

# .nz

## New Zealand

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### ABOUT AOTEAROA NEW ZEALAND

Aotearoa, known as New Zealand in the English-speaking world, is an island nation at the south-western edge of Te Moana-Nui-A-Kiwa (South Pacific Ocean) and 1,600 kilometres from Australia's eastern coast. Comparable in size (268,680 square kilometres) to the United Kingdom and the Philippines, it is one of the world's least crowded countries (SNZ 2008b).

The first Polynesian settlement dates to 1,000 years ago and British settlement on a large scale occurred only in the last 170 years. In 1840, the British Crown and the indigenous Maori signed *Te Tiriti O Waitangi* (the Treaty of Waitangi). New Zealand was the first country in the world to give women the vote in 1893, and in 1947 it became independent from Great Britain. The Waitangi Tribunal was formed in 1975 to investigate Treaty breaches, and in 1987, contrary to the wishes of some of the world's largest and most powerful nations, New Zealand was the first country to declare itself nuclear-free.

New Zealand has a population of 4.26 million. Europeans are the largest ethnic group (68 percent), and the indigenous Maori, are the second largest (15 percent). Asians comprise 8.3 percent and Pacific peoples 6.2 percent (SNZ 2006). Maori, English, and sign languages are official languages, with English as the main language.

New Zealand's Gross Domestic Product (GDP) per capita is lower than the Organisation for Economic Co-operation and Development (OECD) average, although it ranks high on OECD quality of life indicators (MED 2007). It is a small, open economy and has a parliamentary democracy based on the Westminster Cabinet system.

Most exports, mainly to Australia, Japan, and the United States (US), are based on a highly efficient primary sector (SNZ 2008b);

Total population	4.26 million <sup>a</sup>
Literacy rate	99% (2003 est.) <sup>b</sup>
GDP per capita (USD 1 = NZD 0.65)	USD 24,400 <sup>c</sup>
Computers per 100 inhabitants	71.6 <sup>d</sup>
Fixed-line telephones per 100 households	92 <sup>e</sup>
Mobile phone subscribers per 100 inhabitants	86.2 <sup>f</sup>
Internet users per 100 inhabitants	69 <sup>d</sup>
Domain names registered under .nz	31,400 <sup>g</sup>
Broadband subscribers per 100 inhabitants	35.5 <sup>d</sup>
Internet domestic bandwidth	7.6 Mbit/s <sup>h</sup> (maximum speed DSL download, March 2007) 2 Mbit/s <sup>h</sup> (maximum speed DSL upload, March 2007)

(Sources: <sup>a</sup>SNZ 2008a; <sup>b</sup>Central Intelligence Agency 2008; <sup>c</sup>SNZ 2008d; <sup>d</sup>SNZ 2007a; <sup>e</sup>SNZ 2006b; <sup>f</sup>SNZ 2006c; <sup>g</sup>Domain Name Commission 2008; <sup>h</sup>Keall 2007)

MED 2007). The largest import is oil. Manufactured products, such as mechanical and electrical machinery, vehicles, and textiles, comprise almost three quarters of all imports (SNZ 2008b).

### TECHNOLOGY INFRASTRUCTURE

Telecom New Zealand (telecom.co.nz) owns most of the infrastructure. Its monopoly accounts for poor performance and a poor competitive environment. However, recent government interventions are changing the situation and competition and new services are emerging.

The only backhaul service to the country is the Southern Cross Cable Network (www.southerncrosscables.com), a submarine network providing international bandwidth between Australia, New Zealand, Hawaii, and the US. The cable is owned by Telecom New Zealand (50 percent), SingTel Optus (40 percent), and Verizon Business (10 percent). Upgrades will increase the capacity from 240 Gbps to 860 Gbps by the end of 2008. A second submarine cable network is planned for 2010 between government-owned Kordia and Pipe International, and will provide competition and a diversity of routes in the event of catastrophic failure of existing networks.

New Zealand's Internet service provider (ISP) market is dominated by Telecom's Xtra and TelstraClear (www.telstraclear.co.nz). The two companies control 75 percent of the broadband and 78 percent of the dial-up markets (Paul Budde Communication Pty Ltd 2007). In 2007, there were 57 ISPs with 1,505,100 subscribers (SNZ 2007a).

