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Report prepared for Te Puni Kōkiri on behalf of:

Ngā Pū Waea

INVESTMENT OPPORTUNITIES FOR MĀORI ENGAGED IN THE TELECOMMUNICATIONS INDUSTRY: SITUATION AND INITIAL ECONOMIC ANALYSIS

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March 2012

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Opportunities for Māori engaged in the ICT Industry: situation and initial economic analysis

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1 Summary

This report has been prepared by Business and Economic Research Limited (BERL) for Te Puni Kōkiri on behalf of Ngā Pū Waea, the Māori Broadband Working Group.

The report focuses on how Māori may benefit from investment into broadband and the technology and applications this investment supports. This report aims to be a short, initial stage of research that highlights key issues for indigenous people and the economic potential associated with the deployment of broadband. Further stages are planned.

We begin with a situation analysis on industries and areas that are most likely to benefit from the roll-out of broadband and the experiences of indigenous people in such roll-outs. This highlights potential industries, areas and drivers/barriers for Māori to successfully engage with the deployment of broadband on the basis of the general experience around information and communications technology. This more general focus reflects that our search identified little specific evidence on the experiences of indigenous people and broadband roll-out.

The economic analysis looks at how the Māori economy may change between 2010 and 2031, and on the economic opportunities around the use of broadband. It examines how the use of broadband and the information and communications technology industry, subject to the anticipated investment into this infrastructure by the government, could improve income and employment outcomes. The aim of this analysis is to highlight for Ngā Pū Waea which industries should be at the top of the list for further investigation, stakeholder engagement and coordinated planning.

This initial analysis is based on international evidence, and has been informed by BERL's work on broadband for a limited set of specific regions and iwi. These initial estimates are likely to be conservative. Further research is required to provide evidence to validate these estimates, and to discover an information base required to give greater confidence in the estimates and to support stronger conclusions on the benefits to Māori.

To get underway quickly in order to inform Ngā Pū Waea's early work programme planning, we drew on our previous research which has focussed on the benefit of broadband use (i.e. roll-up). We do not specifically examine the jobs and other economic impacts from the 'roll-out' of broadband (i.e. building the infrastructure) in this initial piece. The roll-out is likely to offer a range of opportunities for Māori, and therefore the initial estimates are likely to be very conservative. Further information would be required and could be sought in the subsequent stages of research in order to better characterise the 'roll-out', as well as the 'roll-up', impacts and opportunities.

1.1 The Ultra-Fast Broadband and the Rural Broadband Initiatives

The Government has put in place two initiatives to improve broadband services - the Ultra-Fast Broadband (UFBI) Initiative and the Rural Broadband Initiative (RBI). This will entail a government investment of around $1.35 billion plus significant private co-investment.[1] The UFBI aims to roll out UFB to over 75 percent of New Zealanders within ten years, concentrating in the first six years on priority broadband users including businesses, schools and health services. This RBI aims to deliver broadband to 86 percent of rural homes and businesses and to deliver peak speeds of at least 5Mbps.

1.2 Broadband and ICT in context

Broadband is a form of Information and communications technology (ICT). ICT refers to a general purpose technology that provides access to information through media such as the Internet, wireless networks, cell phones, and other communication devices. ICT is generally considered as a tool for development. As a general purpose technology, ICT acts as an engine of growth. As it improves (e.g. development of broadband for the internet), it gets adopted by an increasing number of people, which enables complementary innovations to be developed, further increasing the demand for ICT and the applications supported by it. This creates a strong positive link between ICT, productivity growth and economic growth.

Evidence from the literature suggests that one of the factors limiting the adoption of ICT by indigenous people is accessibility. Access issues include the high cost of the technology, lack of adequate telecommunications links to remote communities and poor computer literacy together with the difficulty of improving computer skills. These access issues, as well as a general lack of awareness of IT as a possible career path, have severely limited indigenous people studying IT at a higher level and therefore choosing IT as a profession.

1.3 Key economic results

This research indicates that successfully targeted investment that stimulates broadband 'roll-up' could lift employment growth for Māori from 0.9 percent per annum to 1.2 percent per annum between 2010 and 2031. This is equivalent to creating just over 400 extra jobs per year for Māori across a range of industries associated with broadband-enabled applications.

The successful deployment of broadband will also boost growth in the Māori economy, lifting growth in value added output (GDP) from 2.5 percent per annum to 2.8 percent per annum, which would be equivalent to adding just over $1,300 per year to every worker's income.

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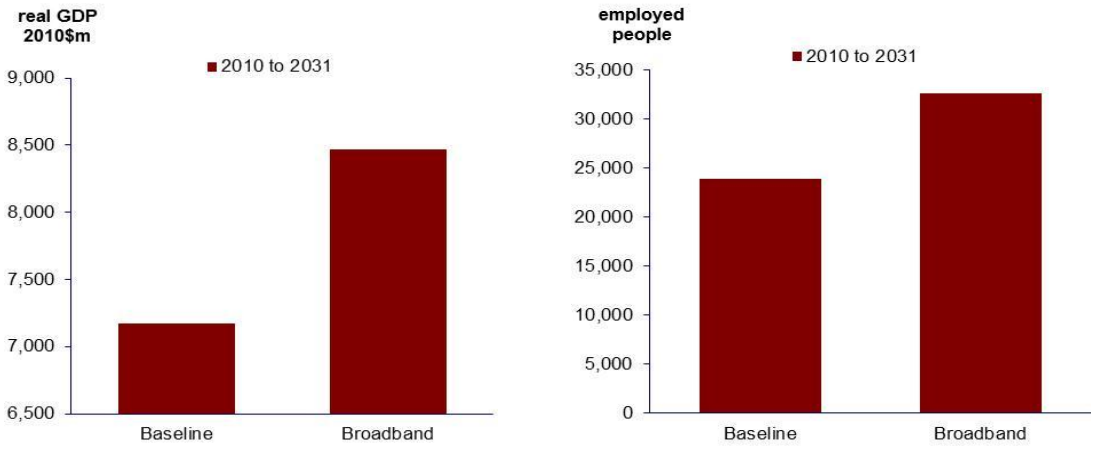
[1] See http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/ and Bell Labs/Alcatel-Lucent (2012) Building the Benefits of Broadband.

Figure 1.1 Change in GDP and jobs in the Māori economy, 2010-2031

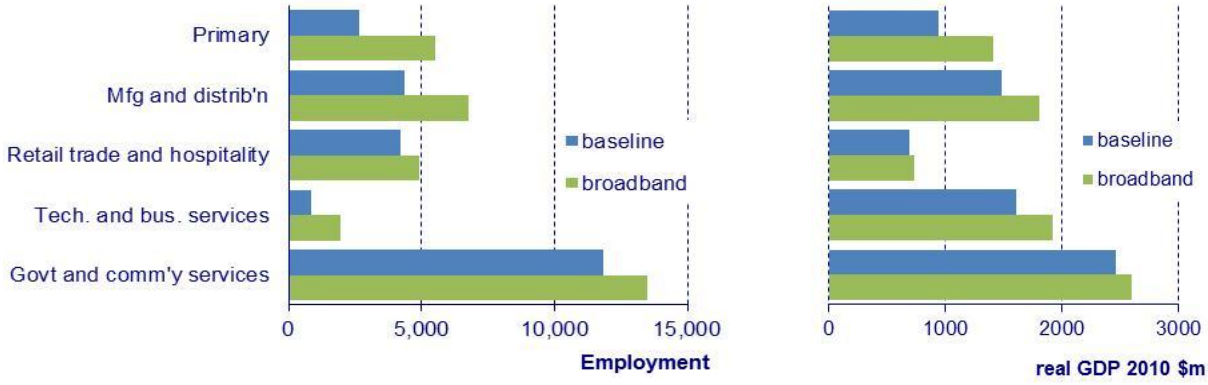


Early roll-out could speed up diffusion of the technology and uptake of applications, that is roll-up. This is a process that Ngā Pū Waea could facilitate. For this simple analysis, we estimate the value of advancing comprehensive uptake by two to three years (i.e. 2014). We then project the compound effects of this out to 2031. Such early roll-up could add an extra $190 million to the Māori economy by 2031 (around $9 million per year) relative to a situation where roll-out and comprehensive uptake is delayed by three years.

