New Zealand

Danny Butt

.nz

Overview

Socioeconomic snapshot

The country of New Zealand (Aotearoa) lies in the southern Pacific Ocean, approximately 1,600 kilometres east of Australia. It comprises the North and South Islands and a number of smaller islands, with a total land area of 268,021 square kilometres (Statistics New Zealand, 2000a). Polynesian settlers arrived in Aotearoa around the 10th century, with European colonisation commencing with British naval captain James Cook's visit in 1769. In 1840, after protracted war, Maori and the Crown signed the Treaty of Waitangi, and New Zealand became a British colony. The Treaty provides for recognition of the bicultural governance of New Zealand by Pakeha and Maori, though European settlers effectively became the country's administrators by 1852; and it is only since the establishment of the Waitangi Tribunal in 1975 that Maori have received reparation for illegally confiscated lands (Waitangi Tribunal, 2002). New Zealand gained independence from Britain in 1947 and is now an independent state within the Commonwealth.

The population of New Zealand in 2000 was 3.79 million, with 2.85 million living on the North Island and 0.92 million on the South Island. Among New Zealanders, 79.6 percent were identified as of European/Pakeha descent, 14.5 percent New Zealand Maori, 5.6 percent Pacific islanders and 2.2 percent Chinese. The proportion of European/Pakeha New Zealanders is significantly higher in the South Island, while almost all Pacific islanders live in the North Island city of Auckland. Auckland is by far New Zealand's largest city with a population of 1.07 million, compared to Wellington, the nation's capital and second largest city, with 340,000 (Statistics New Zealand, 2000a).

New Zealand's economy has traditionally relied on the export of agricultural products to the UK, though Asia is now more dominant. Dairy and meat exports still make a large contribution to the economy. However, industries such as forestry, horticulture, fishing, manufacturing and tourism have become increasingly significant. Over the longer term, biotechnology, ICTs, and the creative industries have been identified by the government's economic development arm,

Industry New Zealand, as three sectors for future economic development in the Growth and Innovation Framework (Office of the Prime Minister, 2002).

In many respects, New Zealand's economy is more structurally advanced than almost any other economy in the world. After a long period as a leading social welfare state, in the 1980s it went through one of the most radical processes of economic liberalisation seen in the Western world. After this failed to produce long-term, sustainable growth, since 1999 the government has been slowly involving itself in the economy – not so much through stimulating development but by aligning and focusing private sector activity. As a small country, the economy can change quickly in response to trends, but the key issue is finding sustainable value for its products and services in a global economy.

ICT use

New Zealand has high per-capita levels of ICT use, which continue to grow, with 46.6 percent of private households having access to a computer in 2001, up from 32.9 percent in 1998 (Ministry of Economic Development Information Technology Policy Group, 2002a). In addition, 58.3 percent of households have access to a cellular phone, and 30.8 percent have access to satellite or cable television. According to ACNielsen, at the end of 2001, 53 percent of the population had used the Internet in a one-month period preceding the survey. Despite high consumptive adoption of IT, OECD reports that New Zealand has registered 8.1 domains per 1,000 residents, placing it in the lower half of OECD member countries (Ministry of Economic Development Information Technology Policy Group, 2002b).

Adoption of e-mail and Internet use in the education sector has increased dramatically in all areas since 1996. In the southern provinces, for example, 100 percent of schools use e-mail and 99 percent use the Internet (Otago Southland Broadband Communications Committee, 2001).

One of the key drivers of New Zealand's Internet uptake and use has been the availability of flat-rate telephony and

Internet charging (OECD Directorate for Science Technology and Industry, 2000). Home users pay approximately NZ$40 per month for telephone access with free local calling and NZ$30 per month for unlimited dial-up Internet use. Business users pay a per-minute charge in addition to fixed-line and Internet charges. Broadband packages are usually priced as a fixed fee covering a specified number of megabytes of data downloaded and a per-megabyte charge for each megabyte exceeding the limit. Howell and Obren (2002) note that the much higher costs for broadband use compared to accesses via a standard modem has inhibited its uptake in the country. New Zealand broadband uptake figures are confined almost entirely to one technology – ADSL. ADSL services are available to around 80 percent of residential addresses, but fewer than 3 percent subscribe.

IHUG, an ISP, offers a satellite-based network for Internet access, with a high-speed incoming bandwidth from the satellite of up to 400 Kbps, and outgoing bandwidth of up to 56 Kbps via a dial-up modem. Costs are in the order of NZ$500 to install, with pricing equivalent to ADSL. It also has a wireless high-speed access system serving central Auckland, from a relay atop the SkyTower, Auckland's tallest building.