There is little investment in fibre-to-the-home or premises, a reliance on ageing copper cables, and performance issues with backhaul networks (HiGrowth and NZCID 2007). Terrestrial broadband access is available to 95 percent of homes, but subscriptions — 16.5 for every 100 households — are well below the OECD average, with New Zealand ranking 20th out of 24 countries (MED 2007). The number of broadband subscribers overtook the number of dial-up subscribers in 2007 (MED 2007a).

The actual speeds for Digital Subscriber Line (DSL) download are 7.6 Mbit per second at best, with a maximum upload speed of 2 Mbit per second (Keall 2007). DSL is the most common connection technology for broadband, but as fibre speeds outshine other technologies, including DSL, cable, and wireless, by a factor of 60, the high proportion of DSL services is a disadvantage (MED 2007a).

Most broadband plans have data caps that restrict the amount of content that can be sent before additional charges apply. Exceeding the data allowance results in either a drop to a speed of 64 Kbit per second or a charge per MiB/GiB over a limit. This is unique to New Zealand.

In 2008, TelstraClear (owned by Australia’s telecommunications company Telstra) has been investing heavily in infrastructure, laying fibre networks in several cities, and building a fibre backbone through the country. At the entry level, TelstraClear offers 1 Gb of data and 2 Mbit per second both up and down — five times more data, eight times faster download speed, and 16 times faster upload speed for a similar price at Telecom’s entry level.

The country’s main cellular service providers are Telecom and Vodafone ([www.vodafone.co.nz](http://www.vodafone.co.nz)). There are 4.25 million subscribers, just 0.01 million short of the total population of New Zealand, so the market is approaching saturation. In 2007, Vodafone had a 53.7 percent share of the market, and Telecom had about 49 percent market share. New player NZ Communications (previously Econet) plans to offer another mobile service in 2009. Overall, New Zealand’s cellular service prices ranked in the third quartile of the OECD (MED 2007a).

The government launched free-to-air digital television in 2007 for a combination satellite and digital terrestrial transmission system called Freeview ([freeviewnz.tv](http://freeviewnz.tv)). The service, the third largest television platform and second largest digital platform, overcomes the poor reception caused by New Zealand’s rugged topography. After a year of operation, over 100,000 Freeview satellite television (TV) receivers have been sold and Freeview has launched its terrestrial service Freeview|HD, which broadcasts in high definition. Analogue transmission signals will be switched off by 2012, or when digital television is available in 75 percent of New Zealand households, whichever happens first (MCH n.d.).

## KEY ORGANIZATIONS DEALING WITH ICT

The Ministry of Economic Development (MED) drives the government’s Digital Strategy (NZ Government 2005), which is a shared strategy for the government, business, and community sectors. The MED is also responsible for the efficient use of the radio spectrum in the provision of telecommunications and broadcasting services (Broadcasting Standards Authority 2006).

The Commerce Commission enforces regulation and legislation that promote competition in the telecommunications industry. It determines whether mergers and acquisitions should proceed based on whether the proposal will have the effect of substantially lessening competition in a market (Broadcasting Standards Authority 2006).

The Ministry for Culture and Heritage (MCH) oversees broadcasting content regulation and administers government funding to broadcasting related organizations. It reserves radio and television broadcasting frequencies for non-commercial purposes (Broadcasting Standards Authority 2006).

Te Puni Kokiri (Ministry of Maori Development) (TPK, [www.tpk.govt.nz](http://www.tpk.govt.nz)) develops policy on reserving radio and television broadcasting frequencies for the promotion of Maori language and culture, for determining successful applicants, and for monitoring compliance (Broadcasting Standards Authority 2006).

The Telecommunications Users Association of New Zealand (TUANZ, [www.tuanz.org.nz](http://www.tuanz.org.nz)) is a non-profit organization promoting the needs of end users. Its 500 corporate members represent banks, credit card companies, supermarkets, universities, government agencies, telecommunications carriers, and others. The TUANZ is represented on the Telecommunications Carriers’ Forum (TCF, [www.tcf.org.nz](http://www.tcf.org.nz)), the recognized industry body in the Telecommunications Act 2001.

The TCF aims to promote competition for the benefit of end users of telecommunications services. It prepares telecommunications access codes for approval by the Commerce Commission and facilitates dialogue on industry issues.