We project that the effect would be slightly greater in relative terms for the New Zealand economy as a whole. In dollar terms, for the New Zealand economy as a whole, early roll-up could add an extra $1.4 billion to GDP per year. The difference for the Māori and overall New Zealand economy reflects that the make-up of the Māori economy. In particular, it currently has a relatively smaller representation in industries that the international evidence indicates that are likely to benefit from broadband. However, further research in the subsequent stages may provide evidence that these estimates are too conservative and should be revised in light of the new evidence.

Our projections indicate that the Māori economy could achieve the largest gains from prioritised investment into the industries of Agriculture, Forestry and Fishing, Processing and Manufacturing, and Education and Training. The investment will create wider job opportunities for Māori, with higher demands for Technicians & Trades Workers, Machinery Operators & Drivers but a lower requirement for Labourers.

Figure 1.2 Employment and GDP growth by sector of the Māori economy, 2010-2031



1.4 Some points to think about

Below we highlight some key issues that may drive, influence or obstruct Māori from fully harnessing the benefits of broadband. Ngā Pū Waea may wish to reflect on how their work plan may relate to these points.

- Barriers to access. What are the current barriers to Māori accessing IT, studying IT and establishing careers and businesses in the ICT space?
- People and place. What industries can be focussed on in specific geographic areas to leverage the local strengths and make the greatest and fastest gains for Māori?
- Employment opportunities. How do Māori think about broadband creating employment opportunities - i.e. what unique approaches do Māori use to support economic development and social outcomes using their assets, people and skills?
- Building capital. What mix of human and physical capital, i.e. skills and equipment is required to increase and improve labour and capital productivity?
- Ownership and development of assets. What objectives do Māori have for the ownership and sustainable development of assets related to broadband?
- Investing and investment. What types of investment are required and what smart ways can Māori use to generate this investment, including collaboration?

2 Introduction

The broad role of Ngā Pū Waea (NPW) is to assist in ensuring Māori communities can be connected in a timely and efficient manner, and to maximise opportunities arising from the deployment of broadband.

This report represents the first two stages of a seven stage research project BERL proposed to assist NPW carry out its work programme.[2] This initial piece aims to provide NPW with a quick, high level view – from an economic point of view – of the key issues, drivers and opportunities for Māori engaging with the telecommunications industry related to broadband. We indicate some of the potentially 'low hanging fruit' that NPW may wish to consider as priorities in its work programme.

In section 2.2 below we also note what would be required next to refine the initial estimates, to ground reference these to a Māori context/experience, and also some suggest some additional potential research areas that have come to light as a result of this initial work.

2.1 Focus for this initial analysis

The report focuses on how Māori may benefit from investment into broadband and the technology and applications this investment supports. We begin with a situation analysis that considers the literature on industries and areas that are most likely to benefit from the roll-out of broadband and the experiences of indigenous people in such roll-outs. This highlights potential industries, areas and drivers/barriers for Māori to successfully engage with the deployment of broadband.

The second part of the report looks at how economic activity for the Māori economy may change between 2010 and 2031. In addition to providing a baseline, this projection illustrates what investment into broadband might mean for the Māori economy and employment. The aim of this analysis is to highlight for NPW which industries should be at the top of the list for further investigation, stakeholder engagement and coordinated planning.

2.1.1 Information base

This report discusses the make-up of the Māori economy using official data sources and BERL's model of the New Zealand and Māori economy. The current interests of Māori predominantly lie in the primary industries – farming, fishing, and forestry, and renewable energy; in health, education and training. This base is combined with the information from

[2] Refer to BERL (October 2011) Proposal for research on the Investment Opportunities for Iwi-Māori engaged in the Telecommunications Industry, and our updated proposal in November 2011.

the situation analysis to examine how Māori can engage with broadband to leverage future economic development across these industries, and emerging sectors.

This analysis also draws on BERL's experience in identifying emerging sectors of importance to specific iwi from the point of view of innovation and collaboration. This experience is used to inform the 'what if' scenario analysis of the potential impacts of broadband within the context of the Māori economy.

2.2 What next?

The immediate next two steps that we propose NPW consider undertaking are noted below. The final three stages that analyse and report on the opportunities would follow subject to NPW's approval of, and guidance on, our directions and progress.

2.3 Evidence of the impacts of broadband for Māori

Stage 3. Profile of Māori in ICT: participants, their characteristics and aspirations. This would explore who, how and what they are doing.
Potentially, NPW may wish to deprioritise this stage, as it is primarily a desk-based, 'wide view' analysis and for us to concentrate instead on progressing Stage 4.

Stage 4. Fieldwork interviews and case studies (discussed below).

We believe that the initial estimates are conservative: for example, the estimated impacts sit at the lower end of the range of GDP impacts in other countries summarised by the OECD. The initial analysis also focussed on the 'roll-up' impacts from using broadband and ICT, and this analysis could be extended to investigate the impacts and opportunities around the 'roll-out', that is, the investment in building the infrastructure required for the use of broadband.

The next two stages of research that BERL proposed to follow on from this initial piece of work involve 'on the ground' research. This research is required to validate or improve upon the initial estimates and to provide a more detailed opportunity analysis. The intention with this work would be to provide an evidence base that NPW could use to confidently answer its key questions around the magnitude and types of benefits that Māori may experience from engaging with broadband. While we believe that the estimates in this report are conservative, and on the lower side, the evidence base may show that the potential is lower than the initial estimate. We believe NPW would wish to be confident about this.

The following areas have surfaced in the course of this initial piece of work, but which are additional to the proposed scope. We would be happy to discuss with NPW how these areas link to the proposed research and to determine the relative priority of conducting these and the resource required. We expand on these areas in section 6.

2.3.1 Where are the people? Where are the assets?

Previous work conducted by BERL has shown that Māori people do not always live where the Māori asset base is. This raises both opportunities and obstacles/issues, and the question of what role broadband can play in tele-working and tele-community. The RBI is an opportunity to overcome these obstacles and realise opportunities.

2.3.2 Labour Force Development Strategy

As noted above, there are potential issues or obstacles to achieving the full potential due to the (dis)location of people and assets. BERL can assist NPW by providing the analysis to identify the labour force opportunities for Māori, and assist NPW to develop a 'labour force strategy' to ensure that Māori are best placed to take jobs created by the Māori economy.

3 Putting broadband/ICT into context

This situation analysis aimed to consider the literature on industries and areas that are most likely to benefit from the roll-out of broadband and the experiences of indigenous people in such roll-out.

The analysis is divided into three parts:

- The first part provides a framework to think about what ICT is, and its role in economic growth.
- The second part considers how broadband and ICT affect the relationship between inputs, productivity and output.
- The third part uses literature/studies conducted in Australia, Canada, the USA, and other countries to briefly evaluate the role, effects and impacts of ICT indigenous people (IP).

This situation analysis tends to take a more general focus on ICT than on broadband specifically, as our search identified little specific evidence on the experiences of indigenous people and broadband roll-out.

3.1 General purpose technologies (GPT) and information and communications technologies (ICT)

Information and communications technology (ICT) refers to a technology that provides access to information through telecommunications. This includes the Internet, wireless networks, cell phones, and other communication mediums.

ICT is considered part of a group of technologies known as General Purpose Technologies (GPTs), a term introduced by Breshana and Trajtenberg (1995) when describing the role of technology in economic growth.[3] GPTs are:

- used throughout the economy (pervasive),
- continuously improving (improvement potential), and,
- are innovation spawning (GPTs enable complementary innovations).

GPTs are commonly referred to as 'enabling technologies' or engines of growth as they provide opportunities rather than final solutions (Shea, 2005). Early examples of GPTs include steam power, rail, electricity and telephone, leading through to the later 20th century developments such as the computer and cell phone.

[3] For further information, see BERL (2011). Regional and Inter-Regional Economic Assessment of the Benefits of Broadband for the Bay of Plenty and Auckland Regions.

