Strategies to Increase Uptake of Broadband Enhanced IT in the Wellington Region

Absolutely POSITIVELY Wellington
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1   CONCEPTS

This paper is intended to stimulate creative ideas to enhance broadband demand development and aggregation in the Wellington Region.

Good ideas, bad ideas, simple ideas and impossible ideas are mixed together as part of the creative process of identifying choices and options. Out of this cacophony of ideas a handful of the most diverse and interesting ideas that could stimulate change have been selected.

For each of these options a representative character and organisation has been created and fully described. The challenge is to look at all the ideas as to how councils in the Wellington region might be able to influence the behaviour of this individual. By narrowing the focus down to a single representative individual, strategic options tend to become more specific, targeted, effective, creative and cheaper than considering a large, vague segment of society.   If strategies will work for this individual, then they are likely to work for many similar minded groups and individuals.

Again this process is based on the concept that the most dangerous idea is when you only have one of them. Free flowing ideas, good and bad, provide the freedom to explore lots of options. Out of this the best can be chosen, while the dross will quietly disappear.

These strategies are part of a bigger picture of adoption and diffusion. The outcome of these strategies is not merely to get individual organisations to adopt new ideas, but for these individuals to be the leading edge for encouraging widespread adoption.

2   OUTCOMES SOUGHT

At present less than half the households that can technically take up broadband do so, and most of those take up limited options. Higher speed broadband brings new possibilities, but only if adopted by users. This paper looks at ways for the public sector to intervene to increase the uptake of the potential from broadband, and high speed broadband.

Increased broadband use can have three broad benefits to the region:

Economic development can be significantly enhanced from information technologies that require broadband. These technologies can increase productivity, connectivity, global reach, quality assurance and performance.

Social development can be enhanced such as through improving outcomes in health, education, transport, public sector productivity and performance, and social connectedness.

Environmental outcomes can be achieved especially through using technology to reduce the need for transport and remote monitoring.

Within these broad outcomes some specific outcomes are listed below. This is an incomplete list, begging for more ideas.

2.1 General Awareness

This would have to be the least useful outcome – expensive, undirected and with doubtful benefits.

2.2 Uptake of New Applications

2.2.1   Unified Communications

Unified communications enables users to have one system to manage their phone, fax, mobile, email, instant messaging, calendar and voice mail seamlessly. In general, it allows an individual to send or receive a message on one medium and receive on another. The system is managed using software programmes which treat voice mail and faxes like emails. It can show which mode of communication the recipient prefers to use at any given time. A single phone number can connect to whichever is the most appropriate phone at the time – work, home or mobile.

Unified communications is particularly useful for teleworkers and mobile workers such as sales staff. However it can also be used to reduce the latency through trying to catch the right person at the right time.

Market segments include:

- *Tele-workers* can easily move from home to work environments seamlessly, and to appear to be fully integrated into the parent organisation

- *Sales representatives* who are constantly on the road

- *Managers* whose time is precious, and may also be needed for quick decisions

- *Mobile services* such as some health workers, mobile bankers and social workers

- *Tradespeople* such as plumbers, builders and electricians working between sites

- *Practitioners* in small organisations who also answer phones such as physiotherapists, panel beaters, and small or solo health practices

- *Fishers* (if cellphone technology works off the New Zealand coast)

- *Police*

- *Hospital staff* especially those moving between patients and offices

- *Large retail outlets* to get hold of supervisors for decisions

- *Exporters* who take customer calls from overseas and do not want New Zealand's time zone to be seen as a barrier to customers.

- *People working on call* in the evenings or weekends such as midwives; maintenance staff for IT, lines and water; and volunteer firefighters

2.2.2   *Thin Client*

Thin clients (or dumb terminals) is a PC with less of everything. It connects to a server that has all of the software and operating system. From the user's perspective the thin client is exactly the same as working on a PC – there is a mouse, keyboard, screen, but the computer is very much smaller. However the system depends on having reliable, high-speed networking.

The benefits of thin clients are:

- *Lower IT administration costs.* Thin clients are managed almost entirely at the server. The hardware has fewer points of failure and the client is simpler (and often lacks permanent storage), providing protection from malware.

- *Easier to secure.* Thin clients can be designed so that no application data ever resides on the client (just whatever is displayed), centralizing malware protection and reducing the risks of physical data theft.

- *Enhanced data security.* Should a thin-client device suffer serious mishap or industrial accident, no data will be lost, as it resides on the terminal server and not the point-of-operation device.

- *Lower hardware costs.* Thin clients are cheap and the hardware on the server is used more fully because it is shared.

- *Less energy consumption.* Thin clients use less energy, and there can also be savings on air conditioning.

- *Easier hardware failure management.* If a thin client fails, a replacement can simply be swapped in while the client is repaired; the user is not inconvenienced because their data is not on the client.

- *Worth less to most thieves.*

- *Operable in hostile environments.* Most thin clients have no moving parts so can be used in dusty environments without the worry of PC fans clogging up and overheating and burning out the PC.

- *More efficient use of computing resources.*

- *Lower noise.* Thin clients don't need fans.

- *Less environmental waste.*

The disadvantages of thin clients are:

- *Server needs to be high performance.*

- *Multimedia performance can be less.* For applications requiring high bandwidth, like video editing and video gaming, performance can be affected.

- *More flexibility.* Some software products are designed for PCs and will not work on thin clients

- *May not support peripherals.* Some thin clients won't accept peripherals like digital cameras, scanners and graphics tablets.

- *Need good network connections.* Reliable high speed connections are essential.

Market segments include:

- *Schools, universities and polytechnics* to reduce costs, theft, and administration

- *Libraries* and other public spaces where theft is an issue

- *Greening organisations* seeking to save power and reduce their carbon footprint (the IT industry contributes about 2% to global warming gases, 85% of the energy is wasted on idle computers, and thin clients reduce energy use by about 50% compared with standard PCs)

- *Hotels and motels* to provide low cost access to the internet

- *Internet cafes* to reduce costs, theft and the noisy EMR environment in a room full of computers

- *Large organisations* seeking to reduce costs and increase control of what is accessed

- *Hot desk organisations* eg Hospitals where it may be useful to access one's files from many different sites on the campus

- *SMEs* may use thin clients with cloud computing as a low cost way to access software and don't have the IT expertise to manage their systems

- *Householders* for the same reasons as SMEs

- *Community centres -* it could also be useful with cloud computing as a lower cost way of getting people confidently using computers

- *Prisons* and other sites where it may be advisable to access the internet but restrictions are needed on what can be accessed.

- *Damaging environments for computers* such as where there is water, steam, heat or dust eg swimming pools

- *Compact environments* like police cars
- *Council flats* – additional rental cost could allow access to the internet via a thin client.

2.2.3 *Cloud Computing*

"The Cloud" is a metaphor for the internet. Cloud computing encompasses any subscription-based or pay-per-use service that extends IT's existing capabilities in real time over the Internet.

Examples of cloud computing include Google apps that provides access to standard office applications, SaaS.com (Software as a Service), Salesforce.com for customer relations managers, BaseCampHq.com for team management, moodle.org.nz for education management, PLAN.IT road (www.bureauco.co.nz) for councils to manage work in the road, and other on line services like spam filters and storage services.

Cloud computing is still at an early stage but predicted to grow rapidly with reliable, high speed internet access.

The benefits of cloud computing are:

- Minimise capital expenditure
- Increase availability of software for infrequent use
- Enables users to access systems regardless of their location or what device they are using
- Enables sharing of resources and costs among a large pool of users
- Centralization of infrastructure in areas with lower costs (such as real estate, electricity, etc.)
- Increase in peak-load capacity
- On-demand allocation and de-allocation of CPU, storage and network bandwidth
- Performance is monitored and consistent, but can suffer from insufficient bandwidth or high network load.
- Reliability improves through the use of multiple redundant sites, which makes it suitable for business continuity and disaster recovery.
- Scalability meets changing user demands quickly without users having to engineer for peak loads.
- Security typically improves due to centralization of data, increased security-focused resources.
- Sustainability comes about through improved resource utilisation, more efficient systems, and carbon neutrality. Nonetheless, computers and associated infrastructure are major consumers of energy.

The disadvantages of cloud computing are:

- Cloud computing is dependent on reliable, high speed internet access

- Most cloud computing services have suffered outages

- There are concerns about the loss of control over sensitive data. Providers typically log accesses, but accessing the audit logs themselves can be difficult or impossible.

Market segments include:

- *Schools* to reduce costs, administration, security concerns and enable access from both home and school.

- *Universities/Polytechnics* to access more specialist software

- *Libraries* and other public spaces to access more information and programmes with security controls. The libraries can make available to businesses some of the software that they would otherwise need to pay a large fee for to use occasionally.

- *Internet cafes* to provide more software options

- *SMEs* who are seeking a low cost way to access software and don't have the IT expertise to manage their systems

- *Householders* for the same reasons as SMEs

- *Teleworkers* who would like to access their information from many different sites

- *Community centres* - it could also be useful as a lower cost way of getting people confidently using computers

2.2.4   *Web 2.0 and E-commerce*

E-commerce is on line transactions between buyers and sellers. These may be virtual store fronts like Amazon, information flows like electronic newsletters, gathering of market data, or electronic trading places like Trademe.

The kinds of transactions through e-commerce include electronically transferring funds, EFTPOS, booking appointments, making sales agreements, marketing, managing the supply chain, exchanging information, track courier consignments, getting customs clearance and keeping track of inventory.

Web 2.0 differs from e-commerce in that it is more about building networked communities on line rather than business to business (B2B) or business to consumer (B2C) transactions. The web community uploads the content. Web 2.0 uses the internet as the platform rather than a company's own hosted website. Examples of web 2.0 are Facebook, Wikipedia, Skype, Trademe, Flickr, iTunes, and Mathletics. To some extent sites like Google maps are Web 2.0 as they also rely on input from the community.

New Zealanders rapidly pick up new technologies. However Ministry of Economic Development research shows that small firms are slower than larger firms at using the benefits of e-commerce. Being so

remote from the world it is doubly imperative that firms make full use of the internet to do business.

Target groups for increasing use of Web 2.0 and e-commerce are:

- *SMEs*
- *Exporting and emergent export companies*

2.2.5 *Radio Frequency Identity Tagging*

RFID tags can be attached to documents, products, animals, or people for identification. They are tracked using radio waves that can be read from several meters away and beyond the line of sight of the reader.

Use of the tags started to take off in 2004 with the current price around US10c each for about 4 billion tags and expected to decline to about 1c per tag and sales of 700 billion tags by 2016.

Uses to date for the tags include:

- Library book recording
- Tracking assets
- Retailing inventory management
- Military tracking
- Passports
- E-tolling on motorways
- Transport passes and value store cards
- Tracing animals from farm to plate
- Animal identification
- Anti theft labels
- Logistics for tracking freight and parcels
- Human implants for accessing high security sites

Concerns about RFID centre on security and privacy issues.

RFIDs have the potential to require a tenfold increase in computing resources to manage the information. As well some uses require high broadband capacity to relay the information.