InternetNZ ([www.internetnz.net.nz](http://www.internetnz.net.nz)) is a non-profit organization of ISPs, Web designers, academics, public information groups, and Internet users. It represents New Zealand for the .nz country code.

The Internet Service Providers Association of New Zealand (ISPANZ, [www.ispanz.org.nz](http://www.ispanz.org.nz)) is a non-profit industry group consisting of all of the ISPs except Telecom and TelstraClear. The organization promotes a competitive marketplace. Its primary goals include improving New Zealand’s poor international ranking for broadband uptake, enabling businesses to become more competitive internationally, and improving pricing and services.

## ICT AND ICT-RELATED INDUSTRIES

The country's ICT companies are mostly focused on the domestic market and the level of technology products exported is far behind the OECD average (MED 2007). Sales from the ICT industry amounted to NZD 18.2 billion in 2007 with exports of ICT goods and services at NZD 1.5 billion and domestic sales at NZD 16.7 billion. Electronic devices and equipment were the leading export products with NZD 304 million in sales (SNZ 2008d).

There are 2,181 ICT businesses and they are typically small, with 96 percent employing fewer than 20 people (SNZ 2008b).

## KEY ICT STRATEGIES, POLICIES, AND PROGRAMS

New Zealand needs policies and programs that are tailored to its environment, its isolation from key markets, its small size, its natural strengths and resources, and its talents (MED 2007b).

In 2006, the government adopted its Economic Transformation Agenda to carve out an approach for a more productive, innovative, and export-led economy.

The government's 2008 New Zealand Digital Strategy ([www.digitalstrategy.govt.nz](http://www.digitalstrategy.govt.nz)) lists five sectors of interest: communities, businesses, government, Maori, and the research sector. It identifies four enablers: connection, confidence, content, and collaboration. The *connection* enabler aims to place New Zealand in the top quarter of the OECD for broadband uptake by 2010. The *confidence* enabler aims to provide people with the skills and confidence to find and use information, and to ensure a secure online environment. The *content* enabler aims to provide easy access to information that is important to people's lives, businesses, and cultural identity. *Collaboration* supports efforts between communities, businesses, government, researchers, and Maori to achieve the strategy's targets earlier than planned. Initiatives linked to the Digital Strategy since 2005 are:

- The regulation of telecom, including local loop unbundling, structural separation, and making 'naked DSL' available.
- Kiwi Advanced Research and Education Network ([www.karen.net.nz](http://www.karen.net.nz)), a high-speed telecommunications network for research and education that provides a fibre optic cable with links to Sydney and Seattle at speeds of up to 10 Gb per second.
- Government Shared Network providing a secure fibre optic network for government agencies in the capital city Wellington, a wide area network (WAN) for government agencies anywhere on a secure voice and data capable network,

Internet access, Internet Protocol (IP) telephony, secure remote access and offsite data storage (WCC 2007).

The ICT Strategic Framework for Education ([www.minedu.govt.nz](http://www.minedu.govt.nz)) seeks to increase confidence, capability, and capacity; create greater opportunities for the generation, application, and sharing of new technologies; and increase effective and efficient investment in ICT. Interoperability and ease of access to, and between, systems and information is important (MoE 2006a).

The Public Broadcasting Programme of Action ([www.mch.govt.nz](http://www.mch.govt.nz)) aims for the successful development of digital broadcasting services. It recognizes that digital broadcasting will further globalize popular culture and that there is a potential for New Zealand to stimulate the development of internationally marketable technical and creative skills (MCH 2005).

## LEGAL AND REGULATORY ENVIRONMENT FOR ICT DEVELOPMENT

The Telecommunications Act 2001 regulates the supply of services. It provides for the Commerce Commission overseeing competition, determining terms and conditions for access, and deciding how costs will be allocated among industry participants. The commission also monitors and enforces telecom's operational separation.

The legislation was changed extensively following the Telecommunications Amendment Act (No. 2) in 2006. Among the changes were the:

- Appointment of a Telecommunications Commissioner to resolve disputes over access, and to recommend regulation of new services or changes to the existing regulation.
- 2006 local loop unbundling that enabled competition in the last mile of copper between the exchange and the consumer.
- Allowance of naked DSL where consumers can purchase broadband without the accompanying phone service.
- Prospect of a *structural* separation of telecom if the government is dissatisfied with its operational separation.