Urban-rural access to ICTs

Howell and Marriott (2002) report that businesses in rural areas continue to lag their provincial centres in uptake of e-mail and website use. Some provincial areas outperform all metropolitan areas in the use of these technologies. They note that provincial and rural New Zealanders face higher overall communications costs than those in metropolitan areas, and they conclude that users in these areas are more likely to substitute new, more effective and lower-cost technologies (e.g. cellular phones) earlier and at higher costs than in the cities. They also found that government and business educational and promotional effort has been successful in stimulating the use of technologies in non-urban regions.

Government agencies have identified the need to stimulate the supply of broadband Internet access outside the major centres. Project PROBE (Provincial Broadband Extension) has been developed jointly by the Ministry of Education and the Ministry of Economic Development to roll out high-speed Internet access, or broadband, to all schools and provincial communities, and also to encourage competition in broadband telecommunications outside the metropolitan centres.

Maori language use

From the 1880s, the use of Maori language (reo) at school had been forbidden. By the early 20th century, Maori were punished for speaking Maori at school. There has been a strong revival in Maori since the 1980s and the *Maori*

New Zealand facts

Total population: 3.79 million[a]

Rural population as a percentage of total population: 14.2%[b]

Key economic sectors: Agriculture and forestry[a]

Literacy in the national language(s):
99% in English[c]
26% of Maori can converse in Te Reo Maori[d]

Computer ownership per 100 inhabitants: 36.02[e]

Telephone lines per 100 inhabitants: 49.99[e]

Internet hosts per 10,000 inhabitants: 900.59[e]

Internet users per 100 inhabitants: 53[f]

Cell phone subscribers per 100 inhabitants: 56.33[e]

National bandwidth to and from the country: 240 Gbps[g]

Sources:
(a) Statistics New Zealand, 2000.
(b) Statistics New Zealand, 2001.
(c) World Bank, 1995.
(d) Statistics New Zealand, 1996.
(e) Ministry of Commerce, 2000.
(f) Ministry of Economic Development, Information Technology Policy Group, 2002.
(g) T. Soja, 2002.

Language Act 1987 recognised Maori as an official language of New Zealand (Statistics New Zealand, 2000a). Almost all Maori speakers are also fluent in English. Written Maori uses macrons above vowels to indicate extended emphasis on that vowel. This has been an issue with ICT development as many standard typefaces do not include macrons, requiring custom software to be installed. With the advent of Unicode on the Web, which recognises Maori as an official language, macrons are now visible in many modern browsers (Robinson, 2002).

Media consumption

In 2001, New Zealanders spent on average 168 minutes per day watching television. By comparison, in 1992 New Zealanders spent 161 minutes viewing. This compares with 274 minutes in the USA, 217 minutes in UK and 209 minutes in Australia. Over 50 percent of the New Zealanders have been to the cinema in the past six months. Outside of the USA, New Zealand and Australia are the top cinema-attending countries on a per-capita basis, followed by Singapore (ACNielsen, 2002).

According to the Nielsen//NetRatings service report for August 2002, New Zealanders on average used the Internet 13 times per month, visiting 30 unique sites, with an average time spent of 25 minutes per session (Nielsen//NetRatings, 2002b). In February 2002, female home Internet users outnumbered male users for the first time, even though men used the Internet more overall and spent more time online. Another demographic group growing online comprises those aged over 65 years. In March 2000, 38,000 people over the age of 65 were online in New Zealand; in January 2001 this was up to 60,000. Search engines, online media and e-mail facilities were the most popular sites for this group (Nielsen//NetRatings, 2002a).

Content

New Zealand, as with other Commonwealth countries such as Australia and Canada, produces and consumes the bulk of its content in English. The percentage of people with access to the Internet has increased steadily from 42 percent at the beginning of 1998 to 72 percent by the end of 2001. ACNielsen's data from 2000 indicated that e-mail was a major activity for New Zealand users (83 percent), with 45 percent accessing information on products and services and 35 percent accessing information on companies and organisations; 24 percent of users stated they were mostly or only using it for business purposes (ACNielsen, 2001).

Data on content consumption online has been difficult to obtain in New Zealand, with numerous commercial research agencies generating proprietary data using competing methodologies but little scholarly work available. A loose grouping of major media companies, including major advertising agencies and publishers, requested a proposal for a standard measurement system from Internet reporting companies at the beginning of 2002. They selected Australian-based RedSheriff and Phoenix Research as the preferred solution providers, surprising some industry observers, who noted that their methodology lacked the ability to track overseas content consumption, a large proportion of New Zealanders' web use.

Clear patterns of use are also difficult to discern as commercial research firms target their data towards advertisers by reporting site visits according to publisher rather than by property. It is therefore difficult to discern, for example, how much of Microsoft's traffic is consumption of Microsoft-generated content and how much is use of their free e-mail service, Hotmail.

