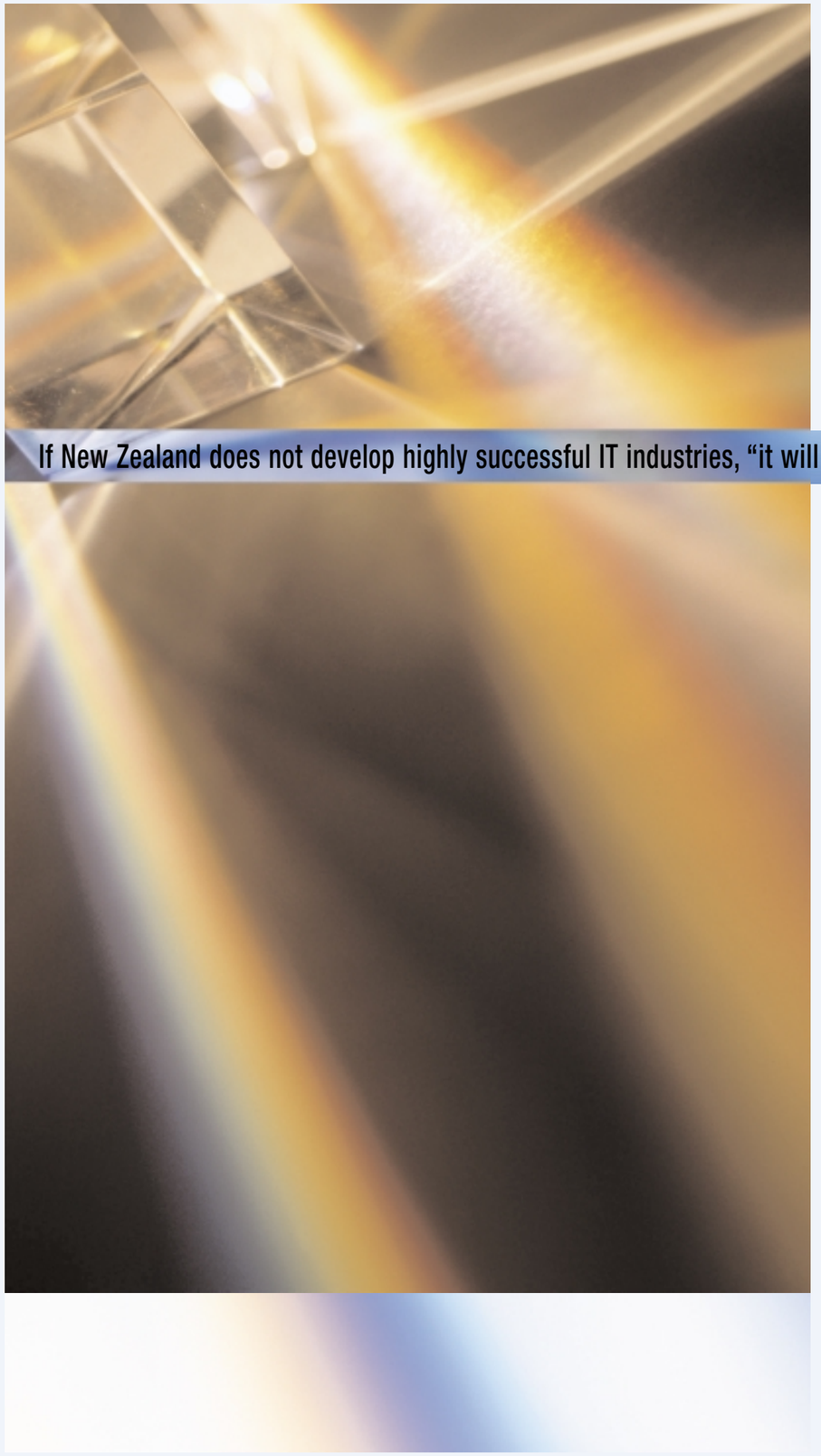

the great IT race: new Zealand lags well behind finland

If New Zealand does not develop highly successful IT industries, “it will survive only as an amusement park and holiday land for the citizens of more successful developed countries”.