The Broadcasting Act 1989 makes broadcasters responsible for program standards and establishes the Broadcasting Standards Authority as a referral and approval body (Broadcasting Standards Authority 2006). In 1989, broadcasting was deregulated to encourage competition and to increase consumer choice. However, the content would continue to be regulated. As sources and distribution routes for digital content multiply,

current regulatory mechanisms have become impractical. Global initiatives attempt to prevent the distribution of potentially harmful and illegal material, such as child pornography, and detrimental content such as spam, but most providers of illegal content are not located in New Zealand. Therefore, New Zealand legislators are focusing on filtering and giving consumers greater responsibility.

But the reality of self-regulation is difficult. To gain viewer attention, broadcasters test the regulation by broadcasting programs that some believe are ‘shocking’. Also, when Grand Theft Auto IV went on sale in May 2008 under an R18 classification (not suitable for under 18 years of age), gaming shops were faced with parents ‘demanding to buy the game with their 14 year old beside them’. Although the Office of Film and Literature Classification provides that adults buying the game for minors could face three months in prison or a NZD 10,000 fine, the parents in this case may be choosing to ignore a law that has yet to be enforced (Barton 2008).

## DIGITAL CONTENT

The New Zealand Digital Content Strategy (NLNZ 2007) was one of the enablers of the 2005 Digital Strategy. It aimed for a content-rich digital New Zealand. Initiatives from the strategy included the Te Reo Maori and Pacific Languages Metadata Project to develop (or further develop) a Te Reo Maori metadata standard and a range of Pacific language standards based on the open organization Dublin Core Metadata Initiative ([dublincore.org](http://dublincore.org)). A Dublin Core Maori translation was first made available in Te Kete Ipurangi ([www.tki.org.nz](http://www.tki.org.nz)) in 2004. But the only project that could be found that had applied the Dublin Core Maori metadata set was the Clearing House project ([www.communityresearch.org.nz](http://www.communityresearch.org.nz)), which shares research in both English and Maori.

The Aotearoa New Zealand People’s Network ([www.people.snetworknz.org.nz](http://www.people.snetworknz.org.nz)), another project under the Content Strategy, uses libraries to provide free access to broadband Internet services; ICT hardware; onsite support and skill building; tools to encourage users to create, access, share and preserve content; and community repositories for citizen-created content. By April 2008 the project had rolled out to 35 regional libraries and 13 local authorities.

Escalating content creation raises environmental concerns around how data centres will store increasing collections of digital resources. There is currently no direction in the government’s Digital Strategy on how the country will produce the necessary extra energy to support increasing loads on data centres. But it is clear that creating digital content at the current rates is not sustainable.

## ONLINE SERVICES

Government agencies increasingly use online services to make information available to the public. They are also a target for intelligence gathering or attacks. Security in Government Departments ([www.security.govt.nz](http://www.security.govt.nz)) uses a security classification system for online information that is based on the Australian/New Zealand Standard ‘Information Technology — Code of Practice for Information Security Management’. The Security in the Government Sector (SIGS) addresses the protective security of both information and equipment, including physical, personnel, document, information technology, and communications. The SIGS manual is mandatory for government departments.

In 2006, the Minister for State Services launched the updated e-government strategy, *Enabling Transformation: A Strategy for e-Government 2006* ([www.e.govt.nz](http://www.e.govt.nz)). This all-of-government strategy seeks to enable State Services, the agency that serves the government of the day, to meet the needs of New Zealanders and reflect changes in how people want to interact with government. For example, people have become accustomed to doing their banking online, 24 hours a day, seven days a week, and they expect to deal with government in a similar way.