Market segments include

- *Libraries* for recording books
- *Councils, construction firms, freight companies, rental firms, medical equipment providers, and museums* for tracking assets which go missing
- *Asset rich organisations* that want to keep track of their inventory
- *Retailers* for their inventory management
- *Military* to track ordinances and equipment

- *Department of Internal Affairs* for passports

- *NZ Transport Agency* for e-tolling on motorways

- *Bus companies* to standardise the transport passes (like Snapper) and value store cards

- *Farmers, freezing works and supermarkets* to trace animals from farm to plate

- *Farmers* for animal identification

- *Freight and courier companies* to provide logistics for freight and parcels

- *Insurance companies, police and hardware stores* to sell anti theft labels

- *Shipping companies* for automating management of loads

2.2.6 *Geofencing*

A geofence is a virtual boundary on a geographic area. When that boundary is entered or exited it can be recognized as an event and the user can be notified of that event. The notification will tell the user which vehicle has entered or left the area and where it is. This information can be sent to a mobile phone or email address. Geofencing uses GPS systems.

The geofence has three main purposes. It is being used to signal if a vehicle or other item is being taken outside the boundary fence, such as a vehicle being stolen from a yard at night. This triggers an alarm.

Geofences can be used to track if sales reps and delivery vehicles are working in the zone that they are supposed to be in. This is causing some antagonism by employees who feel they are being spied on.

And geofences can be used as a vehicle enters a zone to signal their impending arrival. This can be used by delivery vehicles have everything ready at the site for loading or unloading.

Geofences are reliant on reliable high speed broadband.

Market segments include:

- *Anti theft for vehicles and valuable items* such as at depot sites owned by councils, hospitals, universities, social workers, freight companies, Transpower, construction companies, and lines companies.

- *Rest homes* keeping track of Alzheimer patients

- *Employers* of mobile staff ensuring staff are working within the required zone (they may keep track of staff but are also likely to permanently lose them with this type of geofencing)

- *Supermarkets and large retailers and wholesalers* to signal the impending arrival of a vehicle for loading or unloading.

2.2.7 *Government Logon Service*

MED piloted a Government Logon Service to enable citizens to access government agencies with the convenience of using a single

username and password. It does not allow government departments to share personal information.

Developing a Government Logon Service has proven to be an expensive challenge in New Zealand because there is no unique citizen number.

Auckland City Council is allowing its ratepayers to access their rates information on line using the system.

Market segments include:

- *City councils*

- *Government departments*

- *Libraries*

2.2.8   *Telepresence*

Telepresence exists at a number of levels. The telephone is a low level telepresence device. It is enhanced by video conferencing where participants can see each other. Companies are designing telepresence facilities where participants feel like they are seated at the same round table.

Remote control such as the robotic hands used in space, dangerous environments, bomb disposal or remote surgery are another level of telepresence.

Commercial applications include providing people with a taste of a holiday destination, and providing entertainment or education experiences as though actually present.

Market segments include:

- *Organisations seeking staff from overseas* to interview

- *Multinational organisations* to connect internationally

- *National organisations* to connect nationally

- *Exporters*

- *Importers*

- *Creative sector*

- *Government* for international meetings and discussions especially Ministry of Foreign Affairs and Trade, New Zealand Trade and Enterprise, NZAID (teleconferencing facilities have been set up in small Pacific nations)

- *Interpol*

- *Cook Strait cable inspection* system that reports back to Wellington

- *Councils* for remote water pipe inspection

- *Capital and Coast District Health Board* to provide remote information to secondary health care providers in the Wellington region

- *Ambulances* to connect with A and E
- *Loop schools* to establish global team activities

2.2.9   *Virtual Teams*

Software like Base Camp (www.basecamphq.com) enable disparate groups to be able to work together remotely on a team sharing files, calendars, project management, tracking of time spent by individuals, and communications.

Some applications being trialed in New Zealand schools include interactive whiteboard technology. Resource materials are being written for these whiteboards to provide material such as maps, graphs, equations, images, science experiment instructions and many other resources that teachers can display on the whiteboard and then add their own annotations by hand.

As a remote country, New Zealand exporters may find virtual team technologies a powerful tool for working with colleagues globally. The Global Enterprise Experience (www.geebiz.org) was initially supported by NZTE to develop the capability of New Zealanders to use virtual teams to manage global interactions.

Market segments include:

- *Schools* to link with other schools or offshore
- *Universities –*
    - students to link with global teams especially for courses such as international business, peace studies, international law, business communications, anthropology, foreign language, and architecture students participating in the Solar Decathlon Competition
    - or academics to develop global research teams,
    - or academics contributing to global discussions
- *Exporters* to work with clients
- *Multinational organisations* to link parts of their organisation
- *Large multi-site organisations* to link parts of their organisation
- *Councils and government departments* to link parts of their organisation
- *Open source developers*

2.2.10   *Mobile Technologies*

Technologies incorporated in mobile phones include text messaging, phone calling, internet browsing, mp3 playback music, emailing, personal organizer, built in cameras, MMS, PPT, SMS, call registries, built in games, voice mails, downloading, video calling, Bluetooth, infrared and they can also serve as the wireless modem for a computer.

3G technology has enabled more use of cellphones for internet use. Cost and broadband speed are constraints.

Mobile technologies are able to enhance business through:

- Enhancing workplace performance through providing instant access and information for itinerant executives, sales personnel, and field service technicians

- Reversing charging on SMS so that customers can receive instant notifications such as their bank account becoming overdrawn or their on-line shopping bid being exceeded.

- SMS can now deliver readable barcodes that can be used to retrieve special offers

- GPS data can be added to cellphone photos and text to record on-site information.

Geocaching is a new activity similar to orienteering with a GPS recorder. The typical geocache is an item of interest but low value that is placed in a container and its GPS location posted on a geocache website. People who find the cache can take it and replace it with something else, or if it is a logbook to write in it. Geocache sites have been set up globally including a large number in New Zealand which is providing a new interest for people exploring the outdoors.

Market segments to increase the uptake of mobile technologies include:

- *Same as for unified communications*

- *Public or tourists to trial geocaching* with the intention of increasing capability (and enjoyment of New Zealand's outdoors)

- *Museums and parks* as a self paced interactive tour guide

2.3 Teleworking

Teleworking continues to have the promise that it will reduce pressure on transport systems, provide personal flexibility, and enhance productivity.

Studies have failed to show the transport effect on a wide scale with increased teleworking also being matched by increased pressure on roading systems. However no econometric study has been found that separates out the various causes of pressure on the road – oil prices, population increases, consumption, GDP/capita, teleworking, transport systems, just-in-time delivery etc. Anecdotally individuals who telework say their use of transport has dropped significantly, as one would expect.

Nortel's study of teleworking by their staff calculated:

- An estimated $500 a year is saved on fuel costs by employees who work from home one day a week

- An estimated 15 percent increase in productivity among teleworkers, with 94 percent reporting 15 to 20 percent greater productivity

- An 11 percent increase in satisfaction among teleworkers compared to the overall employee population

- Annual real estate savings of about US$9,000 per full-time teleworker

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- Savings of approximately US $22 million per year in real estate costs and associated energy usage

- 18 percent of employees chose "Flexibility" as the #1 reason they like Nortel

- Based on reduced electricity consumption, Nortel's 2,500 registered teleworkers decrease the company's carbon emissions, by 18,070 metric tonnes per year

The downsides are:

- Lack of trust by managers that staff are actually working when not physically present

- A perception by staff that they are likely to be overlooked for promotion if not present in the office

- Loss of motivation and social connectedness when not in the office environment

- Resentment by staff whose jobs are not suitable for teleworking of those who are able to work from home.

These findings are consistent with those from other studies.   The Japanese Government has a campaign to triple the number of teleworkers within five years, and the UK to increase it nearly fivefold in six years.

New technologies provide scope for more teleworking with higher performance. Broadband increases connectivity speeds; unified communication allows people to be accessed wherever they are; thin clients enable people to access all of their information from any site via the internet; telepresence enables meetings be held almost as though individuals are fully present; virtual teams enables groups to work effectively as teams wherever they are sited; and mobile technologies to flexibly work from home or on the road.

Teleworking is enhanced through:

- Secure, high-speed internet access to their organisation's information and key applications. This requires bandwidth, data security, and the ability to access the same resources such as email, files, and applications.

- A phone connection that acts like an extension of the organisation's PBX system so to outside callers their actual location is irrelevant.

- Access to web conferencing

- Access to instant messaging

Market segments to increase teleworking include:

- *Central Wellington organisations* to reduce the need for staff to commute to work

- *Wairarapa commuters*

- *Organisations that espouse quality work-life balance* as a core part of their identity and ability to attract staff

- *Businesses based in homes.* These account for an estimated 34% to 38% of Wellington businesses. Teleworking is a way of them working with clients

- *Organisations with large sales force*

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- *Organisations with mobile workers* eg Plunket, community health nurse, valuers

- *Researchers* in universities, CRIs and research companies

Projects include:

- A programme similar to Work Wise Week in Britain. During Work Wise Week staff are asked to cancel external face to face meetings and instead hold them by conference call, either video or telephone. They also have during the week a national work from home day, and a national summit of business and public leaders. The programme is supported with a website outlying the potential, issues, resources, and suggested actions (www.workwiseuk.org).

2.4 Aggregate Demand

Mangamaire Country School, north of Eketahuna, which hooked up to a fibre-optic cabling network is an example of aggregated demand. The small rural community banded together to drag wire across their farms to provide a high speed hub at the local school which can also services the needs of the local rural community.

Weta Workshops also put together the case for getting early access to fibre-optic cabling to Miramar. There may be many other groups such as Gracefield, Wallaceville, Jackson St Petone and the creative technologies sector in Kapiti, that can be united to create the demand for fibre-optic cabling and the shared means to reduce the costs of deployment while ensuring high levels of uptake.

Rural areas that may be keen and able to do aggregate demand are:

- *Makara* by accessing the line being established by Transpower

- *Wairarapa plains* farmers that may be able to get a lead off the fibre on the rail line. FX Networks is currently upgrading the volume of fibre along this route so more strands of fibre are available and it could integrate with current work

- *Rural holders near Otaki Forks and Te Horo* who could access the FX Networks fibre which will begin being upgraded in March 2009-02-09

Urban groups who could aggregate their demand to get faster rollout of broadband are:

- *Karori* where the College of Education, schools and library are located.

- *Gracefield* industrial area

- *Kapiti creative sector*

Schools have their own opportunities for getting demand aggregation especially the large number of high schools clustered in Waterloo in Lower Hutt.

2.5 WiFi Service through CBD

CafeNet is a small WiFi service operating in Wellington. Auckland City Council has just launched a larger WiFi service covering seven zones to help stimulate business activity. The service targets students, visitors and business people visiting the CBD. Under the arrangement, the Auckland City Council supplied access to buildings, council-owned structures and electricity, while Kordia installed and operates the Wi-Fi nodes.

Complaints are often heard about the exhorbitant charges for access to the internet in Wellington hotels. A WiFi service is one way of circumventing this charge.

Extension of WiFi in the Wellington Region could focus on unserved areas for CafeNet such as *CBD in Porirua, Lower Hutt, Upper Hutt, Masterton, and Paraparaumu*. These are commercial decisions for CityLink and its partners. If public funding is available, it needs to focus on areas that have high levels of business travellers and students.

WiFi near hotels would help business travellers and tourists. CafeNet could usefully be extended to more parts of the waterfront.