The world is entering a period of change as far reaching as any that has occurred before. Technologies, in particular computers, the Internet, and electronic commerce are the driving forces behind this change. These new technologies are creating global markets for goods and services. They are also impacting on every aspect of life, including how people work, communicate and entertain themselves. The new skills required are those associated with information and knowledge rather than with the industrial skills of the 19th and 20th centuries (Ministry of Commerce, 1996).

In this new Information Age, those countries that can adapt and develop new information–based industries will thrive and become significant players in the global economy. Those that cannot adapt may find themselves as producers of low value products for the wealthier nations.

by Rebecca Watson

> “Finland’s GNP per capita has grown to more than $US24,000, placing it amongst the world’s wealthiest countries.”

New Zealand is one of many countries racing to apply information technologies in order to participate in new global markets. But it is claimed that we are doing only moderately well in this vitally important race.

Australia, Finland, Ireland, Singapore, the United States and others are performing much better and have developed highly successful information technology (IT) industries. It is believed that if New Zealand does not do the same then it “will survive only as an amusement park and holiday land for the citizens of more successful developed countries” (ITAG, 1999).

This paper compares New Zealand’s IT industry to one of the successful IT countries, Finland. It begins by comparing Finland’s and New Zealand’s size and economic development. Next, it compares the IT industries in the two countries and then presents the major factors contributing to the differing levels of IT industry success.

REMARKABLE SIMILARITIES

A small country, according to Dedrick, Goodmand and Kraemer (1995), is one with fewer than ten million people. Finland and New Zealand, with populations of 5.1 million and 3.8 million respectively, are thus considered small countries.

The physical size of the two countries is similar, so their population densities are almost identical.

There are also similarities in the economic development of Finland and New Zealand.

In the early 19th century, Finland was one of the poorest and most agrarian areas in Europe. Because of the cold climate, agricultural development – except for forestry – was limited in most areas. Finland became heavily dependent on its forests (Lyytinen and Goodman, 1999).

The economy then made a turnaround in World War II (WWII), when Finland developed a machine industry. In the fifty years since WWII, Finland successfully changed gear and cut its reliance on producing primary commodities (ITAG, 1999).

Finland then found itself in a deep recession in the early 1990s. This recession was fuelled by economic overheating, depressed foreign markets and the dismantling of the barter system between Finland and the former Soviet Union. Under this system, Soviet oil and gas had been exchanged for Finnish manufactured goods.

The effects of the three-year recession continued up until 1994, with persistently high unemployment at around the 18 percent level and a public debt that was still rising, despite increasingly severe austerity measures (Ministry of Finance, 1996).

Today, Finland has emerged from its recession due to strong growth in industrial production. Finland is now considered a highly industrialised, largely free market economy. Finland’s traditional forestry industry now accounts for less than 3% of GDP, despite experiencing growth. On the other hand, high technology industries account for a significant percentage of the Finnish GDP.

Finland has transformed itself from a commodity-based economy to one that has embraced new technologies (ITAG, 1999). As a result, Finland’s GNP per capita has grown to more than US $24,000[1], placing it amongst the world’s wealthiest countries.

Comparing Finland and New Zealand, both entered the 20th century with a heavy dependence on commodity products. Forestry has played the same role in Finland’s development as agriculture has played in New Zealand.

The only major difference between the two countries seems to be that Finland has moved away from its dependence on forestry and has grasped new technologies, whereas agriculture is still a major part of New Zealand’s economy.

New Zealand has historically relied heavily on agriculture. This mainstay of the New Zealand economy went through a massive growth period in the late 1800s due to the invention of refrigerated ships. These new ships enabled New Zealand meats and dairy products to reach Britain, which was New Zealand’s primary market at that time (Myers, 1996).

New Zealand’s dependence on primary commodity exports to Britain continued until the end of WWII. In the early 1980s the government initiated major economic restructuring to move from an agrarian economy to an industrialised, free market economy that could compete globally.

This dynamic growth boosted real incomes, strengthened business confidence and increased demand for New Zealand exports in the Asia Pacific region (Central Intelligence Agency, 1999). Exports also diversified away from dairy, meat and wool into such industries as forestry, horticulture, fishing and manufacturing (Myers, 1996).