Other groups that are using online services include, for example, GeoNet ([www.geonet.org.nz](http://www.geonet.org.nz)), a geological hazard monitoring system. The active Pacific Australian plates boundary passes through New Zealand, producing earthquakes, volcanoes, steep terrain, and active deformation. A major event almost anywhere in the country would affect the whole society and economy because of the country’s small size and the interdependencies of infrastructure, logistics, and business. GeoNet is a network of geophysical instruments, automated software applications and staff to detect, analyze, and respond to earthquakes, volcanic activity, large landslides, and tsunami. This project won the 2007 Computerworld Excellence in the use of ICT in government.

e-Business in New Zealand currently lags behind e-business in other countries. The New Zealand government’s e-commerce website ([www.ecommerce.govt.nz](http://www.ecommerce.govt.nz)) has not been updated since 2003, and it is difficult to find quantitative data about New Zealand e-commerce. It is likely that the country’s slow broadband has impacted negatively on companies that want to develop a competitive e-commerce business. Trade Me ([www.trademe.co.nz](http://www.trademe.co.nz)) is the only New Zealand e-commerce website that has achieved significant success. However, it was bought by Australia’s Fairfax in 2006 for NZD 700 million. At the time, Trade Me accounted for over 60 percent of New Zealand’s Web traffic.

e-Banking is also a growing online service sector. There are eight main banks operating in New Zealand and around 85 per cent (based on assets) are Australian-owned. The Bank of New Zealand, National Bank of New Zealand, and ASB Bank offer two-factor authentication, a system where two different factors such as a piece of information or a process are used to authenticate a user. Using two factors as opposed to one delivers a higher level of authentication assurance. Phishing is a common security issue. Banks can protect customers from phishing by using the Sender Policy Framework protocol that is available to banks through their ISPs. However, no New Zealand bank has been using the protocol and the NZ Banking Association's ([www.nzba.org.nz](http://www.nzba.org.nz)) 2007 Code of Banking Practice focuses on customer liability and responsibility.

## ICT-RELATED EDUCATION AND CAPACITY-BUILDING PROGRAMS

The IT skills shortage is illustrated by the fact that an estimated 36 out of 50 information technology (IT) occupations are difficult to fill. Around 4,000 new IT job positions are created annually, but there are only 1,300 degree or postgraduate diploma graduates each year. Only 64 percent of advertised IT positions are filled, with an average of 1.9 suitable applicants per position (WIT 2008).

Outsourcing is helping to address the shortage, but the small size of New Zealand and its companies means their negotiating power is reduced. For example, the neighbouring Australian market can negotiate shorter contracts and module outsourcing segments such as just the desktop or applications or the data centre (MOFCOM 2008).

New Zealand developers are not trained in open source technologies, and those who are proficient are often self-taught. To help address this, the Tertiary Education Commission ([www.tec.govt.nz](http://www.tec.govt.nz)) allocates NZD 600,000 for Eduforge ([eduforge.org](http://eduforge.org)), an open source community that shares ideas, research outcomes, open content and open source software. It supports over 180 open source projects around the globe.

New Zealand's Summer of Code ([www.summerofcode.co.nz](http://www.summerofcode.co.nz)) is a non-profit program that creates job opportunities for students and workshops in top IT companies in New Zealand. The project has placed 26 students in 17 companies in Wellington and will expand into Auckland and Christchurch in 2008. It won the category of Open Source in Education in the 2007 Open Source awards ([www.nzosa.org.nz](http://www.nzosa.org.nz)).

In the area of educational content, Te Kete Ipurangi ([www.tki.org.nz](http://www.tki.org.nz)) is a bilingual Web portal providing educational materials for teachers and others in English and Maori. Its vision

is to provide schools with an electronic platform to communicate curriculum and administrative materials, enhance teaching and learning, raise student achievement, and advance professional development for school managers and teachers.

The NetSafe Kit for Schools addresses the safety challenges of all communication technologies by providing cyber-safety education for children, parents, schools, community organizations, and businesses. NetSafe's aim is to educate all New Zealanders about safe, secure, and responsible use of information and communication technology. It is delivered by the Internet Safety Group, a non-profit organization offering resources, information, and referrals to help schools maintain a cybersafe learning environment. The online service ([www.netsafe.org.nz](http://www.netsafe.org.nz)) is delivered via a website and through a free phone helpline.

## OPEN SOURCE/OPEN CONTENT INITIATIVES

New Zealand's open source community is small despite organizations like the New Zealand Open Source Society ([www.nzoss.org.nz](http://www.nzoss.org.nz)) promoting open source, and the State Services Commission ([www.scc.govt.nz](http://www.scc.govt.nz)) supporting open source use at government level. With little development of open source tools in New Zealand itself, these organizations tend to promote tools created elsewhere. Half of New Zealand's 20 largest organizations have deployed an open source operating system or applications.