The benefit of a GPT can be thought of as its ability to enable investment in complementary innovations and the development of applications that:

- improve business or operational processes – computers have not only reduced the cost of coordination, communication and information processing costs, they have also allowed businesses increase efficiency through decentralisation;
- develop new products e.g. computers have enabled the internet to be developed; and
- enhance existing products (convenience, timeliness, quality and variety).

Researchers have found a strong positive link between ICT and productivity growth. For example, Lichtenberg (1995, and Lehr and Lichtenberg 1998) found that productivity is linked to the number of computers, and that the rate of return on investment for computers is three times greater than the rate of return on other capital or equipment. Martinez et al (2009) firm-level study found that ICT accounted for about 35 percent of total growth in labour productivity in the US between 1980 and 2004.

The adoption or uptake of GPTs is a significant influence over the size of GPT benefits. Slow adoption or uptake delay the productivity gains that can be made. Research has identified that the rate and benefits of technological progress depends on the presence of a fostering market environment (UN, 2007), and policies and infrastructure that support the diffusion, adoption and adaption of GPTs (Atzeni & Carboni, 2006).

Policies to support adoption and the benefits from the 'roll-up' to broadband include:

- increasing skilled labour,
- encouraging government and private partnerships, and
- patent protection for new products.

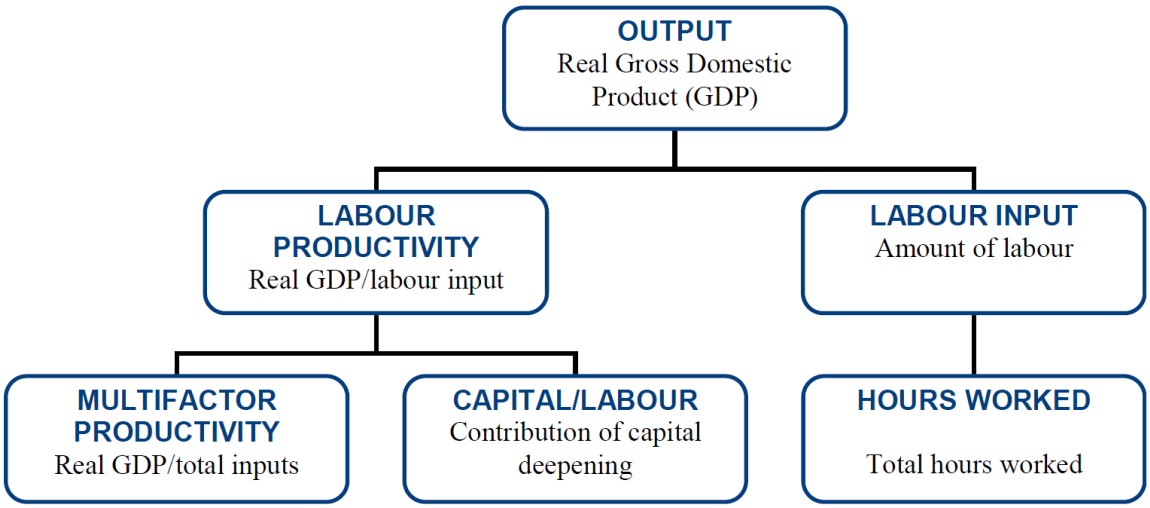
Fast broadband can enable video, audio and data-intensive applications. This permits greater teleworking, telepresence and connection to market. Towards 2031, this could bring benefits to a number of industries of interest to Māori, but in particular tourism, financial and business services, and industries competing in global markets where product quality, innovation and the connection to customers is critical.

The integration of the value chain in our important primary-based industries enables rapid and deep adoption of broadband as the substantial businesses in the supply chain, like Fonterra, Miraka, DairyNZ, Zespri and others can ensure production quality by connection with individual producers, and relating real-time information to customers, such as was necessary recently in the kiwifruit industry.

3.2 Let's get growing

Below, we consider how ICT impacts on productivity and growth, and then examine some international evidence that quantifies this impact. We picture the relationship between inputs, productivity and output in order to help frame up how industries and employment may be affected by the roll-out of broadband and ICT. Figure 3.1 illustrates this relationship.[4]

Figure 3.1 Factors supporting economic growth



Source: Janssen and McLoughlin (2008).

Output might grow from working harder (increases in "labour input") or working smarter (increases in "labour productivity"). Labour productivity measures the amount of output generated per unit of labour input, such as hours worked. In turn, labour productivity is influenced by the amount of capital a worker employs and the knowledge or technology used ("multifactor productivity" or MFP).

Pictured this way, it is apparent that increases in labour productivity could drive growth (in output) without increasing employment – at least in the short to medium term.[5] Thus it is important to consider the relative importance of, say, maximising return on capital versus wage growth versus employment growth. Different pathways may be used to boost productivity and skill levels (lifting wages) but without substantially increasing the number of jobs available. Both of these outcomes may be considered as 'better' job opportunities, but

[4] This figure is a reproduction of Figure 7 in Janssen and McLoughlin (2008).

[5] In the long term, productivity-fuelled economic growth is likely to increase the demand for goods and services due to rising wages and higher incomes. To meet this demand, output is likely to increase and this will stimulate employment. Therefore, in contrast to 'Luddite'-type concerns of technology eroding job opportunities, such technological progress can ultimately yield both higher incomes and greater employment as the effects of greater productivity and growth permeate through the economy.

in one it is the quality of or return to that job while the other relates to the volume of employment. This trade-off may also differ depending on the time frame: short run versus long run. That is, productivity improvements tend to lead to higher incomes *and* greater employment opportunities in the long run, for example, consider the progression of the industrial revolution.

3.2.1 Productivity and ICT

The international evidence reviewed for this project highlights number of mechanisms by which businesses may use ICT to improve their productivity. These mechanisms, and their impacts, tend to differ by sector. Exploring particular mechanisms and applications in the Māori economy may be examined through case studies and interviews in later stages.

Table 3.1 reports a summary of international research by the OECD on the average contribution of ICT to the growth of GDP per annum.

Table 3.1 The impact of ICT investment on GDP growth

	GDP growth (%pa)		Labour productivity growth (%pa)		Contribution of ICT to GDP growth (%pa)	
Country	1990-1995	1995-2000	1990-1995	1995-2000	1990-1995	1995-2000
Australia	1.8	4.9	2.2	3.8	0.7	1.2
Belgium	1.5	2.8	1.9	1.9	0.3	0.5
Canada	1.7	4.9	--	--	0.4	0.6
Germany	2.2	2.5	2.6	2.1	0.4	0.5
United Kingdom	1.4	3.1	3.0	1.5	0.4	0.6
United States	2.5	4.0	1.4	2.7	0.5	1.0
Average	**1.9**	**3.7**	**2.2**	**2.4**	**0.4**	**0.7**

Adapted from: OECD (2003) ICT and Economic Growth

New Zealand's real GDP growth is comparable in terms of magnitude to those of the countries in the table above, namely, 3.0 percent per annum (1990-1995) and 3.7 percent per annum (1995-2000).[6] It seems reasonable – as a first approximation – to use the experience of these economies to investigate the potential effects on the New Zealand and Māori economies.

Table 3.1 indicates that on average, a 1.0 percent increase in labour productivity is associated with between 0.8 percent and 1.5 percent increase in GDP.[7] The table also

[6] New Zealand's real growth rate has fallen over the past three years due to the global financial crisis (down to 1.5% p.a.). The projections take a long-term perspective and estimate the impacts under a 'business-as-usual' scenario.

[7] We assume that an ICT-based increase in labour productivity is matched with capital investment and labour input. Hence, a 1% increase in labour productivity, accompanied by appropriate investments in ICT, capital and labour, can lift GDP by more than 1%.

shows that between one fifth and one quarter of the GDP growth in these countries, on average, was attributable to ICT over this period. If ICT was responsible for an equivalent proportion of labour productivity growth, then ICT would have contributed around 0.5 percent per annum labour productivity growth.