Today, New Zealand still relies heavily on external demand for its agricultural based products. However, New Zealand’s modern agriculture, forestry and fishery industries produce a large variety of products with added value, catering for niche markets in many countries (Ministry of Commerce, 1996).

Whilst these new value-added products have been contributing to New Zealand’s GNP per capita, we have not been experiencing the growth of countries such as Finland.

A NOTABLE DIFFERENCE

Finland’s IT industry is far more successful than New Zealand’s in terms of both industry development and industry success, as can be seen from *Table 1*.

IT INDUSTRY SALES

Table 1: 1998 IT Industry Success

	FINLAND	NEW ZEALAND
DEVELOPMENT		
IT Industry Sales ($ billions)	11.087	2.155
IT Sales/GDP	9.0%	4.1%
Number of Firms in IT	4200	2500
IT Firms/Largest firms	4/50	1/50
IT Industry Employment	5.5% (1997)	2.6% (1996)
SUCCESS		
IT Exports:		
Hardware ($ millions)	7,255	175
Software ($ millions)	488	123
Total ($ millions)	7,743	298
High Technology Exports ($ millions) – 1997	8,797	428
High Technology Exports/ Manufactured exports – 1997	26%	11%
Stock Market Listings:		
Domestically listed IT firms	27	3
Internationally listed IT firms	1	0

The IT industry is a very important sector of the Finnish economy, with sales accounting for around 9 percent of Finland’s GDP.

Sales in the New Zealand IT market are substantially smaller than in Finland, at around 4 percent of GDP. However, New Zealand’s IT sales rose by 13.7 percent in 1998, an improvement over the 1997 financial year when sales fell 3.3 percent (March, 1999).

NUMBER AND SIZE OF IT FIRMS

It is estimated that there are 4200 IT firms in Finland. Most of these firms are very small, with 3700 of them having fewer than five employees (Nygard and Kunnas, 1998). Four IT firms are included in Finland's top 50 companies, with Nokia being the largest company in Finland. Three of the four sell telecommunications products and services.

New Zealand has slightly more than 2500 firms in the IT industry, with the majority in the software or services sector. Like Finland, most of these firms are very small. Telecom New Zealand, the second largest company in the country, is the only IT firm included in New Zealand's top 50 companies. There are 13 IT firms listed in the top 200 companies (Deloitte & Touche Consulting Group, 1998).

IT EMPLOYMENT

In Finland, 5.5 percent of persons employed in the private and public domains during 1997 were in IT jobs. Because of the growth of the IT industry, it accounted for almost 13 percent of the total increase in the number of employed persons in 1996-1997 (Statistics Finland, 1999[a])

In New Zealand, the number of people working in the IT industry in 1996 increased by 4 percent to 41,823. However, as a percentage of the working population, the number employed in IT decreased from 2.9 percent in 1991 to 2.6 percent (March, 1999).

IT EXPORTS

Finland's IT exports have experienced dramatic growth in recent years. Strong export positions have been created in mobile phones, personal computers and software products. In fact, Finland and Ireland are the only two European countries with positive trade balances for IT products and services. Moreover, exports of Finnish IT products and services are expected to double by 2002 (Lyytinen and Goodman, 1999).

Much of this rise in Finnish IT exports can be attributed to global telecommunications company Nokia, which may be better known than Finland itself. Nokia's success is partly the result of its acceptance of the Global System for Mobile Communications (GSM) in 1989, which made Finland the first country to launch a digital mobile network. GSM has since become the standard in all continents except the Americas (Lyytinen and Goodman, 1999). Nokia's growth has been such that if it continues, its revenues will exceed the budget of Finland some time early next decade (ITU, 1999).

New Zealand's export sector has failed to develop an information technology segment similar to that of Finland (ITAG, 1999). New Zealand's IT hardware exports are a minuscule fraction of Finnish hardware exports. However, over the last five years they have grown an average of 25 percent a year. Telecommunications hardware has been one of the major contributors. Exports of software and services increased by 56 percent from 1997 to 1998 (March, 1999).