The State Services Commission has paved the way for government open source deployment by publishing its position on the procurement of open source products (SSC 2003). It also issued a guide to government agencies to consider open source in their procurement processes (SSC 2006a). It follows its own advice using a Web standards compliant version of Plone and will also release the code for its new government portal ([newzealand.govt.nz](http://newzealand.govt.nz)) under an open source GPL licence.

The Electoral Enrolment Centre ([www.elections.org.nz](http://www.elections.org.nz)), which maintains a record of New Zealanders who are eligible to vote, has operated on an entirely open source platform since 2003. Its platform includes Debian-based servers, Virtual Private Networks (VPNs), firewalls, mail servers and clients, databases (postgres), Web servers (Apache), public websites and intranets, call centre interfaces, management applications, and extensive network, security and application monitoring.

The 2007 Open Source Awards ([www.nzosa.org.nz](http://www.nzosa.org.nz)) raised awareness of open source initiatives by celebrating winners in education, government, business, community and the creative sectors. One of the finalist projects, Weka ([www.cs.waikato.ac](http://www.cs.waikato.ac)).

nz/~ml/weka), was created by Waikato University’s Machine Learning Group. It is a potentially far reaching method of machine learning that analyses large quantities of data to make predictions or to make decisions faster and more accurately. It receives about 20–30,000 downloads per month.

The Clearing House website ([www.communityresearch.org.nz](http://www.communityresearch.org.nz)) for community research has an open content approach. It allows researchers to upload content, use the Creative Commons ([creativecommons.org](http://creativecommons.org)) licences, and describe their resources using the Dublin Core and the Dublin Core Maori metadata standards. The project has developed a Code of Practice for researching with communities that encourages an open, ethical and cultural framework.

## ICT AND ICTD RESEARCH AND DEVELOPMENT

New Zealand companies are typically small, with minimal (if any) research and development (R&D) activities. Most research funding comes from the Ministry of Research, Science and Technology ([www.morst.govt.nz](http://www.morst.govt.nz)), which manages NZD 639 million a year and delegates technology-related funding to the Foundation for Research, Science, and Technology (FRST, [www.frst.govt.nz](http://www.frst.govt.nz)). The FRST invests NZD 500 million a year in science and technology research. Its Technology for Business Growth investment aims to develop capability within firms by partially funding technically challenging R&D projects. In 2008, it invested NZD 25 million in the biological industries, biotechnology, specialized manufacturing, and information and communication technologies.

For R&D in ICT for development, the Maori economy provides an appropriate starting point. The ancestors of New Zealand’s indigenous Maori people sailed to Aotearoa, several thousands of kilometres from East Polynesia, around 1,000 years ago. These purposeful journeys used converging technologies that enabled them to cross ‘the mighty Pacific like a garden pond, centuries before Europeans made it across the petty Atlantic’ (Belich 2001). However, following British colonization and breaches of the 1840 Treaty of Waitangi, including questionable land acquisitions, land wars and legislative maneuvers, Maori experienced a severely reduced economic base. Today, only 1.3 million hectares of the original 26.4 million hectares are designated as Maori freehold land, and Maori are represented negatively in most socio-economic factors, including employment, education, housing, and health. This makes their aspiration for development high.

Treaty settlements to tribal groupings in the 1990s and 2000s have included lump sum payments that are typically used as

revenue-producing investments. The Maori economy is based on collectively owned assets, businesses of those who identify as Maori, commercial transactions involving Maori culture, and services oriented to Maori needs. It is an increasingly productive economy and was estimated in 2003 at nearly NZD 16.5 billion, 1.5 percent of the value of the New Zealand business sector (NZIER 2003). Treaty claim settlements since then have continued to add back to the asset base (TPK 2007b). However, trends show that the Maori economy is heavily based on agriculture and fisheries, sectors that are characterized by slow growth, declining profitability and heavy exposure to world markets. Approximately 60 percent of Maori assets are exposed to international trade compared to 31 percent for the whole economy (NZIER 2007). Understandably, there is a strong drive by Maori to enter digital-based businesses.

