanists, Zoologists and Related Professionals
2212 Microbiologists and Related Professionals
2213 Agricultural Scientists
2221 Medical Doctors
2225 Dieticians and Public Health Nutritionists
2226 Other Health Professionals (except Nursing)
2311 Tertiary Teaching Professionals
2321 Secondary Teaching Professionals
2331 Primary Teaching Professionals
2332 Early Childhood Teaching Professionals
2341 Special Education Teaching Professionals
2351 Education Advisers
2352 Education Reviewers
2411 Accountants
2412 Personnel Professionals
2413 Other Business Professionals
2421 Barristers and Solicitors
2422 Judges
2423 Other Legal Professionals
2431 Archivists and Curators
2432 Librarians and Related Information Professionals
2441 Economists
2442 Social Scientists
2443 Philologists, Translators and Interpreters
2444 Psychologists
2445 Counsellors

3112 Civil Engineering Technicians
3113 Electrical Engineering Technicians
3114 Electronic Engineering Technicians
3118 Draughting Technicians
3119 Other Engineering Technicians
3141 Ships' Engineers
3221 Opticians
3324 Statistical and Mathematical Associate Professionals
3341 Social Work Associate Professionals
3351 Careers and Employment Advisers
3361 Authors, Journalists and Other Writers
3362 Sculptors, Painters and Related Artists
3363 Decorators and Commercial Designers
3364 Composers, Musicians and Singers
3365 Choreographers and Dancers
3366 Film, Stage and Related Actors and Directors
3367 Radio, Television and Other Announcers
3368 Clowns, Magicians, Acrobats and Related Workers
B: Administrative & Managerial
1111 Legislators
1121 Senior Government Administrators
1131 Senior Business Administrators
1141 Special-Interest Organisation Administrators
1211 Corporate Managers or Managing Directors
1221 Production and Operation Managers
1222 Finance and Administration Managers
1223 Personnel and Industrial Relations Managers
1224 Sales and Marketing Managers
1225 Advertising and Public Relations Managers
1227 Computing Services Managers
1228 Research and Development Managers
1229 Other Specialised Managers
3332 Other Government Associate Professionals
C: Clerical
3121 Computer Equipment Controllers
3144 Air Traffic Controllers
3321 Administrative and Related Associate Professionals
3322 Legal and Related Business Associate Professionals
3323 Bookkeepers
3331 Customs and Border Inspectors
4111 Typists and Word Processor Operators
4112 Data Entry Operators

4113 Calculating Machine Operators
4114 Secretaries
4121 Accounting and Bookkeeping Clerks
4122 Statistical and Finance Clerks
4131 Stock Clerks
4132 Production Clerks
4133 Transport Clerks
4141 Library and Filing Clerks
4142 Mail Carriers and Sorting Clerks
4143 Coding, Proof Reading and Related Clerks
4144 Office Clerks
4215 Bill, Debt and Related Cash Collectors
4221 Receptionists and Information Clerks
4222 Telephone Switchboard Operators
D: Sales
1226 Supply and Distribution Managers
3311 Securities and Finance Dealers and Brokers
3312 Insurance Representative
3313 Real Estate Agents
3314 Travel Consultants and Organisers
3315 Technical and Commercial Sales Representatives
3316 Buyers
3317 Appraisers and Valuers
3318 Auctioneers
3319 Other Finance and Sales Associate Professionals
E: Production
3131 Photographers and Image and Sound Recording Equipment Controllers
3132 Broadcasting and Telecommunications Equipment Controllers
3151 Safety and Health Inspectors
7242 Electronics Fitters and Servicers
7243 Radio and Television Servicers
7331 Printing Trades Workers
7332 Binding Trades Workers
7333 Printing Engravers and Etchers
8223 Photographic Products Machine Operators
8292 Electrical Machinery Assemblers

Notes: The table lists the four-digit occupations of the 1990 NZ Standard classification of occupations that were included as information workers in this study for 1991 and 1996. Use of the 1999 classification (for 2001 data) resulted in very minor changes (see Mahon, 2002).

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