HIGH TECHNOLOGY EXPORTS[2]

In 1995, the value of high technology exports in Finland exceeded that of imports for the first time. By 1998, nearly a fifth of Finland's exports were high technology products, up from only 4 percent a decade ago (Edmondson, 1995). Further, much of Finland's high technology production is oriented to foreign markets, as indicated by the fact that 25 percent of manufactured exports are in high technology sectors (Kraemer and Dedrick, 1992).

Like IT exports, high technology exports in New Zealand are significantly smaller than in Finland. At $428 million, New Zealand exports are equivalent to 5 percent of Finnish high technology exports. Also, high technology production accounts for only 11 percent of total manufactured exports.

STOCK LISTINGS

There are 150 firms listed on the Helsinki Stock Exchange, of which 27 are in the IT industry. One Finnish firm, Nokia, is listed on six stock exchanges including the New York Stock Exchange (Perry, 1999). Of the top 40 New Zealand listed companies, just three are in IT.

SUMMARY

Finland's IT industry is far more successful than New Zealand's. At this stage, most of Finland's rapid rise in IT can be attributed to Nokia. Even so, the fact that such a small country can spawn a multibillion-dollar company is a notable achievement.

There are three factors that help explain the differing levels of IT success exhibited by the two countries, as outlined below.

> "Four IT firms are included in Finland's top 50 companies, with Nokia being the largest company in Finland."

GOVERNMENT IT PROMOTION

The Finnish government promotes IT very heavily compared to the New Zealand government.

NATIONAL IT STRATEGIES

For a long time Finland has been seeking a pioneering role in implementing an information society. To do this, Finland's Information Technology Advisory Board (1976 to 1991) deemed that a national information society strategy was necessary.

This idea was supported by a country review of Finland's IT and telecommunications policies performed by the OECD in 1990 to 1992. The OECD country review concluded that while Finland had reached an astonishingly high level of IT and telecommunications penetration, the country lacked a clear statement of strategy in these areas. Consequently, the Ministry of Finance was given the task of preparing one.

The report, *Finland Towards the Information Society – a National Strategy*, was approved in January 1995. The strategy aims to gain and maintain a competitive edge within the world economy and to help solve domestic economic problems. As such, it is closely linked with social and economic policies (Ministry of Finance, 1996).

Finland's government promotes the utilisation of information networks and the Internet. The government ensures that basic information skills are available to all. It is also developing an Information Highway that will eventually reach homes, public services and small and medium-sized enterprises (Ministry of Finance, 1996).

The government is actively promoting the development of the IT industry. In fact, action line two of the IT Strategy states that the IT industry is to become an important economic sector. Programmes and grants have been established that seek to strengthen the competitiveness of the industry, to create new products, new businesses, and new jobs (Ministry of Finance, 1996).

Further, the government assisted in the creation of Oulu's Technopolis, the world's northernmost science park. Technopolis is home to the world's best telecommunications and electronics technology and to more than one hundred new technology ventures (Edmondson, 1995).

Unlike Finland, New Zealand has never had a formal IT strategy. The previous National government rejected the idea, preferring to let the free market reign.

The previous government believed that support for the IT industry would go against its philosophy of deregulation – it feared that by directly supporting one industry, other industries would be penalised. Instead, it preferred to support all industries through wider economic strategies. For example, the Asia 2000 strategy was designed to create favourable conditions for New Zealand exporters to move into Asian markets. As another example, the government's macroeconomic policies was designed to keep inflation low and to maintain a favourable exchange rate (Myers, 1996).

In terms of IT development, government promotion is minimal. There are no special tax incentives and few loans or grants are available for IT companies (Ein-dor, Myers and Raman, 1997). The government also does not insist on purchasing local IT products, even though such decisions can have a tremendous impact on industry development.

In one break from its free market stance, the previous National government worked with local businesses to create the Canterbury Technology Park. This park was developed to enable high technology companies to interact with local academic and research institutions (Kraemer and Dedrick, 1993).

IT PRIORITY

The development and use of IT is a very high priority policy in Finland. The fact that Finland created a national IT strategy highlights the importance attached to IT. Also, parallel IT strategy work has been going on in other areas in Finland, most notably in the industrial, educational, cultural and health and welfare sectors.