The most popular overall web properties for August 2002 recorded by the firm Netratings from their panel-based methodology include common US-based portal and search engine sites, plus local ISP XtraMSN, local media companies and Air New Zealand (Nielsen//NetRatings, 2002b).

The New Zealand RedSheriff Ratings are based on standardised data collected from publishers' websites by RedSheriff. They provide the most accurate indicator of the popularity of New Zealand website publishers. Their top ten New Zealand websites for October 2002 were led by XtraMSN, the country's largest ISP. Next was Wilson & Horton and Stuff, who primarily publish newspapers. Other popular sites include Nzoom, a subsidiary of TVNZ; auction site TradeMe; retail loyalty programme Kachingo; employment opportunities site Seek; tourist information site Tourism New Zealand; and IDG, a publisher of technology and business magazines.

Detailed information on some of these content providers appears below.

Important local sources of content

The following are some popular and useful sources of New Zealand content. Content is in English unless otherwise specified.

New Zealand Government Online <http://www.govt.nz>
NZGO is the official gateway to the New Zealand government. The website provides a comprehensive gateway to government services, departments, information and employment opportunities, as well as government agency contact details. Opportunities to provide input into government submissions and a survey of recently released papers are also provided.

Scoop <http://www.scoop.co.nz>
Scoop is a Wellington-based Internet news agency accredited to the New Zealand Parliament Press Gallery. It specialises in providing news and commentary "raw and fast" and is made up largely of what Scoop likes to call "disintermediated" news – that is, news without a spin put on it by a journalist. Scoop is a convenient place to retrieve comprehensive news information on government and business activity in New Zealand.

XtraMSN <http://www.xtramsn.co.nz>
Xtra is the country's largest ISP, owned by the country's largest telecommunications company, Telecom New Zealand. It has formed a partnership with the Microsoft Network in the provision of content primarily to Xtra customers but available to the Internet at large. Content is both original and licensed from other providers, and it includes career advice and job listings, entertainment, news, and e-mail services.

Stuff Online <http://www.stuff.co.nz>
Stuff Online serves as a gateway to content published by Independent Newspapers Limited, which owns a large proportion of the country's newspaper media. Newspapers available on the site include the national *Sunday Star Times*, Wellington's *Dominion Post*, and a range of regional news, making it the best place to find news related to a specific region. Stuff also publishes *Infotech Weekly*, a leading

publication on IT issues. The site also provides job, property and personals listings.

Nzoon >http://www.nzoom.com>
Nzoom.com is a company belonging to state television broadcaster, TVNZ Group. Billed as "the homepage for New Zealanders", it features the latest news, sports, weather and business information, plus sections on entertainment, home and garden, technology and jobs. The site features significant streaming audiovisual content repurposed from the broadcast channels.

Maori Organisations of New Zealand <http://www.maori.org.nz>
"The main Maori site on the Internet", this is a comprehensive gateway to information about the Maori, New Zealand's indigenous people. The site contains information and links on Maori culture, history, traditions, *iwi* (tribal groups), *kapa haka* (performing arts), performing carving, tattooing and more. Some content is posted in the Maori language.

New Zealand Herald **<http://www.nzherald.co.nz>**
The daily *New Zealand Herald* has the highest circulation in New Zealand. Its website contains the majority of the content from the newspaper, making it an important source of national news and commentary.

NZ NetGuide **<http://www.netguide.co.nz>**
NZ NetGuide is one of New Zealand's fastest-growing magazines. Launched in September 1996, it quickly established itself as the country's best-selling technology magazine. *NetGuide* is a consumer magazine focused on providing the "best stuff on the Net". Articles are written in a user-friendly, non-technical way for a wide audience.

IDG <http://idg.net.nz>
"New Zealand's leading provider of information services on information technology" IDG Communications Ltd is a subsidiary of IDG Worldwide and publishes local IT and business periodicals such as *Computerworld*, *PC World*, and *Unlimited*.

Online services

E-government

The government has developed a whole-of-government E-Government Strategy (State Services Commission, 2001) based on Gartner Groups' Four Phases of E-Government:
• Phase 1 (Web presence) – Basic information is available to the public on government websites.
• Phase 2 (Interaction) – More extensive information, forms for downloading and e-mail communication are available to the public.

• Phase 3 (Transaction) – Self-service applications are available so that people can complete entire transactions online.
• Phase 4 (Transformation) – Government service delivery is increasingly integrated across organisation boundaries.

Key challenges to the establishment of e-government have been identified, including: (i) authentication, privacy and security; (ii) governance; (iii) data quality; and (iv) measuring the uptake and effectiveness of e-government. Funding will also be a major issue as the transformation involved in e-government is potentially wide-ranging.