This is broadly consistent with ACIL Tasman's (2004) estimates that in ICT-dominant industries ICT would increase productivity by between 0.44 and 0.47 percentage points per annum, with an average of 0.44 percentage points for the business services sector as a whole (see Table 3.2 below). However, the ACIL Tasman study suggests a lower average impact across the entire economy of about half as much (0.23 percent per annum) as the OECD results. The average effect on productivity reported in the ACIL Tasman study reflects assumed ICT take-up rates by industry. The OECD results may reflect a 'steady state', that is, once cumulative up-take reaches a steady level, where widespread use would imply a greater aggregate productivity impact.

Table 3.2 Average sectoral productivity gains 2004-2015

Sector	Average annual productivity impact
Primary	0.06
Manufacturing	0.19
Construction	0.19
Retail and Distribution	0.27
Business Services	0.44
Recreation Services	0.26
Social Services	0.27
Whole economy - sectorally weighted (#)	**0.23**

Source: ACIL Tasman (2004) Economic Impacts of broadband adoption in Victoria

3.2.2 A focus on 'roll-out' versus 'roll-up'

Maximising the benefits of investment into broadband will require a focus on both 'roll-out' and 'roll-up'. Roll-out will involve ensuring that the right constellation of investment, with the right parameters – location, service speed, and price – occurs at the right time. While Crown Fibre Holdings and MED engage with providers regarding these parameters, NPW may wish to investigate how it can contribute to the policy processes around the establishment and regulation of the broadband market. That is, in its advisory role, NPW could help to steer the roll-out – to the extent this is within its scope and the delineation of roles across the agencies involved – to ensure that the various economic development policies and policy settings are coordinated at a local level to recognise both local opportunities and barriers.

Roll-up involves supporting the development of broadband-based applications and services and supporting adoption of broadband and uptake of the technologies/applications it supports by users in business and the community. The roll-up can be accelerated by specific interventions to encourage, require and enable people and businesses to use specific applications. These interventions may be by government (central or regional), by the substantial businesses in the supply chain as mentioned above, or by wananga.

These enablers may also be provided in partnership with Iwi organisations, which can collaborate with a number of the mentioned players in the provision of broadband-dependent facilities such as video presence meeting capabilities.

The roll-out and roll-up to broadband will likely result in both an increase in labour input, capital and MFP. This will have impacts for both productivity and employment.

3.3 ICT and indigenous people (IP)

ICT is generally considered as a tool for development. The United Nations came up with activities to improve the quality of life of the people, in general but most especially of the underprivileged groups, of which most of the Indigenous people (IP) are classified by forming the United Nations Information and Communication Technologies Task Force (UN ICT TF) in 2001. It is a multi-stakeholder initiative associated with the UN which is "intended to lend a truly global dimension to the multitude of efforts to bridge the global digital divide, foster digital opportunity and thus firmly put ICT at the service of development for all". From then on, initiatives were undertaken geared towards attaining development through ICT.

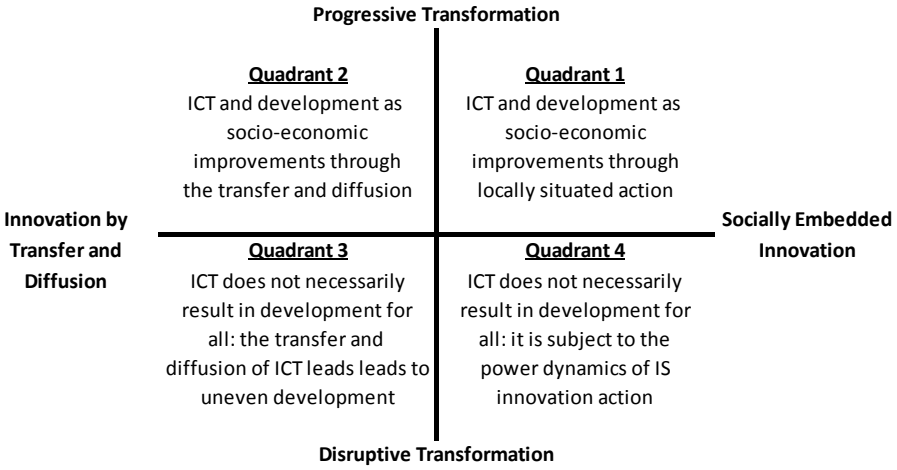
3.3.1 ICT4D

Information and Communication Technologies for Development (ICT4D) is a general term referring to the application of ICTs within the fields of socioeconomic development, international development and human rights.

Avgerou (2009) summarises the current discourse on ICT4D, and characterises two influences on development as occurring along continuums, which he combines to give the four quadrants shown in Figure 3.2 below. These are:

1. how development occurs: progressively or disruptively; and,
2. how ICT acts as an innovation tool in the process of development.

Figure 3.2 ICT, innovation and economic development



Source: Avgerou, Chrisanthi. Discourse on Innovation and Development in Information Systems in Developing Countries' Research. London School of Economics. 2009.

The four quadrants reflect the different ways that ICT can be deployed in the development process and the implications of these alternatives for the people of a developing country.

In quadrant 1, ICT-based improvements reflect local decisions in terms of norms, culture and power relations. That is, socio-economic change should make sense to the local people, and they should be comfortable with the processes of change. Thus, some technological advancements that are successful in one developing country may not work or gain acceptance in another.

Quadrant 2 involves the 'import' of ICT-based practices pioneered in advanced economies that can contribute to improving the quality of life of the developing countries. Emphasis is given to efficiency gains resulting from ICT.

An economy or community under quadrant 3 accepts the logic of ICT as a force for socio-economic change. But there are risks that these forces create or increase inequality as the gains may not be widely or equally spread. In this quadrant, people may doubt the motives of change agents such as development agencies, policy makers, or corporate managers.

Avgerou identifies the fourth quadrant as being "concerned with particular biases of power and inequalities in specific socio-economic conditions of a country of community". In this quadrant, the effectiveness of ICT and development initiatives can depend on the power dynamics associated with information system (IS) innovation and that disruptive change may result in an uneven distribution of gains.

3.3.2 Indigenous People as users of ICTs

Education

ICT has been used by many Aboriginal people in as a tool to teach, learn, share and store knowledge. Websites and the Internet are being used in ways that are increasingly regarded as of paramount importance for the preservation, maintenance and transmission of knowledge of future generations of First Nation, Métis and Inuit communities and individuals in Canada (Wouters, 2006).

In New Zealand, there is a parallel education system (Tuiono 2008). Children can go to an English-language school or an indigenous language school, right through their secondary education. Video conferencing has played a part in making that possible. Not every school can offer every subject in the indigenous language, but there is often, for instance, a science teacher in a particular area who can teach in the indigenous language. Through video conferencing, other schools are able to connect to that one lesson. It's an excellent example of how technology is being used to preserve very scarce language resources, and of how it can bring even very distant communities together. There are further opportunities for Iwi-Māori and Māori education and training providers to extend this collaboration.

Forestry and farming

For centuries, the Mbendjele Pygmies have lived their hunter-gatherer lifestyle in the dense Congo Basin jungle in the north of the Republic of Congo. They use the same basic methods of tracking and killing animals as they have for generations. But when they go into the forest these days, as well as their bows and poisoned arrows, the Mbendjeles take along GPS receivers (ICT Update, 2008). The Mbendjeles use the GPS receivers to plot culturally significant sites for the logging company working in their region. The company incorporates the data into its harvest maps which are then used by workers on the ground to inform them of the locations that must be protected.

By using technology to produce accurate maps, indigenous peoples can help those outside the community to recognize important locations and ensure the sites remain untouched. In northern Cameroon, GPS technology is also being used to protect animals. Lions from nearby Waza National Park have been straying into local villages and attacking livestock. Thus, researchers from the Institute of Environmental Sciences in Leiden University have fitted GPS collars to five lions. Information on the movements of the lions transmits to a website via text messages sent from a mobile phone attached to the collar. The project team also works with nomadic Bororo herdsmen to plot the routes of traditional cattle trails. The information on the movements of the lions and cattle helps identify potential conflict zones that the farmers can then avoid.