Further, the parliamentary election in March 1995 resulted in the appointment of a new government with a different political composition. While many policies changed, an emphasis on information technology matters remained (Ministry of Finance, 1996).

The IT priority in New Zealand remains low, although its importance has increased in recent years. A relatively new organisation, the Information Technology Advisory Group (ITAG), has released a report that foresees New Zealand as a knowledge society and outlines the important role of IT in this society (Blanning, Bui and Tan, 1997).

In September 1999, the Asia Pacific Economic Co-Operation (APEC) summit was held in New Zealand. This summit also considered IT a high priority.

GOVERNMENT IT ORGANISATIONS

Finland has one government IT organisation, the Technology Department, which is responsible for developing IT related strategies and policies. It is headed by the Ministry of Finance. Three more government IT organisations provide advice and stimulate discussion on IT–related issues. One of these, the Science and Technology Policy Council, discusses important questions relating to the advancement of science, technology and scientific education. The other two are the National Information Society Forum and a Government Committee for Information Society Issues (Ministry of Finance, 1996).

The Finnish government has also promoted the development of inter-ministerial clusters. These clusters bring together technology developers, public service providers and policy makers. The clusters partake in IT–related policymaking, research and technology development in an interactive way that creates a fertile ground for innovation (Maenpaa, 1999).

> "New Zealand's R&D tax situation is the least favourable of the OECD countries."

No New Zealand government IT organisations are responsible for setting IT–related policies. However, the government does receive advice on IT issues from three main sources. The Information Technology Policy Unit within the Ministry of Commerce provides economic policy advice (New Zealand Herald, 09/03/93). Further sources of advice include ITAG and the Electronic Commerce Steering Committee (ITAG, 1999). All three have been established within the last six years.

SUMMARY

Finland and New Zealand are clearly different in terms of government IT promotion. Finland has a high priority national IT strategy that promotes both IT use and industry development. As a result, Finland is both a heavy user of IT and a significant player in the international IT industry.

Under the previous National government New Zealand had no IT strategy and IT was treated in the same manner as all other industries. While this lack of government support has not hindered New Zealand's adoption of IT, it has hindered IT industry success.

Government promotion of IT is thus one factor that impacts on the development of a successful IT industry.

LEVEL OF RESEARCH & DEVELOPMENT

EXTENT OF R&D

Research and technological development have been priority areas in Finland for 20 years. As a result, investments in R&D have risen steadily for the past 15 years. The growth in research spending has been among the highest in the OECD countries, at around 16 percent per annum. The proportion of GDP spent on R&D has risen from 1.8 percent in 1987 to 2.7 percent in 1997 (Statistics Finland, 1999:2).

Research activity in IT has also been steadily growing over the last decade. Much of the initial increase in IT R&D was due to the Finnish government increasing and reallocating funding to this area. The Finns have now achieved world class results in areas including neural computing, telecommunications protocols, databases, information systems and software engineering (Lyytinen and Goodman, 1999).

The majority of Finland's R&D spending is funded by the private sector. This trend has been increasing and in the past few years Finnish companies have raised their R&D investments by about 15 to 20 percent annually (Maenpaa, 1999). The reason for this increase is that the government has been actively simulating R&D spending in industry in order to decrease its own spending on R&D.

These efforts have certainly paid off. While the world's top 300 companies spent an average of 4.6 percent of sales on R&D, Finnish companies spent more than double the OECD average, at 10.4 percent. Nokia alone spent more on R&D than the whole of New Zealand (ITAG, 1999).

In terms of total R&D expenditure, New Zealand is more than halfway down the OECD country list, with only 0.98 percent of GDP going into R&D (ITAG, 1999).

Though efforts are being made to increase total R&D spending, these efforts are insignificant and are unlikely to make a major

difference to R&D as a percentage of GDP (OECD, 1996c). With total R&D expenditures low, it is not surprising that IT R&D spending is dismal. In 1995, a mere $2.86 million of government funding was spent on IT R&D. Total private and public sector investment in IT R&D accounted for only 1.3 percent of total R&D spending (ITAG, 1999).