2.6 Dial Up to Broadband

New Zealand still has a high level of dial up access to the internet. This is partly because New Zealand's dial up service is of good quality and cheap - free local dialing makes the differential between dial up and broadband greater than in countries where they pay for local calls. People say they do not want to upgrade because of the cost. However once upgraded, people say they would not be willing to regress. It appears to be more of an issue of lack of perception of the benefits, rather than cost. It also appears that once people have access to broadband they teach themselves to use its potential.

Moving to broadband can raise the level of productivity and prepare people for the next step of benefits to be obtained from ADSL2+ and even faster speeds on fibre optic cabling. It would be helpful to have a web site where suppliers of broadband coverage is made available, and issues of performance can be posted.

2.7 E-learning, Blended learning and M-learning

E-learning covers a wide range of educational processes that are supported with the computer. It includes distance learning where an instructional programme replaces the role of the teacher. With Web2 there has been a more toward collaborative learning using wikis, discussion boards, blogs, podcasts, on-line collaboration or competition and virtual worlds. It lends itself to using gaming technology to enhance fun in learning.

With blended learning, the teacher uses software to assist with students learning. For example, Mathletics tailors the maths to the individual levels of each student. They are able to log on at school or to their account at home. Students can also set up maths "competitions" with people in other parts of the country or overseas to answer maths problems. A New Zealand study found a 55% improvement in the average score within three months of introducing the software into schools.

M-learning makes use of mobile technology to create learning opportunities outside the classroom. Learning is able to be more in context and student led. Students are able to use texting, photo capture and GPS linking. Some British schools are using m-learning inside the classroom in the engagement between the teacher and students, and between the students. One benefit appears to be stronger student engagement and instant feedback. M-learning lends itself toward social networking which can enhance the joy of learning.

M-learning is often used in museum environments as a self paced interactive tour guide.

In a work environment m-learning can enable people to get the information they need to do a job just-in-time.

The Uruguay Government is committed to providing a laptop for every school child. They are making excellent progress with 172,000 laptops delivered so far, of which 91% have access to the internet. An equal number are planned to be distributed in 2009. To date training in the use of IT in classrooms has been completed with 18,000 teachers.

The six Wellington schools on the loop do not yet create sufficient critical mass to make best use of the capability from fibre optic cabling. A larger number of schools will provide more case studies of using it, market for education tools, teacher training, teacher networking on using the potential, generating revenue as an ISP, and sharing the costs and expertise to manage the system.

High Schools

The projects listed below are aimed at high schools and designed to meet a number of criteria:

- Meet the project deliverables for the Wellington Loop Project as easily as possible

- Provide high quality education to students that applies principles of action learning, integrated curriculum learning and project based learning

- Develop and demonstrate educational benefits from using broadband

- Enable students to snag credits from a range of NCEA subjects for completion and write up

- Provide worthwhile benefits to the community

- Serve as a trigger for creative ideas that match the interests of teachers and opportunities facing the schools.

2.7.1 *Projects for Unit Standards and Assessment Standards*

The idea is to create projects in schools that students can use for NCEA credits as well as meeting the aspirations of the Wellington Loop Project. The Trust becomes one of the "clients" of the students.

Wainuiomata High School has led the development of this educational concept with their Project Learning programme (see www.projectlearning.org.nz for more details). WHS is a decile 4 school and those who enrol in technology are generally the least well performing students.

In 2007 a small pilot trial was run with the Year 12 Technology students to develop the "Wearable Arts for Valley Schools" event. They received a modest number of entrants and the show was held at the Lower Hutt Civic Halls Complex. The project was run using the usual class with 5 hours per week. With the same teacher the students went from earning 12 NCEA credits in 2006 to 18 NCEA credits in 2007. In their other courses the students were averaging 9 credits. One third of the students returned to school for Year 13.

In 2008 the project was offered as a ten hours per week programme combining Technology and the Young Enterprise Scheme. The students were placed in teams to design and built the spiral staircase onto the stage, the changing rooms in the adjacent hall, the lectern, and the bridge that connected the two halls. They also formed teams to do the PR, marketing, financing, accounting, presenting, graphic designs, press releases, recording and project management for the event. The event attracted 138 entries from schools around the Hutt Valley and was very successful.

The 23 students averaged 72 NCEA credits (up from 18 credits) which came from 12 different subject areas. The students started to explore the NZQA website themselves to find what subjects they may be able to gain credits in from the work that they were doing for the project, and the requirements and standards they needed to meet. All but one student is returning to Year 13, and another student has gone to Australia to progress his dream to become a professional rugby league player. Performance in their other subjects also rose significantly and there has been a transformation in their self confidence and life aspirations.

In 2009 WHS have extended the programme to their Year 13 class developing a children's adventure playground in Wainuiomata with $150,000 of support from Hutt City Council, in addition to the Year 12 class running another year of the wearable arts project.

Ten other schools in the Wellington region have viewed what has been happening at Wainiuomata High School and are keen to adopt more project learning concepts into their schools. All schools complete their major planning in May which sets out their curriculum and the basis for their resources and staff planning for the following year. So schools are likely to undertake modest projects embedded into existing courses in 2009, and plan for a more intensive 10 hour per week integrated curriculum programme for 2010.

Most of the suggested projects below could be linked to assessment outcomes. However projects aimed at students in Year 10 and below do not need to link to assessment. Some of the suggested project ideas for schools also directly contribute to the deliverables set out in the contract for the Wellington Loop that would contribute to the deliverables set out in the contract.

For one of the projects the NZQA unit standards and assessment standards that could be gained from the project are shown.

2.7.2 *Police alcohol project*

The Police are keen to work with youth to engage youth in responsible attitudes towards alcohol. They have also suggested that they would provide resources.

Students live in a digitised world and understand best what works for their peers. A project could be established to use digital media mechanisms to engage youth. The project can readily achieve a wide range of NCEA credits.

2.7.3 *Videoconferencing facilities for local communities*

This is another project that can be student led as part of the Young Enterprise Scheme or a variety of other school courses. The students would need to consult their local community (interpersonal communications credits), survey

the community (statistics credits), write up findings and recommendations (English credits), plan and develop an event (Business Studies credits, promote the use (Young Enterprise Scheme credits), and give a presentation to the Wellington Loop Trust on the project (English Presentation credits).

2.7.4   Projects with Local Business Partners

Business Studies curriculum provides an excellent platform for students to work with local business partners. One project may be for students to identify and demonstrate IT technologies and web uses that could assist businesses.   For example the students could demonstrate to health practitioners and fitness businesses how to add free open source software to their website to provide on line booking and scheduling.

2.7.5   MediaWiki

MediaWiki makes it easy for the students to establish wiki. Students can be required to work with schools overseas to explore issues of interest to youth.

2.7.6   Utopia board game

This is a downloadable board game which aims to raise understanding of global issues. It has an associated wiki (www.utopiagame.info) where participants develop teacher resource notes on themes raised in the event cards. It also enables students to create their own event cards and their consequences. The best of these are uploaded to the website with the author's name and country shown on the card, and can be used as additional cards for the game.

The board game is available for students to take over, manage or upgrade.

2.7.7   MySource matrix or Silverstripe

MySource Matrix is an open source tool to build and manage websites.   Its advantage is that it can have multiple editors to publish web content. Wellington East Girls College have been using the software and are producing training materials for other schools to use.

Silverstripe is a Wellington based open source software for website development.   The company has shown its commitment to working closely with the education sector to increase its use.

There is the opportunity for schools to develop websites or provide training with these sites. Some social agencies and councils may have projects that they are keen for the students to share ideas on.

2.7.8   Geocache

Geocaching is a new activity similar to orienteering with a GPS recorder. The typical geocache is an item of interest but low value that is placed in a container and its GPS location posted on a geocache website. People who find the cache can take it and replace it with something else, or if it is a logbook to write in it. Geocache sites have been set up globally including a large number in New Zealand which is providing a new interest for people exploring the outdoors.

Schools in the Wellington region can set up geocache trails and provide the accompanying historical, geological or biological information on the site. Students can experience each other sites. They can also be made available for use by tourists to the area and families in the area to have an enjoyable and informative outdoor experience in Wellington.

2.7.9   Computer club

Students can establish a computer club that is during lunch hours or after school. It may be located in the school or in association with the library. The club would encourage students to use the computer creatively and interactively for activities such as:

- Contributing to wiki
- Creating multimedia productions
- Designing games
- Producing electronic music
- Electronic graphic design
- Building websites or web pages

2.7.10   Interactive whiteboard resources

The students can evaluate the teaching resources for interactive whiteboards for the teacher to use in class.

2.7.11   Library IT for youth

The Wellington Public Library system has extensive IT skills but limited engagement with schools. There are possibilities to set up computer systems that link to the Loop in the library. This could be relatively cheaply done with thin clients, or less cheaply with a laptops in libraries programme. The library can provide cloud computing that gives access to a number of software applications not found on the average computer that would help students, and could be used by the wider public.

The library can also be the parent of a computer club, either within the libraries or linked to community centres or schools.

Ideally the library would have staff who energise youth with the potential they can get from IT offerings. This also links to providing skills development for the digitally disadvantaged.

Free WiFi is being deployed around many libraries in New Zealand. This is helpful for students and business travellers.

The WCC ICT policy is overdue for being updated. The ideas suggested above are an extension of the traditional role of libraries in a digitised world.

2.7.12   Thin clients in city housing

The Loop has already engaged with the Newtown eCommunity hubs and Arlington flats. There is the potential to provide thin clients (ie dumb terminals with a server hub) to these areas. The students may develop a project to assist with setting up this system and assisting uptake from the residents.

There are a very wide range of NCEA credits that the students could gain from this project, as well as excellent learning.

2.7.13 *Community consultation*

The Wellington City Council is experimenting with an impressive array of consultation processes for the Long Term Community Council Plan (LTCCP), including some that use IT. School students could also develop processes for consulting their peers on LTCCP issues and reporting these back to the council. Learning includes IT, English, statistics, social studies, environment studies and geography.

2.7.14 **Train teachers in Moodle and Mahara**

Moodle is a learning management system which can be used by teachers to deliver information, instructions, assessment and class management.

Mahara is an e-portfolio to store, share and publish student work.

Students can provide the training for teachers and students in how to use these tools.

2.7.15 *Jane and the Dragon*

Jane and the Dragon is a Weta TV series aimed at pre teens. It is very unusual in that it has a strong female as a central role and focuses on joint problem solving rather than conflict. Sadly these two features make it unsuitable for the three major television networks that control children's television production in the States to accept if for screening. However it has a loyal worldwide following.

CORE Education in New Zealand have developed a website Knight School (www.janeandthedragon.school.nz) that is a platform for creative participation by New Zealand students. Regular educational activities are provided for schools, groups of students, and individual students, including participation in a 3D virtual world, curriculum based activities and competitions.

Knight School offers significant opportunities for schools to collaborate with CORE Education to design educational experiences that develop digital skills.

2.7.16 *Media Accuracy*

Eighty percent of people only read the headline and first two sentences of a newspaper story. A lower percent see the news headlines on TV and then read their website for more details. Journalists are trained to find a hook that catches the attention of the reader and subeditors to create a catchy headline. However this enables sensationalism and distortions to creep in to the media.

What we measure is what we get. This project aims to provide the measure of accuracy between the headline and the opening two sentences with the bulk of the article across a range of media. The resulting league table of media accuracy is likely to be published by those at the top of the table. Such a measure is likely to have an impact on this aspect of media accuracy.