Health

In the case of the Mbendjeles, the ICT especially radio broadcasts are used to give communities information on HIV/Aids and other health concerns. Because the Mbendjeles spend a lot of time travelling in the forest, it is difficult to find a central point where they can receive medical treatment. Announcements on radio will inform the people, wherever they are, as to when and where a medical team will be visiting.

Telehealth centres are popular not only in urban areas in North and South Americas but also in the rural areas where most of the Aboriginal people are living (Perley and O'Donnell, 2006). The telehealth centres break the barriers of distance and access to proper health and medication.

Preservation of knowledge and culture

In Western Australia, the indigenous Ngalia people have been working to protect their territory since the 1980s and have used a wide variety of technologies in that time (ICT Update, 2008). Participatory video has been particularly successful in involving younger community members in preserving traditional knowledge. Web 2.0 applications have enabled collaboration with other indigenous communities, and the development of websites helps to raise awareness of the Ngalia with a wider audience.

Michael and Dunn (2006) examined the use of ICT to preserve Aboriginal culture. They found the greatest gains occurred when indigenous members of the community defined the requirements *first* and these requirements were *then* matched to an ICT solution.

Not all indigenous peoples have the internet at their fingertips and can get online to get their message out. Indigenous communities often have to do the best they can with what little they have. There are projects worldwide where indigenous people have set up wireless systems to bring the internet to some very remote locations. Other communities are building websites to promote their culture, sell traditional crafts online and even encourage tourism to their area. A good example of this is the e-Bario project, which is partly an e-tourism initiative of Kelabit Highlands in Malaysia.

3.3.3 Challenges in the adaption of ICT by Indigenous People

Evidence from the literature suggests that one of the factors limiting Indigenous adoption of ICTs is its accessibility, which is a great barrier (Dyson, 2004). Access issues include the high cost of the technology, lack of adequate telecommunications links to remote communities and poor computer literacy together with the difficulty of improving computer skills. These access issues, as well as a general lack of awareness of IT as a possible

career path, have severely limited the number of Indigenous Australians choosing IT courses at the university level and therefore choosing IT as a profession.

Similarly, Chen-Ling Hung of National Taiwan University identified some challenges in the adaption of ICT specifically in making tribal archives. These are training of local ICT experts; enduring participation from indigenous communities; secret, and taboo in indigenous culture which hinders the progress of digital archive and stable funding to support the project.

There are still people in indigenous communities, who are wary of using technology, and with good reason (ICT Update, April, 2008). A large part of traditional knowledge is sacred and is not meant for everyone. There would likely be concerns in Māori communities if the locations of certain sacred sites and knowledge were recorded and publicly known (Harmsworth 1997). There a will to share the language and culture to support the community, but that has to be done in a responsible way that respects indigenous culture.

3.3.4 Effects of ICT in the lives of Indigenous People

A study conducted by Selouani and Hamam (2007) revealed that there were positive changes in the lives of the respondents in Shippagan area, a rural zone in Atlantic Canada because of broadband internet. Their answers mainly show the importance of the high speed broadband in performing operations and saving time from moving to the bank, library, travel agency, as well as keeping contact and communicating with relatives and friends.

Indigenous communities in Mexico and Bolivia are producing documentaries and films from their perspective (ICT Update, April, 2008). This has led to a vibrant video and filmmaking culture. It began with outside filmmakers teaching the indigenous people, but it is now at the stage where the indigenous people are training the next generation of indigenous filmmakers. With ICT there is an opportunity for communities to not only receive outside culture, but to also get their own voices out in the world.

BERL's (2009) research into the contribution of Māori Television in its first five years of operation found some similar impacts in our domestic film and television industry. Māori Television's focus on local content has allowed production companies and independent producers to be creative and clever in their use of language and programming, and has provided viewers with more opportunities to see themselves and their community. The successful establishment of the MTS has also given people the opportunity to progress and build a career within the Māori television broadcasting and production industry. These career opportunities have include management positions within broadcasting, moves from journalist/researcher roles into producing and directing, and for some Māori entrepreneurs to set up their own businesses. This demand has created positive reasons for young Māori to maintain and revive their language and culture.

Globally, most indigenous communities are quite poor and they would like to improve their income and use their knowledge to do that. The reality is that most communities haven't really used ICT to improve their income. But e-tourism is one example where both indigenous knowledge and technology have been combined to generate an income. The Kelabit Highlands of Malaysia has done that already. With the help of their local university, the community set up the e-Bario project. That is partly an e-tourism initiative where you can book a holiday on the web to stay with the community for a week or two and share the life of the local people. But the project has also supplied computer labs and trained school children and other members of the community on how to use computers and they are now connected to the internet. Hopefully, initiatives like this will bring actual dollars and cents into communities.

ICTs offer the prospect of a genuine, unmediated, unedited Indigenous Australian voice to be heard across Australia and across the world (Dyson, 2004). For Indigenous communities isolated by vast distance, they offer communication and collaboration, Indigenous cultural exchange and learning. In a country where ICTs dominate the workplace, they offer good, well-paid and interesting jobs rather than unemployment.

Masao Aki, of the Atayal tribe, described his experience as an Indigenous person working in the communications sector in Taiwan. "In the old days, there was also a long journey from when Taiwanese Indigenous people first found their voice in media. Before Indigenous people were able to make their voices heard through this platform, Taiwan's mainstream media had long failed to provide in-depth and nuanced coverage of indigenous culture. In 1994, Taiwan's Public Television Service (PTS) began training the first group of Indigenous journalists, enabling Indigenous people to take the first step to present their views and broadcast them to the world. After 10 years, Taiwan Indigenous Television (TITV) was established and started broadcast in 2005. The next step for TITV is to have autonomy so it can create a sustainable operation that allows for long-term planning of programming, production, and digitalization. This is also expected to support the growth of our human talents and to provide job opportunities for Indigenous youth."

4 Economic analysis

The section illustrates what investment into broadband could mean for the Māori economy and employment, and the national economy. We use existing research to underpin:

- a projection of the potential benefits to the Māori and national economies from the widespread use of broadband enabled by the investment into the UFBI and RBI.
- an indication of how the benefits may be greater with early/prioritised investment
- a description of the projection in terms of the changes by industry and occupation to identify the industries in the Māori economy that might secure the largest gains and the associated job opportunities for Māori across these industries.

4.1 Benefits from broadband for the Māori and national economies

The analysis is based on information on the current asset base of the Māori economy as at 2010 and employment information by industry and occupation for iwi from the 2006 Census. The 2010 baseline provides a basis from which we undertake a business as usual scenario projection to 2031 and our modelling of the impact of investment into broadband/ICT.

The first scenario provides a reference point for 'business as usual' growth, while the latter illustrates the potential benefits of the investment on productivity, output and employment.

We modelled a scenario that focused on the impacts of the government's planned investment into broadband with a focus on the Māori economy. The main impacts come from the jobs required in order to deliver on this investment and the productivity boost resulting from wider access to better ICT.

To some, our projections may be considered conservative and at times an underestimation. For example, the projections do not take into account of:

- Generic productivity improvements in sectors that are likely to be innovative or are capable of obtaining economies of scale at the production end of the value chain.

- Development of new products from existing sectors that reflect customer demand in specific domestic and export markets.

- Improved returns from existing enterprises and iwi asset holdings resulting from collaborative measures that are capturing the value that previously flowed to other external players.

Despite this, we would argue that the modelled outcomes provide compelling evidence to NPW of the potential around investment into broadband/ICT, and also the potential opportunity costs if this investment is not coordinated to ensure rapid roll-out and roll-up, and guided to the right areas, the right industries and communities.

While the initial analysis is focussed on demonstrating the value of this investment for Māori in terms of GDP and employment at the overall Māori economy level, hapū and whānau will benefit from this investment through greater education and training, employment opportunities, increased economic activity at a rohe level, and growth in real incomes.

4.1.1 Business as usual baseline scenario

In order to measure the effect of the investment into broadband/ICT, a baseline or 'business as usual' benchmark needs to be set. This scenario is a comparator and is the outcome against which we compare the results of assumed changes in behaviour or economic activity.