The most significant contributor to this small amount of R&D is New Zealand's government. Even so, only 0.61 percent of GDP goes into government funded R&D, less than half the OECD average (ITAG, 1999).

Further, because the majority of the research is government funded, R&D is currently disproportionately skewed towards the agriculture sector. The government's main science fund, the Public Good Science Fund, concentrates on the horticulture, marine and forestry sectors (OECD, 1996c).

Private sector investment is almost insignificant and has declined in recent years (OECD, 1996c). This is particularly unfortunate for the IT industry, which is predominantly funded by the private sector. With decreasing private sector R&D investment, it is widely agreed that there needs to be a much greater investment by the public sector in IT related R&D (Ministry of Commerce, 1999).

PERFORMANCE OF R&D

The majority of Finland's R&D is performed by the private sector, which ensures that research is directed toward commercially viable areas. This large amount of private sector R&D is due to the work of the government funded Technology Development Center of Finland (TEKES), which has been fostering industry-oriented R&D since 1983.

The importance of TEKES in fostering industry based R&D cannot be overestimated. The agency has created a tradition and mode of close industry-university interaction more advanced than in most other countries. As a result, R&D and innovations have been encouraged in many industries, including the growing IT industry. TEKES also supports companies in their risk-bearing R&D projects with grants and soft loans (Lyytinen and Goodman, 1999).

In contrast to Finland, most of New Zealand's R&D is performed by the public sector, specifically, by nine state-owned research companies (Crown Research Institutes). (OECD, 1996c). These companies tend to concentrate on basic research from which commercial applications can be derived (Ministry of Commerce, 1993). They also focus on primary production industries, which are often not adding any significant value or jobs to the economy.

This tendency to research in traditional industries is likely to change, as a recent alteration to government policy has opened up Crown Research Institute funding to companies and researchers (New Zealand Herald, 25/03/99). This change should increase the amount of R&D that is being performed by the IT industry.

R&D TAX INCENTIVES

The Finnish government encouraged private R&D investment by providing tax incentives. Although these tax incentives have been discarded, they did stimulate R&D when they were introduced (OECD, 1996b).

The current tax situation is still favourable to R&D. Finnish companies can fully deduct current business expenditures on R&D in the year incurred, machinery and equipment can be deducted fully in the year incurred and buildings for research purposes may be depreciated in Finland at 20 percent per year (OECD, 1996[a]).

New Zealand's R&D tax situation is the least favourable of the OECD countries. No tax incentives are offered and for every dollar a private company invests in R&D, it costs the company $1.13 (ITAG, 1999).

New Zealand is also the only OECD country that does not allow current business expenditures on R&D to be fully deducted in the year incurred. This is because the tax law maintains that any kind of R&D expenditure is an investment expense and needs to be capitalised accordingly (OECD, 1996a). The requirement to capitalise R&D investment may lead to an under-reporting of R&D, or it may act as a disincentive to such investments (ITAG, 1999).

> "Every Finnish student has access to a computer, and every primary and secondary school has fast web access."

Even though it has been found that short-term tax breaks can help stimulate R&D spending, the New Zealand government opposes allowing any such special treatment to move into the tax system (New Zealand Herald, 25/03/99). New Zealand is certainly not encouraging increased private sector investment in R&D.

SUMMARY

Finland and New Zealand have vastly different levels of R&D investment. Finland spends an increasingly significant proportion of its GDP on R&D. Most of this R&D is funded and performed by the private sector. This ensures that it is concentrated in growth industries such as IT. Further, R&D continues to be stimulated through favourable tax conditions and grants from TEKES.

In New Zealand, R&D spending is extremely low. The government funds and performs most of the research, which tends to be concentrated into declining agricultural industries. As a result, R&D in the IT industry is minimal. To make matters worse, New Zealand's tax situation does not encourage increased private sector R&D.

A country's level of R&D appears to affect the development of a successful IT industry. Moreover, a high level of private sector R&D investment seems to be important for IT industry success.