A number of initiatives are already underway to implement this strategy (State Services Commission, 2001):
1. A comprehensive e-government portal was launched in 2002.
2. Web guidelines are being adopted by government organisations
3. A metadata standard has been agreed to.
4. A secure electronic environment, including mail, public-key infrastructure and directory services, is under development.
5. An e-procurement system pilot is being established.
6. Interoperability frameworks are being established.
7. Authentication policy and implementation frameworks are being established.
8. An e-services stock take and strategy is under development.

Distance education and e-learning

Across the education sector, schools, universities and polytechnics are enhancing traditional teaching with new Web-based courses. In 2001, some 300 courses at Massey University were Web-delivered or Web-supported and over 15,000 students were registered users of Massey's standard development platform, WebCT. At the University of Waikato in 2001, more than 800 papers were e-supported or e-delivered, with 100 fully online, and more than 100 academic staff teaching online (Ministry of Education E-Learning Advisory Group, 2002).

Some of these initiatives are linked to overseas institutions. For example, the oral biology course at the University of Otago is taught jointly with a number of Australian universities, thus improving quality and access.

The E-Learning Advisory Group has been established by the government, and it has recommended implementation of three initiatives (Ministry of Education E-Learning Advisory Group, 2002):
1. An e-learning leadership centre to coordinate the development of e-learning research and capability within the tertiary education sector
2. A central portal to provide a point of entry for people to access information on New Zealand's tertiary education sector and e-learning opportunities within it
3. Capital funding for tertiary education providers to develop e-learning capability

Intellectual property and small economies

One of the key issues facing the New Zealand ICT sector is the engagement with intellectual property regimes in transnational production processes. The small size of the New Zealand economy in a global market means that most ICT companies are in the domestic service sector, where their labour-time is sold, but with little value-adding or ability to extract downstream economic rents. As local companies outgrow the local market, they may supplement their domestic market with export and services to Australia and the USA, becoming a contractor within transnational production processes. Maintenance of these economic relationships becomes largely dependent on the fortunes of offshore markets or companies. For example, New Zealand has a developing interactive games industry, but even the larger companies, such as Sidhe Interactive, produce work where the intellectual property is owned by transnational interactive game publishers based offshore. Similarly, a lot of the digital design and effects companies working on productions such as *Lord of the Rings* provide knowledge labour without retaining intellectual property from this process.

In this scenario, the prospect of "task migration" becomes a key issue. Many proponents of moving towards a "knowledge economy" cite the threat of the manufacturing sector moving offshore to markets with cheaper labour and materials. However, digital tasks are even easier to move offshore than non-digital processes, should the owner of that process find a cheaper or better service somewhere else. This makes the long-term sustainability of information service work difficult to predict. For example, how will a digital effects industry in New Zealand maintain its position as a leading supplier of effects to a US-based movie industry in the face of Southeast Asian countries' growing capability (and lower production costs) in this area? Some companies such as Virtual Spectator (sports viewing technologies), Weta Digital (digital crowd generators) and Right Hemisphere (3D paint tools) have developed proprietary technologies which will give them a lasting competitive advantage in the field.

For New Zealand as a whole, the question remains of not only how to make use of the industry development benefits in hosting foreign-owned production, but also how to stimulate New Zealand-based initiatives where ongoing economic activity and employment are not subject to decisions made by multinationals offshore and sustainable returns can accrue to New Zealand companies.

Inequality of student access to ICTs, the resource-intensive nature of e-learning, quality issues, and difficulty in attracting and retaining staff with ICT skills and expertise have been cited as key constraints faced by New Zealand's e-learning environment (Ministry of Education E-Learning Advisory Group, 2002).

E-commerce and e-business

New Zealanders have already adapted to the idea of electronic transactions, as can be seen from the high use of EFTPOS and telephone banking technologies. In New Zealand, there is one EFTPOS machine for every 54 people – the highest penetration in the world (Ministry of Economic Development, 2002). New Zealand ranks behind only Iceland, the USA, and Australia in the number of secure web servers per capita, an indication that e-commerce activity is strong compared to other OECD countries (Ministry of Economic Development Information Technology Policy Group, 2002b).

A large-scale, multi-industry empirical survey undertaken by the Waikato Management School (Clark, Bowden & Corner, 2002) found increasing business use of computers (92.4 percent in 2001 to 95.3 percent in 2002) and websites (up 8.8 percent to 63.4 percent in 2002). Computer use and Web presence increased with the size of the organisation. The frequency of communication activities (e-mail, provision of product information) was high, but low for online purchases and sales.