Sites like www.click4news.com show the same news reported by a number of TV outlets. It enables media studies students to compare the reporting and

bias, and contrast it to a fuller story. Students in the loop schools would need to use the video linkage capacity of their broadband connection.

2.7.17 *Global Enterprise Experience*

The Global Enterprise Experience (www.geebiz.org) is a Wellington based contest that links participants from 56 countries and 150 universities around the world. The participants are formed into teams of eight made up of four pairs of students from four radically diverse countries who communicate via the internet. The teams have three weeks to develop a business concept proposal on a set theme such as financing development, environmental sustainability, goods and services for the poor, or fostering unity in diversity.

It would be easy to set up a parallel contest or activity for schools using the same website and online enrolment system. Many of the relationships built up through the Global Enterprise Experience make it easy to find enthusiastic partner schools from round the world especially in Uganda, California, Illinois, Finland, Italy, Colombia, Macau and Iran. Schools may prefer to limit access to other schools that are also on high speed broadband to enable videoconferencing and other bandwidth intensive activities. Or they may want their students to develop a wider appreciation of different cultures and circumstances.

2.7.18 *Sanitation Uganda*

At Victoria Universities students in the MGMT 317 programme have developed a number of projects with the Conservation Trust in Uganda (www.contrustuganda.org), including providing them with 10 second hand computers and a website. The Ugandans are an impressive group of youth volunteers who have developed programmes in 380 schools across Uganda. They have dial up access to the internet.

One of the Victoria University students was keen to establish a programme with Uganda on toilets and sanitation. There are 2.4 billion people in the world with no access to toilets and the impact on health, water quality and life expectancy is significant. In 2008 she flew to Uganda to establish a sanitation and education project in partnership with New Zealand.

The intention is to link a Ugandan school and a New Zealand school to design, fund and build a toilet with good sanitation in Uganda. The two schools would collaborate using the wiki and discussion board on the Conservation Trust website. The New Zealand students have the advantage of access to high speed internet, advanced design software, readily available resources and a little funding to be able to design and experiment with low cost solutions for the Ugandans. The Ugandans have the advantage of understanding the local conditions and are able to inform the New Zealand students of the challenges, resources and local concepts.

The discussion board is a process for the New Zealanders and Ugandans to jointly work up the proposed solution. The wiki would enable some of the solutions and choices to be offered in a structured way. And it could become a repository of information for other similar projects.

Ideally the New Zealand students would undertake the project under the banner of a technology course and Young Enterprise Scheme. However the

NCEA credits that are open to them from a project of this nature are extensive and listed in Appendix 2.

2.8 E-health

Estimates for the benefits of a quality e-health system in Australia have shown predicted savings of $30 billion over ten years and an annual saving of 1,300 lives.

New Zealand is a world leader in electronic health record use, second only to Denmark. In 2007 the Ministry of Health found that e-laboratory results are sent from community laboratories to 70% of general practitioners. Practice management software is currently estimated to be in use in 90% of general practices for patient administration. About half of general practitioners are electronically generating prescriptions and recording details of patient health encounters. Over 80% are connected to the internet and 99% of pharmacies are computerised.

In 1999 New Zealand established a "health intranet" which connects 900 organisations which includes all DHBs, almost all GPs, most private hospitals, some pharmacists and other health bodies such as laboratories.

There is a move towards:

- E-referrals
- E-discharges
- E-pharmaceuticals
- E-labs
- E-scheduling and booking
- Primary health care datasets

The next phase is to:

- support real time collaboration;
- connect the entire sector which has 17,000 organisations;
- create a nationally consistent IT architecture;
- create processes that routinely capture the data for clinical purposes, that has as a by-product value for administration, research, policy development, epidemiology, decision support and research;
- enable the process to be patient driven and accessible by patients;
- have mobile access;
- have a single integrated record that is used at all points of care; and
- use sector leverage to improve connectivity and reduce costs

Seven district health boards – Canterbury, MidCentral, Nelson Marlborough, MidCentral, South Canterbury, Wairarapa, Whanganui and Northland – put out a request for proposal in January 2009 that would achieve many of these aims.

Other technical possibilities with e-health are:

- Telemedicine that enables medical data to be collected locally and provided electronically to specialists so patients do not need to travel, and medical experts time can be better utilised.

- Provision of consumer health information via the internet

- Health knowledge provision for medical practitioners such as epidemiological tracking, best practice guidelines and latest knowledge

- Real time collaboration of medical experts on a patient

- The use of mobile technology to collect information, monitor patients or provide remote care.

- Remote diagnosis

- Video consultations

Market segments include:

- *Ministry of Health* Nine hundred health organisations are connected to New Zealand's health intranet for patient records. The next step is to incorporate the entire sector of 17,000 organisations.

- *GPs* to uptake e-referrals, e-scheduling and e-prescriptions - 90% are already using practice management software but only 50% are generating electronic prescriptions.

- *Hospitals* to create e-discharge papers. Also e-booking greatly reduces the number of missed appointments.

- *Elderly homes* to trial video conferencing consultations with hospital specialists and trial remote monitoring. Some of these homes have sufficient scale that they could employ a health IT specialist to set up these systems.

- *Retirement centres* to offer thin clients. Many elderly wish to use email and simple applications but are daunted by owning and managing a computer. Thin clients reduce the costs and enable the central server to be responsible for internet security, software provision and upgrades. These centres have sufficient scale that they can employ an IT person to teach the elderly how to do simple transactions like their banking and grocery purchases on line – activities that may require a drivers licence and/or good mobility. This is the kind of support that enables elderly to remain in independent from full care for longer.

- *Pharmacies* routinely receiving e-prescriptions

- *Laboratories* – most provide test results electronically to the doctors however they do not provide x-ray results or other results requiring broadband.

- *Alternative practitioners, dentists, physiotherapists, osteopaths and chiropractors* for e-scheduling and booking, and inclusion on the health intranet for patient records

2.9 E-governance

New Zealand has made strong progress on providing government services via the web. However e-gov is still in its infancy. There are many more opportunities to reduce costs, bureaucracy, and support citizen involvement.

Benefits from e-governance include:

- Making decision making more transparent

- Provide greater accountability

- Enable individuals to access information and services faster, easier, cheaper and without the need to travel

- Encourage more dialogue between citizens, community groups and elected members

- Improve the public sector's quality and efficiency of response

- Reduce costs

- Improve the accuracy of information flows

According to the "Benchmarking NZ E-government 2008 Survey" only 15% of councils have formal strategies to build e-government services. Local Government Online has a comprehensive suite of online interactive forms, complete with back-end management and online payments (See www.localgovt.co.nz). These are available to councils at no capital cost and with a very small usage fee, yet less than one third of city councils have interactive forms of any kind.

E-governance opportunities for councils include:

- Expanding public input on the council pages

- Webcast live coverage of council meetings

- MyGov to enable citizens to customise the content displayed to them on the council's website

- E-petitions (these are well used by the Wellington City Council)

- Online submissions that are part of the standard "public participation" slot at a committee of council meeting.

- GoForms – Auckland company Ubiquity has developed a process for council forms to be entered electronically and sent by email. These arrive as a pdf and handled in the same way as if it was posted. However once a decision has been made the status shifts from "processing" to "approved", "declined" or "withdrawn". This then automatically emails back the applicant. GoForms can be easily applied by councils without the expensive and risky process of interfacing with the council's information system. However they still require data entry and have the same data integrity issues of paper based applications.

- Track the progress of consent applications on line (currently about 10% of councils provide this service)

- Develop neighbourhood websites that promote interaction between local residents

- Enable utilities working in the road to see on line what other utilities are in the area, what work is being proposed, and to apply for a road opening notice. Such a system is in operation in Upper Hutt and Lower Hutt with PLAN.IT road, and has the potential to significantly increase collaboration and joint planning on road openings and installations. If a system like this accesses the information in all of the local councils, then there are significant cost and time savings for applications that cross regions.

- Enable GIS and archives databases to be available on line.

- E-panels are resident groups who are consulted on relevant council issues

- E-service for Solicitors Statement of Account

- E-service for Request for LIMs online with online payment

- E-service for online payment and download of Property Reports

- E-service for online payment and download of Building Information Report

- E-service for online booking and payment of Learn to Swim programmes

- E-service for online payment of invoices for the Wellington Convention Centre

- E-service for online dog registration and payment

- E-service to pay for library fines online

- E-service to book council community halls and venues online

Wellington City Council's current efforts to consult the public on the LTCCP are worth studying to see its effectiveness in using IT solutions for consultation.

The challenge with e-governance is maintaining tight security especially where money transactions are involved. These require complex and secure infrastructure, 24x7 monitoring, call centres, IT maintenance staff and back office staff.

The key target audience is local councils. It is best to work with the people who want the problem solved rather than beginning with the IT specialists.

2.10 Environmental Sustainability

According to the World Energy Council, electricity generation accounts for twice the level of CO_2 as the next major cause, transportation. It also has the greatest opportunity for reducing emissions. Broadband enhanced IT can contribute through:

- Smart metering of electricity in homes

- Smart metering of electricity in commercial buildings

- Home automation system for remote management of heating

- Remote metering and management of electricity supply systems

In California one third of all electricity consumed in the state is by commercial buildings. The High-Performance Commercial Buildings Project aims to cut energy use by 70 percent in new buildings and save 50 percent in retrofits of older buildings using broadband connections combined with other technologies
Transport impacts can be reduced through teleworking and teleconferencing. These have been separately covered above. The CarboNZero programme (www.carbonzero.co.nz) provides tools and resources to measure, manage and mitigate greenhouse gas emissions accessible via their website. Ilinc provide software for organisations and individuals to calculate how much CO_2 emissions have been created or saved (see www.ilinc.com/pdf/data-sheets/ilinc-green-meter.pdf)

Web based carpooling is being made available to help people organise trips with people who live and work in close proximity. Greater Wellington Regional Council plans to launch a comprehensive car pooling programme in March 2009, in a bid to

reduce the number of single occupancy cars and thereby reduce congestion and greenhouse gas emissions. The programme includes an on-line service that enables potential car poolers to match up. Research has found that car pooling has more chances of success when incentives are available such as priority parking, reduced cost or free parking for car poolers and reward programmes.

NZTA plans to have cameras along key routes to provide information on hold ups can reduce traffic congestion. Their information shared through the Metservice website showing congestion at nine sites is well patronised.

Remote metering has been in use for over a decade to assess water quality, air quality, likelihood of flooding, and for the routine collection of data in remote sites. Increased sophistication is requiring high bandwidth. NIWA is modelling is assessing effects of land-use changes on water quality and socio-economic indicators. Their next step is to make the system more suitable for regional agencies.

Target audiences for increasing the use of broadband for environmental sustainability are:

- The lines companies in the Wellington region – specifically:
    - Ross Dixon, PowerCo (Ross.Dixon@powerco.co.nz),
    - Brendan Drysdale, United Networks (Brendan.Drysdale@unitednetworks.co.nz), and
    - Ross Leggett at Electra (rossl@electra.co.nz).
- Transpower NZ Ltd specifically John Crisp T & N Manager, (john.sloper@transpower.co.nz).
- Remote metering suppliers in Wellington eg www.metec.co.nz.
- NZTA – including agreements on sharing fibre deployment for their webcameras and electronic motorway signs and other uses.
- NIWA who are already leading edge in its use so they can prioritise what needs to be done, and support other organisations with remote metering
- Support the Wellington Regional Council's carpooling initiative

2.11 Industry

Some industry sectors that could be targeted for increased uptake of broadband enhanced IT are:

- Manufacturing sector especially IT that enhances transport, storage, connecting with customers, web 2.0 systems for clients, cloud computing and thin clients

- Food and beverage sector. Traceability, sustainability, carbon footprint, safety, and fair trade are elements that the region can have a competitive advantage. Traceability requires RFIT or similar systems to track the produce. Food quality is essential and requires advanced controls over transport and storage systems. Some players in the industry are role models for what is possible.