GOVERNMENT EDUCATION POLICIES

TOTAL EDUCATION EXPENDITURE

It is believed that a top quality education system is essential to success in the information age. Both Finland and New Zealand consider education important. When compared to other OECD countries, they exhibit among the highest education expenditures as a percentage of GDP. Though Finland's percentage is slightly higher, both countries have well-developed education systems (Butler and Zwimpfer, 1997).

SCHOOL EDUCATION

The Finnish education system has actively promoted IT skills, resulting in extensive IT usage throughout Finland's schools. Primary and secondary schools have offered computing since the mid 1980s (Lyytinen and Goodman, 1999). Today, students are exposed to IT at an early age and computer literacy is part of the national curriculum. Every student has access to a computer, and every primary and secondary school has fast web access (ITAG, 1999).

New Zealand's schools are making much smaller investments in IT infrastructure than other OECD countries (Butler and Zwimpher, 1997). In 1998, there was one computer for every fourteen students in primary schools and one for every eight students in secondary schools, figures that are hardly considered adequate.

> "There have been complaints in New Zealand that there is a mismatch between IT graduate skills and those required by the IT industry."

Further, only 55 percent of primary schools and 60 percent of secondary schools have web access from at least one classroom. Fortunately, IT expenditure in schools has recently increased and it is expected all schools will have adequate computer and web access within the next five years (March, 1999).

TERTIARY EDUCATION

Finland has around 20 universities or other institutes of higher education. Computing education began in the higher education sector when the first chair in computing was established in 1965. By the end of 1996, IT topics were taught in 15 universities that annually graduate more than 600 students with five-year degrees and 40 with doctorates.

Finland also has an extensive network of polytechnics that produce more than 2000 degrees each year in computing and engineering (Lyytinen and Goodman, 1999).

Reacting to the demand for trained professionals, universities and polytechnics have dramatically expanded their computer and IT-related programs over the past few years. Finland now produces five times as many science and technology graduates as law graduates. (ITAG, 1999).

New Zealand currently has eight universities. Most of the universities and the 25 polytechnics offer IT–related degrees and/or diplomas (Ein-dor et al., 1997).

The number of students enrolled in IT–related courses has been increasing dramatically over the past decade. However, the 1996 graduates in these areas amounted to only 3.84 percent of the total number of graduates. There have also been complaints that there is a mismatch between IT graduate skills and those required by the IT industry (Ministry of Commerce, 1999).

SUMMARY

Finland and New Zealand both have well-developed education systems, indicating that a reasonable level of education is required for IT industry success.

However, the Finnish and New Zealand education systems differ in two main ways. First, Finland has implemented IT and promoted IT use in schools to a greater extent than New Zealand. Second, Finland is producing a greater number of IT-related graduates.

These two findings may be correlated. Students who are exposed to IT in schools may be more inclined to pursue IT-related courses at tertiary level.

In any case it appears educational policies have an impact on IT industry success. Specifically, a high degree of IT competence at school and tertiary level is associated with a successful IT industry.

CONCLUSION

Finland and New Zealand are similar in terms of country size and economic development. Despite this similarity, Finland's IT industry is far more successful than New Zealand's, particularly in terms of the hardware sector.

Three major factors have contributed to Finland's success: Government IT promotion, high levels of private sector R&D investment and an education system that produces IT–literate graduates. In the great IT race, New Zealand lags well behind Finland at the beginning of the new millennium.

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FURTHER READING

Many of the ideas for this paper were suggested by Ein-dor et al (1997), who uncovered reasons for differing levels of IT industry success in Israel, New Zealand, and Singapore. Further valuable sources included Dedrick et al. (1995), who examined reasons for the success of IT industries in nine small countries from around the world; and Kraemer and Dedrick (1992), who studied the impact of government policies on the IT industries of ten Asia Pacific nations. The report by ITAG (1999) provides important insights into the general similarities between Finland and New Zealand.

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[1] Note: All monetary figures used in this paper have been converted to US dollars for ease of comparison between the two countries

[2] High technology includes space and aviation, computers and office machinery, electronics and telecommunication equipment, pharmaceuticals, scientific instruments, electrical machines and equipment, chemicals, non-electrical machines, and weapons.

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