Adoption of online banking by New Zealand Internet users has placed the country fourth, or 28 percent, after Finland (57 percent), Norway (56 percent) and Australia (30 percent), according to Nielsen//NetRatings (iStart, 2002).

Telemedicine

Real-time teleradiology is the most widespread telemedical service, where an image is sent to a radiologist for an immediate opinion. There are few telemedical services operating which are based on remote consultation in real time, but examples include teledermatology (Waikato), telepsychiatry (North Auckland) and telepaediatrics (West Coast-Canterbury) (Australia New Zealand Telehealth Committee, 2000).

Telehealth networks are under development, investing in system hardware and network infrastructure, and developing cultural practices of clinicians and patients with regard to telemedicine and telecommunications in general.

Most public hospitals have videoconferencing capabilities for administrative purposes, which are beginning to be used in clinical areas such as continuing medical education, peer support and postgraduate training.

E-community

Flaxroots Technology <http://www.flaxroots.net.nz> organised conferences in 2000 and 2002 for people interested in using the Internet and other new technologies to build stronger communities and to address digital divide issues. Its website provides an overview of the conference events. Conference papers, programmes, speaker biographies, photographs and other materials are available online. It runs an e-mail discussion list at <http://groups.yahoo.com/groups/flaxroots>.

ICT industries and services

IT industry employment

From a figure of 29,282 in 1993, employment in all the IT occupations grew steadily to reach 42,011 in 2000 and then fell to 40,935 in 2001. Computer consultancy services is the single largest employment area in IT, having risen from 4,457 in 1993 to 13,815 in 2001. However, the number employed in telecommunications services declined from 17,267 in 1990 to 8,898 in 2001 (a decrease of 48.5 percent).

Age-wise, 81.4 percent of men and 80.9 percent of women working in IT occupations are under 44 years. More men than women are in managerial IT positions and in highly skilled non-managerial occupations such as systems analyst and engineer. By contrast, women still dominate occupations such as data entry. (Ministry of Economic Development Information Technology Policy Group, 2002a).

Hardware manufacturing and assembly

Based on customs figures (Statistics New Zealand, 2002a), IT hardware imports decreased between 2000 and 2001, having risen rapidly the year before. The main sectors of imports were 4.5 percent for computing hardware and parts, 26 percent for wireless communications hardware and 15.6 percent for telecommunications hardware. Imports of wireless communications hardware were still significantly greater in 2001 than they were in 1999 or at any time during the 1990s. IT hardware exports fell 10.6 percent in 2001 after having risen 24 percent the year before. Exports of computing hardware and parts decreased by 3 percent, wireless communications hardware by 17 percent, while telecommunications hardware exports increased by 6 percent (Ministry of Economic Development Information Technology Policy Group, 2002a).

Software

Exports of software totalled NZ$110 million in 2000, up 13 percent from a year earlier. Auckland-based Peace Software has expanded the company to four countries, with 120 staff in the USA alone. Health-care software companies account for about 20 percent, or NZ$22 million, of the software industry's exports. This is because 60 percent of New Zealand doctors are using computer-based patient records, perhaps the highest rate in the world, due in part to a government requirement for patients to have a unique identification number (Oram, 2001).

Telecommunications services

Over the past decade, competition has grown into all aspects of the communications market. Today, it is one of the most rapidly growing sectors of the economy. Major providers include Telecom New Zealand, TelstraClear and Vodafone. In the central business districts, competition extends to all telephone and data services. A range of number portability and interconnection agreements are in place. Residential telephone service competition is developing, with TelstraClear now offering an extensive range of services to residential and business customers in Wellington, the Hutt Valley and Kapiti. Telecom (analogue and CDMA standard networks) and Vodafone (GSM standard network) provide extensive coverage for cellular mobile services. Internet telephony services are widely available (Statistics New Zealand, 2000b).

Examples of innovative and key initiatives

CommunityNet Aotearoa <http:/www.community.net.nz>
CommunityNet Aotearoa aims to bridge the digital divide. Supporting this aim is a website for community groups. CommunityNet is concerned with both community development and equity issues and is built on principles of empowerment, partnership, consultation, business efficiency and community building. Its goals are:

1. to provide Internet resources to encourage and support the strengthening of communities throughout New Zealand

2. to promote equitable access to IT and the Internet for community organisations

The CommunityNet website is hosted by the Department of Internal Affairs, which also supports the Flaxroots Community networking initiative. The site contains links to a wide range of community organisations in New Zealand.

Computers in Homes <http://ww.computersinhomes.org.nz>
The Computers in Homes pilot project aims to narrow the digital divide in less-advantaged New Zealand communities. Recycled computers with software, telephone line and Internet connection have been provided to 25 families in each area. Participating parents commit to attend training sessions, call the designated technician if their computer develops faults, make family rules about use of the computer and the Internet, supervise use of the computer and teach a family member or neighbour the IT skills they have learnt. The project is administered by the 2020 Communications Trust <http://www.2020.org.nz>.