- Screen and digital technologies. This sector is already very IT literate. However there may be areas where demand could be aggregated to access better broadband such as in Kapiti. The sector can also be leaders in

demonstrating the benefits of new applications as outlined in section 2.2 and in virtual communication with offshore clients especially Weta and Peter Jackson's studios.

- Biotechnology and life sciences are intensive users of research and IT capability. The clients for some of these products and services are based in universities and hospitals and are very well serviced with broadband and virtual communication technologies. The sector could be early adopters of broadband enhanced IT and able to share their learning and experiences with other businesses.

- Tourist focussed businesses. Tourists are ever changing clients who are hungry for easy connectivity to information and bookings with providers. The sector has considerable potential to step up with applications. Some of the smaller providers who run the tourist venture and the office need better systems for capturing enquiries. The sector could benefit from increased use of unified communications, thin clients, cloud computing, mobile technologies, and online booking and scheduling.

  There may also be potential for aggregating demand for broadband, and aggregating supply of information about tourist attractions.

  Hotels and motels need to consider improving access to broadband and what they charge for it. Business travellers are not interested in being disconnected from the internet during their stay.

- The rural sector could benefit from working with their neighbours to use web2.0 applications for rural services. Urgent work will need immediate attention, but many activities could be done on the same day as neighbours to reduce travel costs. For example providers could offer a wide variety of services on a web 2.0 system such as accounting, mechanical repairs, hay baling, stock transport, insurance, banking, and water supply management.

2.12 Households

Households may be a key to developing uptake on IT technologies because:

- Businesses run from home account for 34% - 38% of businesses in the region. These individuals have high needs for connectivity to enable them to continue to choose to work from home.

- Workers may also increasingly seek to connect to their workplace from home.

- There are teenagers in the home who push the IT boundaries

- People want to be socially connected and are willing to experiment with new applications like facebook, hardware like web cameras, or downloading of films that they would not try in the workplace. These skills can translate into the workplace.

- Households challenge providers to find low cost solutions to their needs

- Households will be getting ADSL2+ soon which will increase their experimentation. However without a change in the rate cards it may also create some alarming and unexpected bills.

The key audience are the SMEs based in homes. They may be accessible through Grow Wellington small business initiatives, accountants and their high school children. The aim is to increase their daily use of IT capability.

2.13 Digitally Disadvantaged

The digitally disadvantaged lack a computer, internet connection, useful software, the skills to keep a computer going, or the skills to make good use of the computer. They are likely to be school age children at home, tertiary students away from home, elderly, unemployed, low income, in council housing, or refugees.

The United Kingdom has active programmes to engage these groups in the internet including:

- 6,000 community online centres that offer free or low cost Internet access and free advice on how to get started with computing. They note that the focus needs to be on acquiring life skills not just IT skills

- On line training for how to use computers see www.myguide.gov.uk

- Get on line day with events across the UK – see www.getonlineday.com

- Web based information for accessing health care, health information, and diagnosis - see www.nhs.uk

- Easy access to public services and government information in a single website – see www.direct.gov.uk See Appendix 1 for links on the home page of this website

The target audiences are those groups who work with the digitally disadvantaged eg

- *City housing*

- *Ministry of Social Development*

- *Church social welfare organisations*

- *Community colleges with evening classes*

- *Refugee programmes*

- *Retirement centres*

- *SeniorNet*

2.14 Demographics and Sociographics

This section aims to pick up groups of people to target who are not otherwise picked up in the sections above. Demographics and sociographics include:

- Gender

- Age (children, teenagers, early adults, adults, third age, elderly)

- Urban dwelling (inner city, city, town, semi rural, rural)

- Access to ADSL2+ or unlimited broadband (eg potentially Miramar)

- Migrants, refugees, and English as a second language

- Extent of IT literacy and usage

- Income levels

- Ethnicity (Maori, Pacifika, Pakeha, Asian, other)

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- Connectedness (eg living on one's own, migrant, unemployed, sickness beneficiary)

From these triggers, possible target audiences include:

- *Third age* (60-75 years) who are still willing to learn new things, and may find it beneficial when their health worsens or isolation increases. Engaging this group could future proof using telemedicine, virtual presence, and other forms of connectedness using IT.

- Those communities with *access to unlimited broadband* can provide a role model and experimental base with promoting broadband use. Miramar and central Wellington are the two areas that most closely meet this criterion.

2.15 Partnerships

All of these concepts need to be undertaken in partnership with other organisations. Except for in-council projects we do not wish to own these activities but to inspire and help others to make them happen. Examples of partners are:

- CityLink including their CafeNet business

- SmartLinx3 especially for demand aggregation projects in the Hutt and Porirua

- Telecom especially considerations on how to increase uptake of ADSL2+ from their cabinetisation process

- Woosh Wireless and other wireless companies for wireless initiatives

- Other telcos and lines companies

- Gen-I which has an interest in promoting thin clients and cloud computing

- Government departments especially Ministry of Education, Ministry of Health, NZ TA

- KAREN

- Councils, Regional Council and Grow Wellington

- Within councils such as the library, consents, city housing and grants that interface with the public

- Universities, especially for getting students engaged in making the projects happen

- Chamber of Commerce and other business organisations to connect with individuals and raise awareness

- Equipment suppliers

2.16 Overcome inhibitions

People are held back from increasing their uptake of broadband enhanced IT for a range of reasons. Removing the inhibitions can often be more valuable than creating the opportunities.

Digital security is a concern for many groups. With connectivity come threats of viruses, scams, and unsavoury material. There are also the risks of needing the skills to keep the computers safe or fix them when attacked. Thin clients are one

solution for these issues. Several organisations have run campaigns and provided information such as the Australasian Consumer Fraud Taskforce, Consumer Institute, Police and Ministry of Education.

Copyright violations are rife. The Government is seeking to introduce legislation to mitigate and enforce copyright however this is proving difficult without violating rights to privacy and assumed innocence.

Lack of computer literacy affects most people – except teenagers. Uptake may be faster where there is computer literacy and a willingness to experiment, however the need may be greater with those without computer literacy. The digital divide can become one more barrier for people who are already marginal in society.

Cost remains a concern. Uptake of broadband enhanced IT without changes in the surcharge for higher broadband use could lead to very high bills. Programmes will not be successful if the extra cost cannot be afforded or is less than the benefits.

3   ADOPTION AND DIFFUSION

From the ideas presented above, ideas have been written in Section 4 on how to achieve increased uptake. These have been selected because they offer several benefits:

1. They represent a segment of a key group that could generate benefits from making better use of broadband

2. Each group is very different so it can stretch our thinking on what activities would increase adoption and diffusion rates within this group

3. Each group are able to be role models or can influence others to follow in their footsteps.

Surprisingly the behaviour of people is more likely to be influenced by peers than by experts. So the key is to get uptake from innovators or early adopters so they will in turn influence uptake by other groups.

Process of Influencing Peers
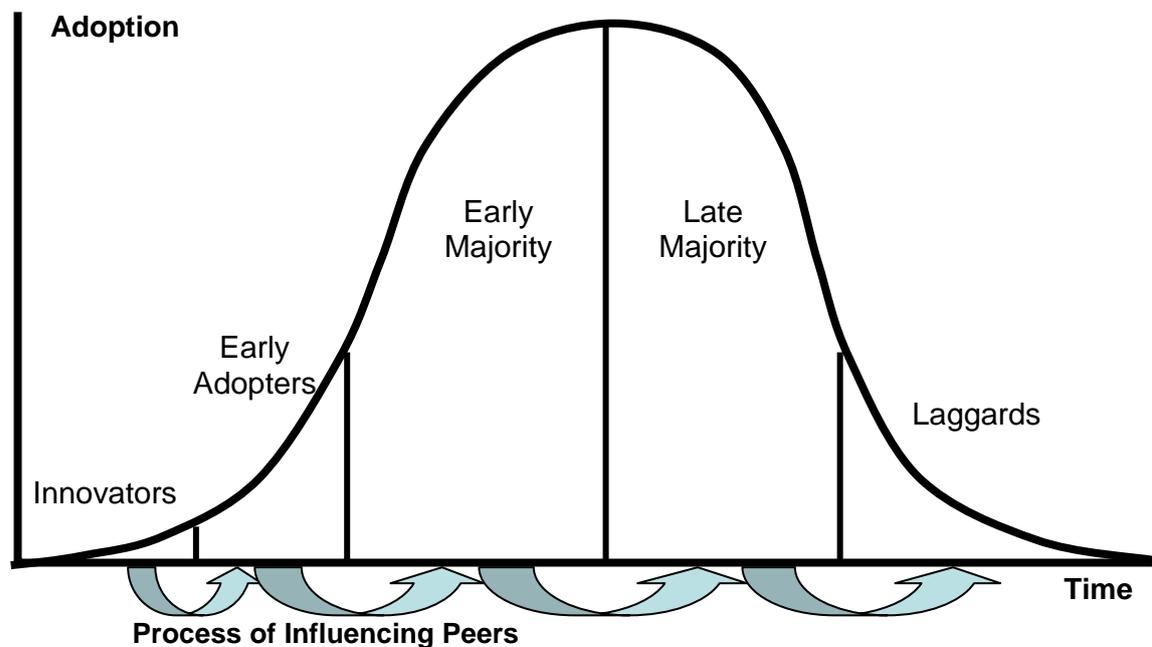
The first step is to consider an appropriate message. This is led by *initiators* such as Grow Wellington. An effective message will have the following characteristics:

- The message will *stick* well in the minds of the target audience. So the message needs to have some marketing zing.

- The message will *offer advantage* such as increased efficiency, improved profitability, ease of working, enhanced learning, or improved social standing with peers;

- The message will be *compatible with their existing values, attitudes and behaviours.* This is why fostering broadband uptake to people with IT phobia or the socially disadvantaged could be very difficult;

- Behavioural changes are best if they *can be tried* with minimal effort or cost. An example would be free trials or hands on experimentation with IT solutions.

Often with IT learning comes from being on the receiving end of other people's trialling IT systems – for example a request to participate in a virtual presence conference, or to use Facebook to provide comments, or to enrol in a virtual team;

- The message has more impact if it is *easily observed*. An example would be to observe what our children are doing, or to observe a system in use.

- *Simple messages* repeated often work.