In the business as usual situation, national GDP steadily increases from $180 billion in 2010 to $302 billion (measured in 2010 values) in 2031. GDP in the Māori economy increases at a slightly lower rate growing by 2.5 percent per annum from its 2010 level of $10.7 billion to sit at $17.8 billion by 2031. During this time, employment in the Māori economy grows by around 0.9 percent per annum, resulting in around 24,000 more jobs by 2031. This employment growth is fairly evenly distributed across the occupation groups examined, starting from the 2010 base.

This growth is based on an assumption that world growth and the demand for New Zealand exports continues to expand at historic averages. Further, the level of productivity in sectors of the Māori and New Zealand economy continue to improve at their historic averages.

The national and Māori economy contexts are used as the driver of a baseline scenario for employment projections to 2031. The Māori economy projections are presented Table 4.1 (on page 24 below).[8]

4.1.2 Investment in broadband scenario

Under this scenario, broadband infrastructure is identified as a key enabler to economic development. Investment in broadband, and broadband infrastructure, has improved productivity and created employment opportunities for iwi and whānau members.

[8] While not presented here, baseline national GDP projections have also been generated, and similarly provide comparator figures for the alternative scenarios.

As noted in section 3.1 above, ICT is a general purpose technology (GPT) and is widely used in most sectors of the New Zealand economy. We did not aim – in this piece of work – to establish the specific uses in the Māori economy. This could be conducted as a future piece of analysis.

An important feature of GPTs is that their value depends on the applications they will support and the benefits these applications bring to businesses and consumers. In the case of iwi-Māori, investment in broadband will potentially provide information to support better production and business decisions, as well as community benefits. For example, kiwifruit growers may be encouraged to access more technical information to lift their productivity with reliable, high speed broadband. Greater application of best practice could then allow growers to increase the level and consistency of the dry matter in their fruit, which can then lead to higher quality fruit.

4.1.3 Impact on employment and GDP

Converting the potential benefits of broadband and broadband infrastructure to actual benefits requires businesses and households to adapt to the technology and take up the applications. Under this scenario it is assumed that the uptake is fast, i.e. widespread penetration within two years of roll-out, and that the benefits accrue quickly. This can be seen in the impact on GDP and through the creation of additional jobs in Table 4.1.

Table 4.1 Headline projections: baseline and broadband boost, 2010-2031

			2010 to 2031		
Indicator	**2010**	**2031**	**Change**	**%**	**%p.a.**
Employment (people)					
Baseline	118,153	142,091	23,938	20.3	0.9
Broadband		150,788	32,635	27.6	1.2
GDP (real 2010$m)					
Baseline	10,667	17,844	7,176	67.3	2.48
Broadband		19,139	8,471	79.4	2.82
GDP per person employed (real 2010$)					
Baseline	90,286	125,580	35,294	39.1	1.58
Broadband		126,924	36,638	40.6	1.64

Source: BERL

Scenarios:
Baseline = continuation of 'business as usual'
Broadband = productivity lift, along with targeted focus on 'roll-out and roll-up' of ICT/broadband (with particular emphasis in dairy, hort, education and health sectors)

Under this scenario, GDP grows by 2.8 percent per annum between 2010 and 2031, from $10.7 billion in 2010 to $19.1 billion in 2031. Overall, this results in the amount of GDP generated per person employed rising from $90,300 (rounded) in 2010 to $126,900 in 2031.

This is a faster rate than that achieved under the baseline scenario, where GDP in the Māori economy grows to $17.8 billion in 2031 (2.5 percent per annum). We believe that this estimate is conservative, and the impact could be higher. Further evidence is required and can be gained by further analysis.

Higher growth resulting from successfully targeted ICT investment would lead to higher employment growth for Māori, rising from 0.9 percent per annum to 1.2 percent per annum. This is equivalent to creating just over 400 extra jobs per year in the Māori economy.

4.2 Early roll-out and adoption/roll-up

This section explores the potential economic gains for the Māori economy and New Zealand from the adoption of fast broadband and uptake of applications supported by the successful roll-out of broadband under the UFBI and RBI. The estimates for the Māori economy are based on the broadband scenario above and the New Zealand economy analysis draws on the high level estimates of productivity impacts by industry (see on page 15 in section 3.2.1).

The information in Table 3.1 and Table 3.2 summarise the international evidence on the impact of ICT on labour productivity and GDP growth – that is, the GDP boost by economic sector from ICT. On average – across an entire economy – ICT boosts productivity by 0.23 percentage points per annum and this translates to a 0.27 percentage point boost to an economy's GDP. We use this information to project the impact of broadband uptake in each sector of the New Zealand (i.e. weighted by employment in that sector) to estimate the effect on value added within that sector.[9] We summarise these impacts and report the total effect on New Zealand's GDP.

4.2.1 Broadband boost from early adoption

The industry productivity gains from ICT, based on New Zealand's industrial profile in 2010, would boost GDP growth per annum by approximately 0.54 percentage points on average. This is higher than for the Māori economy (0.34 percentage points). The impact is projected to be lower for the Māori economy where employment and output is currently concentrated

[9] Our research for this project suggests that New Zealand's integrated primary industries are well placed to take advantage of the ICT benefits that broadband deployment will allow. For example, the average productivity gain in primary sector industries could be substantially higher than 0.06 percent (see Table 3.2), and may be more towards the economy-wide average of 0.23 percent. As such, we believe our estimate is conservative, and could realistically be higher. However, for this initial piece of analysis we work from the international evidence base and would look to improve and contextualise this information base in our further research.

in industries that are less able to take up and benefit from broadband.[10] For example, we estimate that around 12 percent of employment in the Māori economy was in ICT, business or financial services, while it was 19 percent for the rest of the New Zealand economy.

The scenarios below aim to illustrate the potential economic gains in the Māori and New Zealand economies from the adoption of fast broadband and uptake of applications, assuming the successful roll-out under the UFBI and RBI. We assume that roll-out is underway (we denote this base "year t"), but that widespread adoption will not occur for three to six years into the future ("t+3" or "t+6").

We consider two adoption scenarios from the base year that broadband is rolled out:

- Early adoption assumes that broadband is fully deployed and adopted by the main industries that can benefit from it by 2013 (t+3);
- Delayed adoption assumes that the deployment and/or adoption is slower and the main gains are not achieved until three years later around 2016 (t+6).

Applying the GDP boosts to the BAU annual growth rate under the two adoption scenarios gives the real GDP projections to 2031 shown in Table 4.2.[11]

Table 4.2 Projected impacts on GDP from early, delayed and BAU roll-up (2010 - 2031)

Real GDP (2010$m)	Māori economy	New Zealand
GDP base, 2010	10,667	179,894
GDP base growth, % p.a.	2.48%	2.50%
GDP boost, %p.a.	0.34%	0.54%
BERL 2031 BAU projection	17,844	302,074
Delayed (t+6) roll-up	18,760	326,645
Early (t+3) roll-up	18,950	331,795

Source: BERL

The BAU case where broadband is not rolled out as a priority sees the Māori economy's GDP increase from $10.7 billion in 2010 to $17.8 billion in 2031, and New Zealand's from $179.9 billion to $302.1 billion in 2031. Early roll-up would see GDP from the Māori economy increase to $18.95 billion, while delayed roll-out would lift it to $18.76 billion, which is a difference of $190 million.

[10] Shifting employment from low value manufacturing to high value specialised manufacturing could, for example, alter the benefit that the Region could derive from broadband. If the productivity impact were as high as that seen in the Business Services sector (0.47 percent), then the projected boost to GDP in the Bay of Plenty would rise to 0.62 percent per annum, which would be greater than the projected national impact of 0.60 percent per annum.

[11] The lower 2031 estimates for the early/delayed scenarios in Table 4.2 relative to the broadband scenario in Table 4.1 reflect the extent to which the benefits from roll-out and roll-up are delayed.