(e)-vision <http://www.e-vision.org.nz>
(e)-vision has been established to showcase and provide access to new media technologies. Its aims include developing knowledge and skills through workshops and training, promoting appreciation of the arts through digital technology, and raising business and community awareness of digital media as an exciting new area of economic development and community participation. The centre is located in Wellington and managed by a non-profit charitable trust.

CityLink <http://www.citylink.org.nz>
CityLink was formed in late 1995 following a business initiative sponsored by the Wellington City Council to deploy low-cost advanced communications network. It is privately owned and has 12 shareholders, including many of the leading key New Zealand communications and Internet organisations. It has developed a high-bandwidth network throughout Wellington, built using single-mode fibre optic cable and an open architecture, and this has received international acclaim.

New Zealand Maori Internet Society <http://www.nzmis.org.nz>
The society has been established to promote a strong Maori presence on the Internet and to lobby for Internet administration in Aotearoa/New Zealand to better accommodate Maori needs. It has successfully established a new second-level domain name maori.nz. The society aims to represent all Maori, whether in New Zealand or overseas.

Digital opportunity

The government has been developing an initiative called Digital Opportunity to "enable individuals and communities to participate fully in the economic, social, educational, cultural and democratic opportunities available in a knowledge society". The main focus is improving community access to, and competence in using ICTs.

A whole-of-government approach is being taken, with the objectives to:
• stimulate development of community infrastructure for and access to ICTs
• provide skills development and understanding through training, education and awareness building
• coordinate information
• develop private sector engagement in community ICT development

Enabling policies

A key feature of the current government is its focus on whole-of-government initiatives and public-private sector partnerships. Most key government initiatives are aligned to a broader strategic framework (as described above). The government, through Industry New Zealand, is also facilitating cluster development in ICTs and cross-sector initiatives. This section outlines the key agencies involved in policy development and advocacy in the ICT sector, and information about the development and progress of many policy initiatives is available on the agencies' websites.

Industry New Zealand <http://www.industrynz.govt.nz>
Industry New Zealand is a government entity whose fundamental goal is to help existing New Zealand businesses grow and to encourage the establishment of new businesses. Its focus is on increasing this country's GDP and foreign exchange earnings through targeted economic development assistance. It has identified ICTs as one of the key sectors for development in the Growth and Innovation Framework, and it has been very active in commissioning research, forming industry taskforces and advancing discussion on ICT issues.

Ministry of Economic Development
<http://www.med.govt.nz>

The Ministry of Economic Development (previously the Ministry of Commerce) provides advice to the Minister of Communications on broadcasting policy issues, manages the radio spectrum and carries out regulatory functions relating to communications. It administers the *Telecom-munications Act 1987*, *Postal Services Act 1987*, *Radiocommunications Act 1989* and *Broadcasting Act 1989*.

ITANZ <http://www.itanz.org.nz>

This is the New Zealand national association of organisations involved in the development, production, marketing and support of goods and services related to information processing. ITANZ works to improve the business climate in the interests of all suppliers through advocacy and promotion, government relations and industry research.

Telecommunications Users Association of New Zealand (TUANZ) <http://www.tuanz.org.nz>

Formed in 1986, TUANZ is a non-profit organisation that represents business telecommunications interests and promotes competition and innovation in the telecom-munications market. The association has more than 500 corporate members, who represent a cross-section of the major business users of telecommunications.

Electronic Business Association of New Zealand (EBANZ) <http://www.ebanz.org.nz>

EBANZ provides a meeting ground for end-users of e-business products and services in New Zealand, together with suppliers, consultants, web developers and other e-business specialists. It is a good source of information about e-business in New Zealand and around the world.

Technology New Zealand <http://www.frst.govt.nz>

Technology New Zealand has a wide range of programmes to help fund the adoption of new technologies and to apply technological innovations to business development. It concentrates on innovative development in high- technology and high-value areas.

InternetNZ <http://www.internetnz.net.nz>

InternetNZ is a non-profit society established in 1995 to foster coordinated and cooperative development of the Internet in New Zealand. It guides development of Internet policy, oversees use and expansion of the New Zealand domain name space and guard Internet standards. Membership includes ISPs, web designers, public information groups and Internet users. InternetNZ owns the NZ Internet Registry Ltd, which manages the ".nz" domain name space and trades as Domainz.