The second step is to garner support from **key people**. These key people have three different roles in presenting the message and influencing adoption:
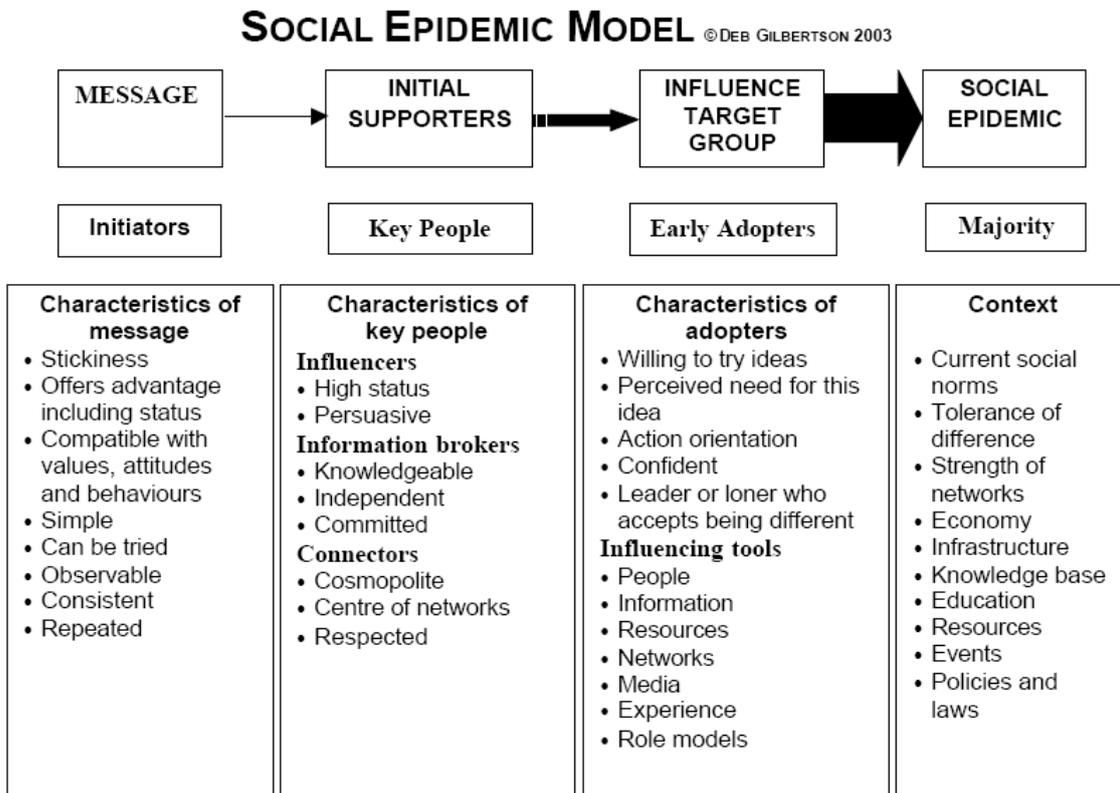
- *Influencer*: so they need to have high status in the minds of the target audience and be persuasive. Examples include Richard Taylor, business leaders, Rod Oram, and President of Wellington Region Secondary School Principals Association.

- *Information broker:* who need to be independent, knowledgeable and committed. Examples include DomPost, Grow Wellington, Consumer, 7x7.

- *Connecter:* Peers deliver messages that have the most impact on behaviour. Effective connectors are likely to be colleagues in the same industry sector. Or they could be via formal network organisations like the Chamber of Commerce, university or Rotary.

The third step is to identify the right **early adopters** who will influence those they are in contact with and lead to a snowballing action that feeds through to the majority. Early adopters tend to be ***willing to try new ideas, have a perceived need for the idea, are action oriented, confident, and comfortable to be different either as a leader or loner***. If they have **high status** and are **cosmopolite** then the idea is likely to spread quickly. The tools to influence this group are through the **key people** mentioned above, ***information, resources, networks, media, offering new experiences and observing role models***.

The fourth step is to consider the **context** that affects uptake of broadband in New Zealand. For the snowballing effect to occur with the majority of market segments adopting broadband, then effort needs to be directed at societal influences. These include:

- The **current social norms** including IT uptake which is generally high in New Zealand;

- *Tolerance of difference*. In general New Zealand society is tolerant of difference – for IT Kiwis are generally admiring of earl IT adopters

- *Strengths of the networks*. In education this would be the linkages between the IT leaders in schools; in business it could be Chamber of Commerce, Rotary, industry groups; etc;

- *Economy*, the current downturn reduces capital available for investment but may also increase the essential need for efficiency, competitive advantage, customer focus, etc;

- *Infrastructure* such as the availability of broadband;

- *Knowledge base* such as knowledge of the killer applications, or international best practice;

- *Education* levels which have both a general effect on uptake, as well as IT literacy. Of particular interest are the digital native youth;

- *Resources* to commit to uptake of broadband;

- *Events* which lead to people experiencing some IT possibilities;

- *Policies and laws* such as copyright, and internet security

SOCIAL EPIDEMIC MODEL © DEB GILBERTSON 2003

MESSAGE	→	INITIAL SUPPORTERS	⇒	INFLUENCE TARGET GROUP	⇒	SOCIAL EPIDEMIC

Initiators	Key People	Early Adopters	Majority

Characteristics of message	Characteristics of key people	Characteristics of adopters	Context
• Stickiness • Offers advantage including status • Compatible with values, attitudes and behaviours • Simple • Can be tried • Observable • Consistent • Repeated	**Influencers** • High status • Persuasive **Information brokers** • Knowledgeable • Independent • Committed **Connectors** • Cosmopolite • Centre of networks • Respected	• Willing to try ideas • Perceived need for this idea • Action orientation • Confident • Leader or loner who accepts being different **Influencing tools** • People • Information • Resources • Networks • Media • Experience • Role models	• Current social norms • Tolerance of difference • Strength of networks • Economy • Infrastructure • Knowledge base • Education • Resources • Events • Policies and laws

4 STRATEGIES FOR THREE TARGET GROUPS

The three groups selected are:

1. SME exporters for applications for enhancing connectedness with global clients
2. Loop schools to lead developments in other schools
3. Councils for increased e-governance

4.1 SME exporters

The outcomes we are seeking from targeting SME exporters in the Wellington region are:

- Improved capacity to engage with international clients
- Increased ability to work remotely from New Zealand
- Improved internal efficiencies
- SME companies that role model what is possible to other SME companies
- Support for SMEs from a wide range of organisations to better understand and implement IT options
- Reduced costs and/or improved broadband speed for clusters of SMEs
- More effective use of teleworking such that it improves staff retention and performance
- Recession-proof the companies

Strategies that could achieve these outcomes are:

- **Direct personal approaches** such as through the business advisors or existing clients of Grow Wellington
- **Train advisors** in the IT options to be considered. Advisors include business advisors at Grow Wellington, New Zealand Trade and Industry, BizInfo and private providers
- **Presentations** on the IT options at existing functions such as Rotary, Institute of Management and Wellington Chamber of Commerce. There is also the possibility of working as a guest speaker for educational programmes such as the MBA, Bachelor of Commerce and Institute of Management programmes
- Provide **seminars, workshops and demonstrations** through Grow Wellington's seminar series. These can also link with Industry Association conferences and events. Or it could be organised through the clusters. The seminars can look at broadband enhanced IT options. One seminar may focus on effectively running a business from home, as 34 - 38% of Wellington businesses are run from homes.
- A dedicated **website** aimed at raising awareness of the options would have links, demonstrations, wiki and the ability to log into some web 2.0 applications experiment with how they work. (Dr Peter Metham's second semester class at Victoria University builds these kinds of websites at no cost for "clients")

- A **brochure** would accompany the website to provide information on what is possible and how to access it.

- **Strategic alliances** can be formed with organisations with some shared aims such as:
    - Telecommunication companies
    - Gen-i
    - Equipment sellers
    - Software system sellers
    - Chamber of Commerce
    - BizInfo
    - Grow Wellington
    - Industry Associations
    - Te Papa
    - City to Sea Museum
    - Universities and polytechnics, especially providing action learning programmes that link town and gown
    - Schools, especially the loop schools. This includes action learning programmes with business and the tech angels programme.
    - WEA

- **Funding sources** such as the Tertiary Education Commission's Encouraging and Supporting Innovation Fund may be useful sources of funds for IT based activities and to support town and gown links

- A **teleworking campaign**, similar to the one operating in the UK can have the benefits of increasing productivity and reducing staff turnover, while providing social and environmental benefits to the region.

- **Demand aggregation** can be encouraged with clusters of businesses to push for better connectivity and reduced prices from telcos. Possible clusters include the Kapiti creative industry sector, Gracefield, Petone industrial sector, the Jackson St Programme, Porirua industrial sector, and Whakatiki St in Upper Hutt.

4.2 Loop schools

As a result of doing this report several of the suggestions have been implemented in partnership with students at Victoria University. Underway are:

- **The Global Enterprise Experience for schools**

- **Thin clients in city housing with IT training**

- An invitation from Wellington East Girls' College to launch the **Sanitation Uganda** project

- **Media accuracy** league table

- Providing **IT assistance to businesses** through the Virtues Project, Sustainable Living Project, Transition Towns Project, and Manuka Carbon Footprint Project

4.3 E-governance for councils

The Wellington City Council have rolled out or are in the process of rolling out several e-governance projects:

- E-petitions

- Online submissions for the standard "public participation" slot at a committee of council meeting

- E-panels which are resident groups who are consulted on relevant council issues

- E-service for Solicitors Statement of Account

- E-service for Request for LIMs online with online payment

- E-service for online payment and download of Property Reports

- E-service for online payment and download of Building Information Report

- E-service for online booking and payment of Learn to Swim programmes

Consideration is being given to a region wide solution using the web for applications for working in the road.

The business case needs to be developed for an ongoing process of e-governance applications. Smaller councils, especially those that service rural areas, need to consider GoForms as a low cost process of using internet access to submit applications.

A regional group of IT staff to share experiences and learning about e-governance would be beneficial.

Appendix 1 - Home page items on www.direct.gov.uk

Appendix 2 - Unit and Assessment Standards for Project Based Learning

Listed below are a range of unit and assessment standards that are being offered in schools which could be snagged for performance in projects like some of the projects listed in section 3.5. This particular set of standards was for the Sanitation Uganda project described in 3.5.17 as an example of what is possible. The principle of linking assessment to projects as opposed to linking them to subjects taught in silos can be widely applied.