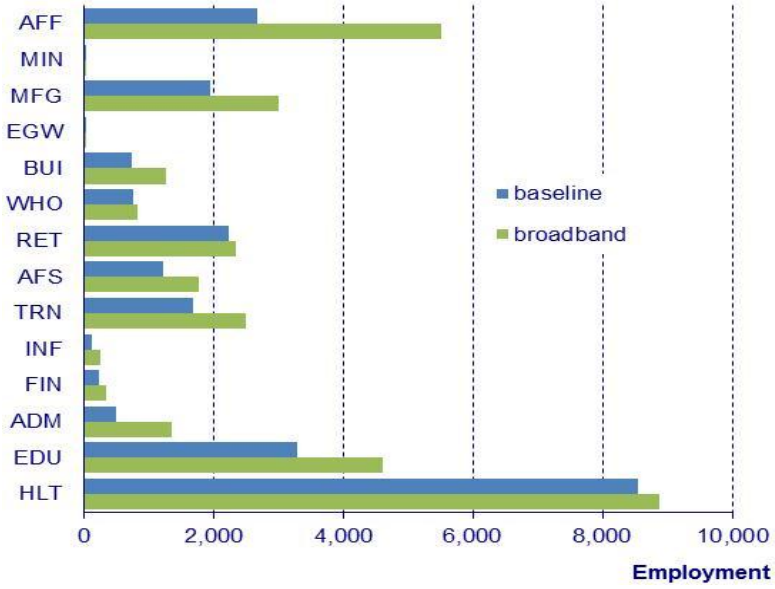
Early roll-out could speed up diffusion of the technology and uptake of applications, and is a process that NPW could facilitate. For this simple analysis, we estimate the value of advancing comprehensive uptake, that is 'roll-up', by two to three years. We then project the compounding effects of this out to a 20 year horizon. Such early roll-out could add an extra $190 million to the Māori economy by 2031 (around $9 million per year) relative to a situation where roll-out and comprehensive uptake is delayed by 3 years.

We project that the effect would be slightly greater in relative terms for the New Zealand economy as a whole. This primarily reflects that the Māori economy currently has a relatively smaller representation in industries that the international evidence indicates that are likely to benefit from broadband. However, further research in the subsequent stage may provide evidence that these estimates are too conservative and justify revision to provide more robust estimates.

4.3 Impact on employment and GDP by industry

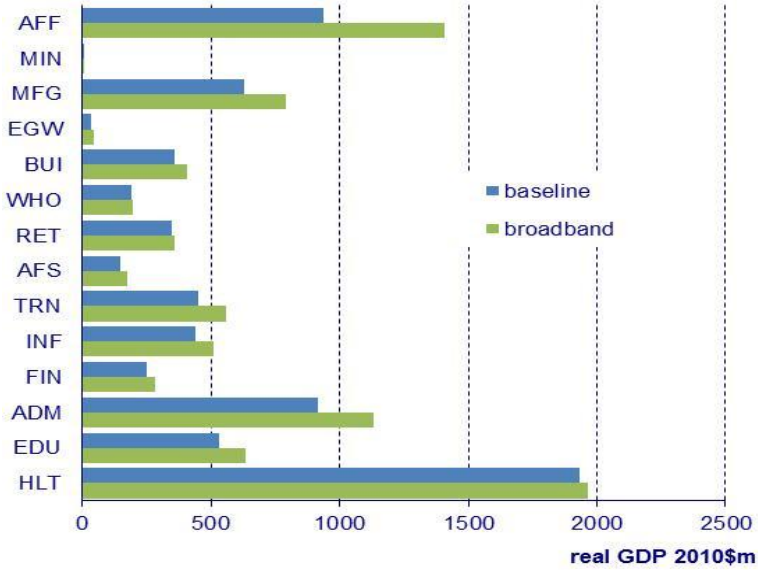
Figure 4.1 and Figure 4.2 show the growth in employment and output by industry. The labels are defined in the Glossary on page 33, but are ordered from top to bottom in terms of primary (e.g. AFF – Agriculture, Forestry and Fishing), secondary (MFG – manufacturing – and BUI – building and construction) and services industries (HLT – health care).[12]

Figure 4.1 Employment growth by industry of the Māori economy, 2010-2031



[12] Due to low or zero levels of employment recorded for Māori by the 2006 Census, the following industries are omitted from the figure: Rental, Hiring and Real Estate Services, Professional, Scientific and Technical Services, Public Administration and Safety, Arts and Recreation Services and Other Services.

Figure 4.2 GDP growth by industry of the Māori economy, 2010-2031



The figures above indicate where the largest gains are likely to occur, and the magnitude of these gains in terms of employment and output growth. A subsequent phase of work could dig into the changes by industry (e.g. AFF) to examine in more detail the potential in the sub-industries (Agriculture vs Forestry), which could be used to inform a labour force strategy.

One aspect that the current study does not unpack, is the relative importance of broadband in creating jobs involved in its roll-out versus its roll-up. Given much of the benefit in the long run tends to come from the development of new, innovation-spawning applications, training and jobs may be best focused into this area. However, in the short-run, there is substantial investment into the roll-out of broadband, and a demand for skills, workers and businesses to turn the financial investment (i.e. money) into physical infrastructure (i.e. capital assets).

The factors driving growing needs for skills in New Zealand include those to support the re-build of Christchurch; the roll-out of broadband and other significant infrastructure investment programmes; and these demands coming at the same time as significant demand from Australia is generating high levels of skilled emigration from New Zealand. In this situation investigation of the specific skills needed for broadband roll-out may well identify opportunities for training tailored to expanding the role of Māori in this investment programme.

5 Some points for thought

This section highlights some key issues that may drive, influence or obstruct Māori from fully harnessing the benefits of broadband.

5.1 People and place

People are a key part of the 'asset base' of the economies of the Māori economy. To undertake any medium to long-term economic, social, environmental and cultural development programmes it is important to understand where people live and work. That is, while we have provided an indication of where in the economy output and employment may grow, we have not identified where in the country this growth will occur.

BERL's analysis of the potential economic impacts of broadband for the Auckland and Bay of Plenty economies highlighted that - from an economic perspective - three key factors drive where and what particular areas could focus on to make the greatest and fastest gains. We summarise these factors under the headings of **productivity, place**, and **preparedness**.

Productivity

- The focus industries are **well suited to applications that will boost productivity** given access to high speed broadband. This productivity means there will be **high gains to users.**

Place

- There are **key locations that have high business and residential density** within the two regions - both urban and rural . Higher density can increase affordability, and therefore uptake, as the infrastructure supplier and service provder can reach a greater number of people and businessess with a given infrastructure investment. This means there will be a **large number of users** who can benefit from the broadband infrastructure.

Preparedness

- Our field work suggests there is unmet demand for high speed broadband applications: businesses in key industries are **ready and willing to access high speed broadband services**. This will support **rapid adoption and widespread uptake** of new applications, and in turn, complementary innovation and development.

5.2 Skills and training

Our projections do not account for labour market behaviour or the decisions that individuals make in regards to participating in the labour force, gaining skills and knowledge, or progressing into a particular career. But they do provide an indication of the size of an occupation group and the need for people to have a wide variety of skills to take advantage of the opportunities available in 2031.

If NPW considers that developing an employment strategy would be a useful part of its early work plan, one step to informing this strategy could be to forecast skills and training requirements associated with the projected employment growth. This could indicate points of focus engaging with industry, educators and training providers to ensure that there are sufficient people with the rights skills for Māori to maximise the opportunities around broadband. In particular, this study does not establish the relative importance of creating jobs involved in rolling out broadband versus jobs associated with the development and provision of ICT and broadband-related applications, that is, roll-up focussed jobs.

Such a forecast may also provide a basis for discussion with high schools, career guides, Māori trusts and philanthropists who have an interest in having an impact for young Māori.

5.3 Youth unemployment, income inequality and poverty reduction

The International Monetary Fund (IMF) and the International Labour Organisation (ILO) argue that sustainable economic growth needs to be based on employment and on job creation in particular.[13] Sustainable growth and optimal wellbeing mean understanding the complex relationships between youth unemployment, income inequality and poverty reduction. Investment into broadband could be one element of a strategy or set of strategies that are targeted at fast-tracking Māori achieving their medium to long-term economic, social, environmental and cultural development programmes.