E-Commerce Action Team (ECAT)
<http://www.ecat.govt.nz>

ECAT is made up of industry and business leaders and experienced e-commerce individuals. The team was set up in March 2001. It has worked on raising awareness of e-commerce issues across the broader community represented by its members and identifying ways of meeting specific sector needs.

IT Policy Group

The IT Policy Group is part of the Ministry of Economic Development's Competition and Enterprise Branch. The group's role is to provide policy advice to the Minister for Information Technology and the government on IT issues as they affect the economy and society. The unit also monitors overseas trends in technology policy and technology developments.

Regulatory environment

New Zealand has a relatively light-handed regulatory regime. For example, there are no specific licensing requirements to commence business as a telecommunications carrier and no foreign ownership restrictions for carriers, and the government is not involved in approving prices. In addition to the generic *Commerce Act 1986*, the "Kiwi Share" imposes a number of obligations on dominant telecommunications provider Telecom, including the retention of local free calling for home users and the maintenance of near-universal residential access.

The government recently passed an *Electronic Transactions Act 2002* enabling statutory requirements to be met for digital documents and signatures and the retention and production of information using electronic methods. The Act is based on the *Model Law on Electronic Commerce* issued by the United Nations Commission on International Trade Law (UNCITRAL).

The E-Government Unit (EGU) of the State Services Commission recently updated previous research on centralised e-billing and e-payments, concluding that there is no case at this time for a centralised system for state agencies. Individual agencies will pursue e-billing and e-payment where they have a clear and supportable business, while EGU will commission further research into various legal aspects of these matters.

In September 2001, the Cabinet approved the establish-ment of a Centre for Critical Infrastructure Protection <http://www.security.govt.nz> to provide coordination, support and advice on maintaining and improving security and protecting New Zealand against "cyber threats".

In New Zealand, the *Privacy Act 1993* provides a high level of protection for the personal information of New

Zealand consumers dealing with local companies. The Act applies to the e-commerce sector as well as the paper-based environment. However, consideration is being given to whether the law should also apply to non-citizens, in line with European Union Directives.

Open source movement

There is a growing interest in open source development in academic and business circles. Many developers are connected to larger US- or European-based projects rather than undertaking New Zealand-specific projects. However, open source solutions are increasingly applied to local contexts in response to dissatisfaction with Microsoft licensing fees and security issues. For example, Air New Zealand, the national airline, recently decided to replace 150 Microsoft NT servers with Linux on an IBM mainframe (Niccolai, 2002).

The New Zealand Open Source Society <http://www.nzoss.org.nz> exists to advocate the use of open source software in government, education and business. Openz <http://www.openz.org> is another organisation that connects businesses with software and IT system needs to open-source-focused vendors who can provide and support them. Following these connections, Openz strives to promote ongoing business relationships.

Research into ICTs

Research into ICTs is primarily undertaken by academic institutions, though there are a few private think tanks and public-private partnerships.

Waikato University <http://www.mngt.waikato.ac.nz/ict>
The Waikato Management School is investigating the major economic, strategic and structural impacts of ICTs, particularly in relation to the empowerment of relatively disadvantaged groups: women, Maori, new immigrants and Pacific islanders. The project is funded by a grant from the Foundation for Research Science and Technology (FRST). This research aims to increase the ability of public and private sector agencies to evaluate and respond to some of the socioeconomic consequences of the use of ICTs and to directly benefit the community groups engaged in the research.

New Zealand Institute for the Study of Competition and Regulation (ISCR) <http://www.iscr.org.nz>
ISCR is an independent non-profit research institute conducting high-quality empirical and conceptual research on competition and regulatory issues. It has a broad mandate to conduct research in any areas of organisations and markets both in New Zealand and in those international markets

directly relevant to New Zealand. It has produced important papers on e-commerce and regional development.

MediaLab South Pacific <http://www.medialab.co.nz>
MediaLab South Pacific is a research consortium linking commerce, tertiary institutions and research providers in collaborative, interdisciplinary teams. Supported by local and national governments, MediaLab develops products in the areas of IT, telecommunications and digital media.

New Zealand Institute of Economic Research (NZIER) <http://www.nzier.org.nz>
NZIER is an independent economic forecasting and consulting organisation specialising in quality economic analysis and research to help decision makers in the private and public sectors. It employs the largest team of economists in New Zealand outside of government and has undertaken numerous projects mapping the economic contribution of specific IT projects and the broader intellectual property industries.

Human Interface Technology Laboratory New Zealand (HIT Lab NZ) <http://www.hitlabnz.org>
HIT Lab NZ is a human-computer interface research centre hosted at the University of Canterbury in Christchurch. It is a partner of the HIT Lab based at the University of Washington in Seattle, USA. HIT Lab NZ is exploring the way people interact with computers by creating interfaces to enhance human capabilities and to increase the flexibility and utility of industry's existing products.