Unit Standards

Business Information Processing
Level 2

| 107 | 5 Credits | Apply language and text processing skills to produce communications |
| 111 | 5 Credits | Use a word processor to produce documents |

Level 3

| 108 | 5 Credits | Apply language and text processing skills to produce business documents |
| 112 | 5 Credits | Produce information using word processing functions |

Text and Information Management - Generic
Level 1

| 12883 | 3 Credits | Enter and manage text for generic text and information management |

Level 2

| 12884 | 3 Credits | Create documents and manage files for generic text and information management |
| 12885 | 6 Credits | Create and enhance documents combining text and images for generic text and information management |

Level 3

| 12886 | 6 Credits | Customise software features to manipulate text for generic text and information management |
| 12887 | 6 Credits | Integrate text and images and refine file management for generic text and information management |

Level 4

| 6406 | 5 Credits | Establish and maintain quality customer relations for a small business enterprise |

Business Studies
Level 1

| 22845 | 1 Credits | Demonstrate knowledge of stakeholders in a business organisation |

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22847	2 Credits	Demonstrate knowledge of enterprising behaviour, innovation, and entrepreneurship in business contexts	
22848	1 Credits	Plan for a one-off business activity	
22849	2 Credits	Carry out a planned one-off business activity	

Level 2

22854	2 Credits	Apply innovative thinking techniques within a business context	
22855	3 Credits	Plan for an ongoing business activity	
22856	5 Credits	Carry out a planned ongoing business activity	

Level 3

22862	4 Credits	Plan for an ongoing complex business activity	
22863	8 Credits	Carry out a planned ongoing complex business activity	

People Development and Coordination

Level 3

24873	3 Credits	Demonstrate knowledge of teamwork and its importance within a workplace	
24874	8 Credits	Demonstrate knowledge of performance management, motivation theory and performance review in a workplace	
24875	6 Credits	Describe and review team building and team leadership in a specified workplace	

Level 4

15189	4 Credits	Implement a health and safety plan for a workplace	

Work and Study Skills

Level 2

7121	2 Credits	Demonstrate information search, access, and selection skills	
7122	3 Credits	Organise, store, and retrieve information and documents for own use	

Self Management

Level 2

7123	2 Credits	Demonstrate knowledge of problem solving and apply a problem solving technique to a problem	

Generic Design

Level 1

7485	3 Credits	Interpret a design brief, and select and present information for solutions	
7486	3 Credits	Create and explore visual design elements	

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| 7487 | 3 Credits | Use the design process to solve design problems | | |
| 7488 | 3 Credits | Present design material | | |

Level 2

7489	4 Credits	Identify design problems and carry out investigation		
7490	4 Credits	Apply visual design elements to solve design problems		
7491	3 Credits	Develop and refine design solutions		
7492	3 Credits	Present design work		

Level 3

7493	4 Credits	Develop a design specification, and produce and implement an investigation plan		
7494	4 Credits	Investigate and apply design principles and elements		
7495	4 Credits	Apply design development and evaluation techniques		
7496	4 Credits	Prepare, plan, and present design project work		

Level 4

15726	10 Credits	Gather and interpret research information on a design project brief		
15730	15 Credits	Produce conceptual design ideas		
15731	8 Credits	Select materials and processes for design projects		
16534	4 Credits	Coordinate design project procurement options and make recommendations		
16535	5 Credits	Coordinate contracts and monitor work in progress for design implementation		
16537	5 Credits	Coordinate specialist consultants and suppliers for a design project, under supervision		
2100	8 Credits	Obtain client approval for design solutions		

Engineering

Level 4

11414	6 Credits	Prepare working drawings for an engineering project		
11415	3 Credits	Demonstrate knowledge of force systems		
11416	5 Credits	Analyse fluid system and components in terms of fluid mechanics principles		
12635	2 Credits	Identify ethical engineering practice in the workplace		
12811	6 Credits	Test materials used in simple and/or small scale civil engineering projects		

Engineering Drawing and Design

Level 1

| 4434 | 1 Credits | Demonstrate knowledge of basic geometric form in engineering | | |

Level 2

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2430	4 Credits	Draw and interpret engineering sketches under supervision
2431	8 Credits	Draw and interpret engineering drawings under supervision
2432	3 Credits	Construct engineering plane geometric shapes under supervision
2433	6 Credits	Create simple engineering drawings using computer aided design (CAD) software

Level 3

20802	5 Credits	Produce detailed two-dimensional engineering drawings using CAD software under supervision
21910	5 Credits	Interpret mechanical engineering drawings
2434	15 Credits	Manually produce detailed engineering drawings under supervision
2435	10 Credits	Apply productivity concepts to two dimensional computer aided design engineering drawing (this unit standard has expired and is no longer available)
2436	5 Credits	Create three-dimensional engineering models under supervision

Applied Principles of Mechanical Engineering

Level 2

| 14866 | 12 Credits | Demonstrate workshop skills for mechanical engineering |

Level 3

| 21775 | 15 Credits | Demonstrate knowledge of mathematical principles for mechanical engineering |

Engineering Fabrication

Level 2

16954	4 Credits	Calculate lengths, areas and mass of engineering fabrication materials
2414	15 Credits	Lay out and mark off regular fabrication shapes under supervision
2415	10 Credits	Form and shape fabrication materials under supervision (this unit standard is expiring and no longer available)
2416	10 Credits	Assemble and mechanically join plate and sheet under supervision
2417	8 Credits	Mechanically cut fabrication materials under supervision
25075	12 Credits	Perform basic fabrication operations under supervision

Level 3

16955	4 Credits	Calculate sizes, mass, volumes, and quantities for engineering fabrication
2418	15 Credits	Lay out and mark off irregular fabrication shapes under supervision
2419	15 Credits	Form and shape sheet, plate, pipe and structural sections using power machines under supervision
2420	15 Credits	Assemble and mechanically join tube, pipe and sections under supervision
2421	10 Credits	Mechanically cut fabrication materials using powered machinery under supervision

Materials Technology

Level 3

7529	5 Credits	Test and select materials for a design task

Process Technology

Level 1

7535	3 Credits	Create and carry out a project plan in process technology
7536	3 Credits	Develop sequence of operations for one-off construction in process technology

Level 2

7537	3 Credits	Use information technology to obtain and present information for a project in process technology
7538	3 Credits	Develop, and apply time management and project organisation to, a design brief in process technology
7539	3 Credits	Produce project presentation using computers and reprographics in process technology
7540	3 Credits	Identify and obtain materials for manufacturing, and develop a sequence for manufacturing

Level 3

7532	5 Credits	Design, set up, and complete a short run production project in process technology
7541	4 Credits	Research design problems and present conclusions in process technology
7542	4 Credits	Create a manufacturing system for short run production in process technology

Level 4

7544	5 Credits	Apply project management planning practices in process technology

Technology – General Education

Level 1

13389	10 Credits	Develop technological solutions by using knowledge of technological practice
13392	6 Credits	Employ biological agents to develop a biotechnological product
13397	6 Credits	Employ food technology practices to produce a technological solution
13400	6 Credits	Employ information or communication technologies to produce a technological solution
13403	6 Credits	Use materials to produce a prototype of a technological solution
13406	6 Credits	Design and construct a prototype to solve a mechanism design problem
13409	6 Credits	Design, model, and test a one-off production process to solve a design problem
13411	6 Credits	Construct a prototype of a structure capable of bearing a point load
14375	6 Credits	Incorporate a control system into a prototype of a technological solution

Level 2

13390	10 Credits	Develop technological solutions by using knowledge and analysis of technological practice
13393	6 Credits	Use biological agents to develop a biotechnological system or environment
13395	6 Credits	Design and incorporate a control system into a prototype of a technological solution
13398	6 Credits	Use food technology to modify an existing food product to produce a technological solution
13401	6 Credits	Employ distance information and communication technologies to produce a technological solution
13404	6 Credits	Modify materials to produce a prototype of a technological solution
13407	6 Credits	Use a mechanism in a prototype of a technological solution to meet specified requirements
13410	6 Credits	Design and model a mass production process
13412	6 Credits	Use engineering practices to construct a prototype of a structure capable of bearing a point load

Level 3

13391	12 Credits	Evaluate technological practice and develop and evaluate technological solutions
13394	6 Credits	Use biotechnological process to develop and evaluate a product, system, or environment
13396	6 Credits	Customise and integrate a control system into a prototype of a technological solution
13399	6 Credits	Employ food technology practices to formulate a food product to produce a technological solution
13402	6 Credits	Develop an information and communication technology product, system, and/or environment
13405	6 Credits	Construct a prototype of a technological solution using a composite material
13408	6 Credits	Incorporate functionally dependent mechanisms into a prototype of a technological solution
13413	6 Credits	Construct a prototype of a structure capable of bearing uniformly distributed loads
14374	6 Credits	Design and model a complex production system

Telecommunications – Management and Support

Level 3

4966	6 Credits	Seek, evaluate, and organise telecommunications information for action
4968	4 Credits	Establish and maintain effective working relationships for telecommunications operations

Wastewater Treatment

Level 3

17881	5 Credits	Demonstrate knowledge of primary processes in wastewater treatment
17885	7 Credits	Demonstrate knowledge of oxidation ponds in wastewater treatment processes
17886	7 Credits	Demonstrate knowledge of fixed growth reactor processes in wastewater treatment
17887	7 Credits	Demonstrate knowledge of tertiary processes in wastewater treatment
24928	2 Credits	Demonstrate knowledge of preliminary processes in wastewater treatment

Water - Generic

Level 2

17870 2 Credits Carry out safe practices when working in water and wastewater treatment plants

19200 3 Credits Demonstrate knowledge of, and apply, mathematics in the water industry

Level 3

17871 3 Credits Describe safe practices when working with hazards in water and wastewater treatment plants

17873 5 Credits Demonstrate knowledge of process control and monitoring in water and wastewater treatment plants (this unit standard is expiring and no longer available)

17874 6 Credits Demonstrate knowledge of basic science theory relating to water

17876 5 Credits Demonstrate knowledge of water and wastewater treatment plants process management systems (this unit standard is expiring and no longer available)

19205 2 Credits Demonstrate knowledge of pathogens, diseases, and their control in the water industry

Interpersonal Communications

Level 1

1285   4 Credits   Make inquiries and complete practical transactions

3501   4 Credits   Apply listening techniques

3503   2 Credits   Participate in a team or group to complete routine tasks

9707   5 Credits   Demonstrate knowledge of workplace communications requirements

Level 2

10791   3 Credits   Participate in informal meetings

1277   3 Credits   Communicate information in a specified workplace

1299   4 Credits   Be assertive in a range of specified situations

1304   2 Credits   Communicate with people from other cultures

24878   3 Credits   Describe preparation for and contribution to structured meetings in a workplace

9677   3 Credits   Participate in a group/team which has an objective(s)

9680   2 Credits   Communicate within an organisational context

Level 3

11097   3 Credits   Listen to gain information in an interactive situation

1307   3 Credits   Speak to a specified audience in a predictable situation

1312   3 Credits   Give oral instructions in the workplace

9681   3 Credits   Contribute within a group/team which has an objective(s)

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| 9694 | 5 Credits | Demonstrate and apply knowledge of communication process theory |
| 9705 | 3 Credits | Give and respond to feedback on performance |

Level 4

11099	4 Credits	Develop strategies for communicating in a culturally diverse workplace
11101	4 Credits	Collaborate within a group/team which has an objective(s)
1311	4 Credits	Present and defend an argument orally
21335	5 Credits	Lead a group/team to achieve an objective(s)
9679	4 Credits	Participate in a formal meeting
9695	3 Credits	Examine a problem-solving model and associated techniques
9696	4 Credits	Apply problem-solving techniques
9704	6 Credits	Manage interpersonal conflict
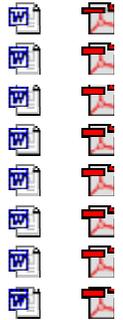
Introductory Communication Skills

Level 1

1273	4 Credits	Express own ideas in writing
1284	20 Credits	Complete practical transactions not requiring negotiation
1291	20 Credits	Participate in conversations with known people
2970	18 Credits	Read independently texts about life experiences
2976	20 Credits	Read independently texts for practical purposes
2987	20 Credits	Read independently texts to gain knowledge
2993	20 Credits	Read independently texts which debate issues
3485	12 Credits	Write presenting information
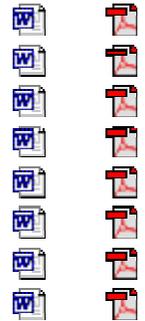
Writing

Level 2

1280	2 Credits	Communicate with graphics
3488	6 Credits	Write business letters and memoranda
3492	3 Credits	Write a short report

Level 3

11095	3 Credits	Write business correspondence to convey complex ideas and information
1279	3 Credits	Write in plain English
3491	4 Credits	Write a report