[13] Developed economies include economies such as New Zealand, Australia, the United Kingdom, Canada and the United States. Emerging economies include economies such as India and China.

5.4 Māori Business Models

There are a number of examples of where Māori have used innovative paradigms and approaches to develop highly successful businesses and to promote economic development in a way that is consistent with kaupapa Māori.

Project Employment Programme

- In the late 1980's Maori organisations imaginatively used the Department of Labour's PEP employment and training initiative to create some assets like kaumatua housing, businesses like catering, and as a funding source in the early growth of Wananga training activities.

Wananga based on EFTS Funding Model

- The Wananga took early and extensive advantage of the EFTS model of funding education to develop comprehensive education and training programmes. These developed and used pedagogy relevant to, and successful with Maori, migrants and other groups who did not succeed in the previous 'competency-based' systems.

Quota owning entities

- Also in the late 1980s Iwi organisations with little business infrastructure received seafood quota. In order to benefit from this, some developed the practice of 'Fishing on the 'phone'. This process involved tendering the catching, then the processing of the seafood, and the organisation themselves marketed the seafood. This reduces risk as it avoids or delays investment in capital items.

Primary Health Organisations

- Leveraging the environment created by the Regional Health Authorities, and latterly the Health Funding Authority, a number of local whānau ora organisations were established as PHOs with a By Māori For Māori ethos.

Primary Growth Partnerships

- The first PGPs to be awarded both involve Māori fishing interests, and have successfully attracted more than $25 miillion of government funding each. These developments and the aquaculture development being explored by Whakatohea will all benefit from ICT applications.

Miraka

- Miraka Limited is a new entrant to the New Zealand dairy processing industry, backed by a group of Māori trusts and incorporations. The vision is for sustainable business practices that will provide long term returns for current and future generations, from land that will never be sold.

Integrated Development through Collaboration

- Tuaropaki E Trust have leveraged their land and geothermal resources to develop a geothermal power station and run it in partnership with Mighty River Power. The residual heat is used to produce hothouse bract tomatoes and capsicum for supermarkets in Australasia and Southeast Asia. These are produced in collaboration with a European horticulture company. The heat also contributes to the operation of Miraka (above).

What these examples show is that Māori are developing new models of business to leverage the skills, assets and people to achieve their aims. NPW may wish to consider exploring these – or other examples – in greater depth as part of the case study analysis. Through collaboration with other players in their various supply chains, training provision and other activities Māori organisations may again be able to take the innovative lead, this time in further developments and applications based on the telecommunications industry.

5.5 Other issues for further investigation

We suggest it is worth considering the relative importance of the following issues:

- Barriers to access. What are the current barriers to Māori accessing IT, studying IT and establishing careers and businesses in the ICT space, or incorporating ICT into workplaces and communities to boost productivity and improve social outcomes?
- Employment opportunities. How do Māori think about broadband creating employment opportunities - i.e. what are the models? For example, enabling localised employment within one's own rohe, i.e. 'at home'? Or teleworking from elsewhere in New Zealand or overseas, i.e. 'at a distance'? Each model may require different mixes of investment into infrastructure, capital and training, and support to achieve uptake.
- Building capital. What mix of human and physical is required to increase and improve labour and capital productivity? What does this mean for the industries (and the geographic areas where they are located) and training providers that need to be involved to make this happen?
- Ownership and development of assets. What objectives do Māori have for the ownership and sustainable development of assets related to broadband? This may inform decisions around the model – or models – that could be designed and implemented to support development in the broadband area of the New Zealand and Māori economies.
- Investing and investment. What types of investment are required and what smart ways can Māori use to generate this investment? This may include Māori owned or controlled assets, but may also include leveraging investment by others in to Māori businesses and enterprises. What insights can be gained from successful Māori businesses and enterprises in other spheres that can be used maximise the gains to Māori from development in the broadband space?

6 Next steps

We would be happy to refine the proposed research in light of stages 1 (Situation Analysis) and 2 (initial Economic Analysis), but suggest proceeding with the following areas.

The immediate next two steps that we propose NPW consider undertaking are noted below. The final three stages that analyse and report on the opportunities would follow subject to NPW's approval of, and guidance on, our directions and progress.

6.1 Evidence of the impacts of broadband for Māori

Stage 3. Profile of Māori in ICT: participants, their characteristics and aspirations. This would explore who, how and what they are doing.
Potentially, NPW may wish to deprioritise this stage, as it is primarily a desk-based, 'wide view' analysis and for us to concentrate instead on progressing Stage 4.

Stage 4. Fieldwork interviews and case studies (discussed below).

We believe that the initial estimates are conservative: for example, the estimated impacts sit at the lower end of the range of GDP impacts in other countries summarised by the OECD. The initial analysis also focussed on the 'roll-up' impacts from using broadband and ICT, and this analysis could be extended to investigate the impacts and opportunities around the 'roll-out', that is, the investment in building the infrastructure required for the use of broadband.

The next two stages of research that BERL proposed to follow on from this initial piece of work involve 'on the ground' research. This research is required to validate or improve upon the initial estimates and to provide a more detailed opportunity analysis. The intention with this work would be to provide an evidence base that NPW could use to confidently answer its key questions around the magnitude and types of benefits that Māori may experience from engaging with broadband.

We have identified a number of potential participants that NPW may wish us to engage with during the next stages. We would be happy to discuss these options and confirm the organisations/contacts to be approached upon NPW's confirmation that it wishes to proceed with these.

6.2 Additional steps for consideration

The following areas have surfaced in the course of this initial piece of work, but which are additional to the proposed scope. We would be happy to discuss with NPW how these areas link to the proposed research and to determine the relative priority of conducting these and the resource required.

6.2.1 Where are the people? Where are the assets?

Previous work has shown that Māori people do not always live where the Māori asset base is. This raises both opportunities and obstacles/issues, and the question of what role broadband can play in tele-working and tele-community.

Possible opportunities

- Teleworking opportunities for whānau who live out of the rohe to work for whānau, hapu, iwi; while continuing to live outside the rohe.
- Teleworking for whānau living in the region but who wish to work from home/marae.
- Opportunities for governors (e.g. Trustees) of Māori Inc. to teleconference back to rohe for 'board meetings'.
- Opportunities for cultural connection to those living away from the rohe by Skype, etc.

Possible obstacles/issues

- Industries may be developed without the people in place (i.e. in the specific geographic areas where the assets/jobs are).
- Businesses may be plan or expand without suitably trained or skilled people available.

The RBI is an opportunity to overcome these obstacles and realise opportunities.

6.2.2 Labour Force Development Strategy

As noted above, there are potential issues or obstacles to achieving the full potential due to the (dis)location of people and assets. BERL can assist NPW by providing the analysis to identify the labour force opportunities for Māori. We suggest that NPW consider how we might best shape this analysis in order to enable it to develop a 'labour force development'. This strategy should be developed so that Māori are best placed to take jobs created by the Māori economy in these key industries. AS well as an industry focus, the strategy should have a 'labourers to management' occupation focus, to ensure that all the diverse range of skills, qualifications and aspirations are harnessed.

7 Glossary

Table 7.1 Sector and Industry codes

Sector	*Industry*	*Code*
Primary	Agriculture, Forestry and Fishing	AFF
	Mining	MIN
Mfg and distribution	Manufacturing	MFG
	Electricity, Gas, Water and Waste Services	EGW
	Construction	BUI
	Transport, Postal and Warehousing	TPW
Retail trade and hospitality	Wholesale Trade	WTD
	Retail Trade	RTD
	Accommodation and Food Services	AFS
Technical and business services	Information Media and Telecommunications	IMT
	Financial and Insurance Services	FIN
	Rental, Hiring and Real Estate Services	RHR
	Professional, Scientific and Technical Services	PST
	Administrative and Support Services	ASS
Govt and community services	Public Administration and Safety	PUB
	Education and Training	EDU
	Health Care and Social Assistance	HLT
	Arts and Recreation Services	ARS
	Other Services	OSV

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