Future trends

A key issue to be faced is New Zealand's low level of spending on R&D. Such expenditure is dominated by the government and other public institutions, such as universities, with private R&D spending as a proportion of GDP rating as one of the lowest in OECD (only 28 percent of R&D spending is private, compared to an OECD average of 71 percent) (Office of the Prime Minister, 2002).

In terms of future development, the government is taking a strong lead on focusing attention towards ICT niches where New Zealand can exhibit a sustainable advantage. Some ICT sectors, such as IT hardware, are not likely to hold significant opportunities for local firms. However, there is a small but active wireless technology sector (New Zealand employs both of the major cellular communications standards), and some New Zealand software firms are world leaders in their field.

The rise of the creative industries in New Zealand is also related to and driving ICT adoption. Industry New Zealand has convened numerous forums on the potential of the interactive games and the digital effects industries, capitalising on increased interest in these fields following the success of *Lord of the Rings* and the high visibility of post-production works by companies such as Weta Digital, Oktobor, and Saatchi and Saatchi Interactive (who recently designed multi-player online games for the Rugby World Cup and Soccer World cup)

The government has also signalled that digital divide issues will be addressed through both training and economic development strategies for the ICT sector. Through the PROBE project, for example, the government is seeking high-speed Internet access for every New Zealander. (Oram, 2001)

Select bibliography on New Zealand

E-Commerce in New Zealand
<http://www.ecommerce.govt.nz>
This site contains *E-Commerce: A Guide for New Zealand Businesses*, which is a comprehensive manual to doing e-business in New Zealand, with numerous case studies and pointers to other information sources.

Statistics New Zealand <http://www.statistics.govt.nz>
The government statistics office provides detailed facts and information on all aspects of New Zealand life.

An Annotated Bibliography of Research into E-Commerce in New Zealand <http://www.ecommerce. govt.nz/statistics/bibliography200111.html>
Prepared by Dr Janet Hughes, this comprehensive bibliography contains annotated links to many of the sources cited in this chapter.

Digital Horizons – Learning through ICT <http://www.minedu.govt.nz/web/document/ document_ page.cfm?id=6760>
This site outlines the strategy for schools for the period 2002–2004. It includes links to many online resources related to education.

NZ E-Commerce <http://www.nzecommerce.co.nz>
This site is a gateway to the best information about e-commerce available in New Zealand. Here you will find how-to information for businesses, case studies, the latest research and news about e-commerce events, broadband initiatives and government policy.

Statistics on Information Technology in New Zealand
<http://www.med.govt.nz>
Published by the Ministry of Economic Development Information Technology Policy Group, this paper provides comprehensive statistical data on IT in New Zealand.

Information and Communication Technologies and Social and Economic Inclusion: Addressing the Social and Economic Implications of Limited E-Literacy and Access to Information and Communication Technologies. <http://www.med.govt.nz>
A paper by Marianne Doczi of the Information Technology Policy Group, it contains a comprehensive review of digital divide issues in the New Zealand setting.

CommunityNet Aotearoa
<http://www.community.net.nz>
CommunityNet Aotearoa provides a comprehensive list of Internet resources to encourage and support the strengthening of communities throughout Aotearoa/New Zealand. Numerous examples of community initiatives are highlighted on the site.

Industry New Zealand <http://www.industrynz.govt.nz>
Industry New Zealand is a government entity whose fundamental goal is to help existing New Zealand businesses grow and to encourage the establishment of new businesses. Its online magazine, *Venture Online*, is an excellent source of content on New Zealand industry, and it also publishes many reports on the ICT sector.

References

ACNielsen (2001). *ACNielsen Netwatch Q4 2000*.

ACNielsen (2002). *Media Trends* <http://www.acnielsen. co.nz/MRI_pages.asp?MRIID=3>.

Australia New Zealand Telehealth Committee (2000). *New Zealand 2000*. <http://www.telehealth.org.au/ states/NZ%202000.HTML>.

Clark, Delwyn, Bowden, Stephen & Corner, Patricia (2002). *Adoption and Implementation of E-Business in New Zealand: Comparative Empirical Results for 2001 and 2002*. Hamilton: Waikato University.

Howell, B. & Marriott, Lisa (2002). *The Rural-Urban "Digital Divide" in New Zealand: Progress since September 2000*. Wellington: New Zealand Institute for the Study of Competition and Regulation.

Howell, Bronwyn & Obren, Mark (2002). *Broadband Diffusion: Lags from Vintage Capital, Learning by Doing, Information Barriers and Network Effects*. Wellington: New Zealand Institute for the Study of Competition and Regulation; and Graduate School of Business and Government Management, Victoria University of Wellington.