Level 4

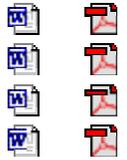| 12336 | 4 Credits | Write a manual or technical text |
16612	4 Credits	Use effective business writing skills in a business organisation
19629	4 Credits	Present a reasoned argument in a report
9701	3 Credits	Write proposals

English Written Language
Level 1

12411	3 Credits	Explore language and think critically about transactional written text
8808	3 Credits	Read an inclusive range of written texts and record the reading experience
8811	3 Credits	Collect information using a range of oral, written, and visual sources and methods
8812	4 Credits	Produce transactional written text in simple forms
8814	2 Credits	Write regular responses to texts and reflections on personal learning
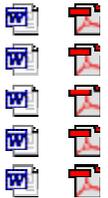
Level 2

12420	4 Credits	Read transactional written text closely
12905	4 Credits	Read an inclusive variety of written texts and record the reading experience
8823	4 Credits	Investigate a theme across an inclusive range of selected texts
8825	5 Credits	Produce transactional written text in complex forms

Level 3

12428	4 Credits	Read closely and evaluate the effectiveness of transactional written texts
8834	6 Credits	Investigate a theme across a range of selected texts and evaluate the outcomes of the investigation
8835	6 Credits	Produce sustained transactional writing in a range of complex forms

Construction Technology
Level 4

9658	10 Credits	Demonstrate knowledge of cost estimation processes for a building project
9666	5 Credits	Contribute to the design process
9669	10 Credits	Apply principles from published data to evaluate and select materials and finishes for buildings

Environmental Education
Level 2

| 18663 | 4 Credits | Demonstrate knowledge of and apply sustainable environmental management practices in the workplace |

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Family, Community and Society Studies

Level 2

6663	4 Credits	Complete a study of societal influences on housing	W	PDF
6664	6 Credits	Design and make an item for a living environment	W	PDF

Level 3

16833	5 Credits	Determine changes to a living environment in response to people's changing needs	W	PDF
6667	5 Credits	Investigate the influence of a nominated factor on family and society over a time period	W	PDF
6668	5 Credits	Investigate the influence of a nominated factor on a living environment	W	PDF

Maths – Measurement

Level 1

20662	2 Credits	Make estimates of measurements with common units	W	PDF
5228	3 Credits	Take measurements and use calculations to solve measurement problems	W	PDF
5241	3 Credits	Use strategies to solve measurement problems	W	PDF
8492	3 Credits	Use standard units of measurement	W	PDF

Maths – Geometry

Level 1

5229	2 Credits	Use geometry to describe situations and solve problems	W	PDF
5231	2 Credits	Use constructions and make drawings for geometrical situations	W	PDF

Mathematical Processes

Level 1

5233	7 Credits	Use mathematical processes and skills in a variety of contexts	W	PDF

Level 2

5243	7 Credits	Apply mathematical processes and skills in problems	W	PDF

Level 3

5254	7 Credits	Link mathematical processes and skills in problems	W	PDF

Mathematical Studies

Level 1

| 12321 | 2 Credits | Describe mathematical algorithms and use them to solve problems |
| 12322 | 2 Credits | Use mathematics in the design of a given object or process |

Level 2

| 12323 | 3 Credits | Apply mathematics in the design of an object or process for a given purpose |

Level 3

| 12324 | 3 Credits | Apply and report on mathematical techniques necessary to design a system to meet given constraints |

Science – core

Level 2

| 6352 | 4 Credits | Report on an issue affecting the environment from a scientific perspective, with supervision |

Level 3

| 21613 | 4 Credits | Research and report on a scientific sustainability issue, with guidance |
| 6355 | 4 Credits | Research and report on a current environmental issue from a scientific perspective, with guidance |

Biology

Level 1

18969	2 Credits	Demonstrate knowledge of the characteristics of living things, organs and organ systems
18970	2 Credits	Demonstrate knowledge of adaptations and relationships in a biological community
6294	4 Credits	Compare the diversity and organisation of different biological communities
6298	5 Credits	Describe interactions between humans and microorganisms

Level 2

| 6310 | 3 Credits | Investigate an example of applied biology |

Composting

Level 2

23290	1 Credits	Identify organic materials suitable for bio-energy feedstock
23291	3 Credits	Describe composting worms and the environment required for vermicomposting for resource recovery
23292	5 Credits	Describe and evaluate homemade and commercial vermicomposting units for domestic composting
23293	1 Credits	Describe the processes of sourcing, preparing, and adding feedstock for vermicomposting for resource recovery
23299	3 Credits	Describe and locate raw materials, plant, and equipment, and the handling of raw materials at a composting facility
23304	8 Credits	Receive raw materials from customers, and assess, sort, and stockpile for composting

Level 3

23294	5 Credits	Establish vermicomposting units for resource recovery activity and maintain the environment and microbiology	
23295	4 Credits	Explain and conduct the separation of vermicompost from worms, and package worms for transportation	
23296	2 Credits	Explain the issues related to vermicomposting and their effects on the worms and the vermicomposting unit	
23298	4 Credits	Identify, describe, and observe health and safety practices at a composting facility	
23300	3 Credits	Prepare for and conduct sampling for on-site testing and commercial laboratory analysis for a composting facility	
23301	3 Credits	Set up and operate water delivery systems at a composting facility	
23302	6 Credits	Dispatch compost products and complete documentation at a composting facility	
23314	10 Credits	Prepare value-added products at a composting facility	
23317	6 Credits	Amend and prepare biosolids and sludges for treatment and use in composting	

Level 4

23316	10 Credits	Source, assess, and classify raw materials for composting	
23318	5 Credits	Describe the properties and applications of compost products, and production issues at a composting facility	
23652	3 Credits	Prepare for and conduct on-site testing at a composting facility	

Resource Recovery Theory

Level 2

| 22631 | 5 Credits | Demonstrate basic knowledge of classifications for recoverable resources and residual waste | |
| 22632 | 9 Credits | Outline recovery options for recoverable resources | |

Level 3

22633	2 Credits	Explain responsibilities for resource recovery	
22634	5 Credits	Explain principles of organic resource recovery and recycling	
22635	4 Credits	Explain the content of an environmental management plan for a resource recovery site	
22636	6 Credits	Relate the principles of environmental sustainability to resource recovery	
22637	8 Credits	Demonstrate knowledge of hygiene and health for working in a resource recovery or solid waste context	

Media Studies

Level 2

| 7470 | 4 Credits | Investigate print conventions by producing a print publication | |

Assessment Standards

Education for Sustainability Matrix

Level 2
AS90810　　　　2.1 Plan, implement and evaluate a personal action that will contribute towards a sustainable future 6 credits　　　　Internal
AS90811　　　　2.2 Describe the consequences of human activity within a biophysical environment in relation to a sustainable future 4 credits　　　　Internal
AS90812　　　　2.3 Describe world views, their expression through practices and activities and the consequences for a sustainable future 4 credits　　　　External
AS90813　　　　2.4 Describe values and associated behaviours in relation to a sustainable future 3 credits　　　　Internal
AS90814　　　　2.5 Describe aspects of sustainability in relation to a sustainable future 4 credits　　　　External
AS90815　　　　2.6 Work cooperatively to develop and present a strategy or design for sustainability in response to a future scenario 3 credits　　　　Internal

Information Management Matrix

	AS90030　1.1	AS90031　1.2	AS90032　1.3	AS90033　1.4	AS90034　1.5	AS90035　1.6	AS90036　1.7
Level One	Enter text from provided material and by direct entry composition 2 credits Internal	Use standard operating and file management procedures 2 credits Internal	Access and process information from different sources 4 credits Internal	Apply a decision-making model to produce a solution from a given brief 4 credits Internal	Communicate information from provided materials and by direct composition 4 credits External	Manage information using a spreadsheet and a text application 4 credits External	Apply design principles to produce documents 4 credits External

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Technology Matrix

Level 1	AS90045 1.1 Develop an outcome through technological practice to address a given brief 6 credits Internal	AS90046 1.2 Formulate a brief to address a given issue 6 credits Internal	AS90047 1.3 Develop an outcome by widening the use of an existing technology 6 credits Internal	AS90048 1.4 Develop a means for ongoing production of an outcome developed through technological practice. 6 credits Internal	AS90049 1.5 Demonstrate understanding of technological knowledge 4 credits External	AS90050 1.6 Present an outcome developed through technological practice that addresses the requirements of a brief 4 credits Internal	AS90051 1.7 Describe the interactions between a technological innovation and society 4 credits External
Level 2	AS90339 2.1 AS90342 AS90340 AS90343 AS90341 AS90344 Develop and model a conceptual design in (biotechnology, electronics and control technology, food technology, information and communication technology, materials technology, structures and mechanisms). 6 credits Internal	AS90346 2.2 AS90349 AS90347 AS90350 AS90348 AS90351 Develop and implement a one-off solution in (biotechnology, electronics and control technology, food technology, information and communication technology, materials technology, structures and mechanisms). 6 credits Internal	AS90352 2.3 Develop a means for multi-unit production of a technological outcome. 6 credits Internal	AS90773 2.4 Examine how technological practice is influenced by responsibilities to the wider community. 4 credits External	AS90360 2.5 Inform own technological practice through the characterisation of an existing production process. 4 credits External	AS90361 2.6 AS90363 AS90371 AS90365 AS90373 AS90367 Learning area specific standard. 4 credits External	AS90362 2.7 AS90364 AS90372 AS90366 AS90368 Learning area specific standard. 4 credits Internal

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	AS90613 3.1	AS90620 3.2	AS90792 3.3	AS90676 3.4	AS90677 3.5	AS90678 3.6 AS90684 AS90680 AS90686 AS90682 AS90688	AS90679 3.7 AS90683 AS90685 AS90681 AS90687
	Develop a conceptual design to address a client issue.	Develop a one-off solution to address a client issue.	Develop a proposal for a production process for a client.	Describe technologists' responsibilities to the wider community.	Analyse an existing multi-unit production process.	Explain knowledge that underpins a (biotechnology, electronics and control technology, food technology, information and communication technology, materials technology) outcome.	Demonstrate techniques in (biotechnology, electronics and control technology, food technology, information and communication technology, materials technology).
Level 3	8 credits Internal	8 credits Internal	6 credits Internal	4 credits External	4 credits External	4 credits External	4 credits Internal

Learning Area Specific Sections of the Levels 2 and 3 Technology Matrix

Biotechnology	AS90361 Examine technological knowledge in biotechnology practice

4 credits External | AS90362 Demonstrate skills in biotechnology

4 credits Internal | AS90678 **3.6** Explain knowledge that underpins a biotechnology outcome.

4 credits External | AS90679 **3.7** Demonstrate techniques in biotechnology

4 credits Internal |
| **Information and Communication Technology** | AS90367 Examine technological knowledge in information and communication technology practice

4 credits External | AS90368 Demonstrate skills in information and communication technology

4 credits Internal | AS90684 **3.6** Explain knowledge that underpins an information and communication technology outcome.

4 credits External | AS90685 **3.7** Demonstrate techniques in information and communication technology

4 credits Internal |

| **Structures and Mechanisms** | AS90373
Examine technological knowledge in structures and mechanisms practice

4 credits
External | | AS90688 **3.6**
Explain knowledge that underpins a structures and /or mechanisms technology outcome.
4 credits
External | |