As an example, the Maori Spectrum Charitable Trust known as Te Huarahi Tika Trust ([www.thtt.co.nz](http://www.thtt.co.nz)) and its commercial arm Hautaki Ltd were set up to provide Maori right of purchase over the third generation 3G spectrum radio frequency being auctioned by the government, and to engage a commercial partner to develop the 3G spectrum. Hautaki Limited owns 30 percent of Econet, now renamed NZ Communications, which is planning to build a third cellular network in New Zealand.

Another Maori-owned IT company, Paua Interface Ltd ([www.pauainterface.com](http://www.pauainterface.com)), has provided consultancy and IT services mainly, but not exclusively, to Maori and community groups since 1990. It has generated a wide range of research reports on the overlap of information technologies and Maori, ethics, intellectual property, security, governance, education, business, community, and more. Its biggest challenge is finding appropriate ICT skills among Maori, a near impossible task.

EDS New Zealand ([www.eds.com](http://www.eds.com)), a subsidiary of the USD 20.6 billion Texas-based IT outsourcing giant, the Maori Education Trust ([www.maorieducation.org.nz](http://www.maorieducation.org.nz)), and Te Puni Kokiri (TPK, [www.tpk.govt.nz](http://www.tpk.govt.nz)), the Ministry of Maori Development, are providing five scholarships for young Maori studying IT subjects. EDS is the largest IT employer in New Zealand, and it aims to increase the presence of Maori in the IT workforce while tapping in to a new resource pool in a tight labour market.

Overall, Maori have development objectives, an asset base and a desire to enter into the digital sector, and they are well positioned to meet the challenges and opportunities of the digital environment. They have shown a strong uptake of digital technology, and are prolific creators and consumers of distinct digital content particularly in the broadcasting, arts, education and academic arenas. Future reviews will have an opportunity to monitor progress.

## CHALLENGES AND OPPORTUNITIES

The ICT challenge for New Zealand is mainly one of timing. The country’s remoteness means high transport costs and large carbon footprints for commodity exports. Thus, digital capability is a critical issue. Many believe that the pace of ICT development in New Zealand will only maintain its low ranking in the OECD. At the current rate of fibre rollout, New Zealand will have fibre to the premises (FTTP) to only 75 percent of premises by around 2040 (WCC 2007). Innovations for the development of communities and Maori that depend on speed will not be enabled.

The situation perhaps reflects the government’s contribution of just over 1 percent of the GDP to science and technology research, whereas many other countries in the OECD contribute an average of 3 percent. The economic benefits of competitive broadband access, if available, could be in the range of NZD 2.7 to NZD 4.4 billion or more per year to New Zealand’s gross domestic product (NZIER 2007).

If available, high-capacity broadband would enable video conferencing, online health services, e-learning, and other applications to run simultaneously. However, the expectations of businesses to work effectively in a global online economy are not being met in New Zealand (WCC 2007). New Zealand’s best innovative, export-orientated technology companies often disappear as foreign shareholders, originally brought in as strategic investors, restructure them. They move the intellectual property and the best talent overseas to where conditions and incentives are more favourable. For example, the manufacturing arm of award-winning Humanware, maker of the BrailleNote computer, was moved to Canada, closing down the Christchurch-based team and a New Zealand technology export (Griffith 2008).

In the broadcasting sector, ICT development have had major impacts with the change from analogue to digital, increased distribution options, including terrestrial and satellite transmissions, and the demand for mobile broadcasting applications and Web-based services. However, inadequate access to high-speed Internet is a constraint to the development of content for users and production companies, and it impacts negatively on the true potential of the industry (HiGrowth and NZCID 2007).

Clearly, the opportunity for New Zealand lies in its ability to address its poor infrastructure and therefore attract and keep its best talents, as well as in its ability to discover its point of differentiation in the global context. For example, it is fruitless to attempt to compete with countries that have hundreds of thousands of competent software developers and programmers when

New Zealand has only 1,300 graduates a year many of whom are from overseas and leave after graduation. But some have noted that there is a trend emerging in New Zealand’s creative digital sector in film, animation, and other creative products and services that could be the key to the country’s distinct contribution to the world. New Zealand has much more to offer than just jobs. It has access to a relatively clean, untouched environment with more available space per capita than any other developed country. The country is primed for creativity. Its lifestyle could well be the country’s attraction to people with skills. Engaging in ICT developments that enhance New Zealand’s unique environment would sustain and celebrate what the country has to offer.

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