

# Connected Education: The Case of the Wellington Loop

Allan Sylvester  
Beverley Hope  
School of Information Systems  
Victoria University of Wellington, New Zealand

Allan.Sylvester@vuw.ac.nz  
Beverley.Hope@vuw.ac.nz

## Abstract

The Wellington Loop Trust was formed in 2007 by six inner city secondary schools in Wellington to set up a pilot project to provide high speed uncapped internet access and shared applications for its members. The intent was to allow participating schools to exploit new technology in their teaching practices, particularly the use of resource intensive applications such as streaming video and audio, video conferencing and Web 2.0 tools. They also sought access to the wider educational resources available on advanced networks through a connection with KAREN (Kiwi Advanced Research and Education Network) and the ability to collaborate with other teachers to enhance the learning experiences for their students and embrace a generational shift in information communication and technology (ICT) enabled teaching and learning practice. The schools also needed foundational applications such as identity management, web content management, email, web filtering, learning management, and library catalogues – all potentially expensive and complex projects. An objective of the Loop was to reduce overall costs to schools and build shared capability by providing common tools, hosted and supported centrally. This paper provides a background to this initiative and examines some of the issues arising in the implementation and execution of it as perceived by providers and participants.

## Keywords

teaching and learning, collaboration technology, connected education

## INTRODUCTION

In 1984, Apple computers provided every high school in New Zealand with one Apple IIe computer. One of the authors was teaching accounting at a Hamilton high school at that time and was selected to attend a one week training course on “how to use the computer” at Waikato Institute of Technology (Wintec). The rationale? “Well, they use computers in accounting don’t they?” All attendees were required to bring with them their school’s computer; Wintec did not then have computer labs! The following year, the high school developed a computer lab to hold 20+ Apple IIe computers. Very few high schools had the financial resources or parental support to achieve this so soon.

Fast-forward 25 years. New Zealand high schools have information and communication technology (ICT) labs and many are developing ICT-rich, flexible learning spaces with modern equipment and employ increasingly IT-literate staff who are confident to adapt and revise pedagogy to align with the needs of today’s learners. However, the lack of high speed Internet connections inhibits full and effective use of ICT in many schools. Staff reluctance may also contribute to under-use of ICT. This reluctance may arise from factors such as self-perceptions of inadequacy in ICT use, the need to book special rooms and resources in a busy timetable, and the need to prepare new materials for lab work. In an already busy schedule, this may seem like “just more work!” To enable and encourage use, teachers need support: support in learning design, in running classes (at least initially), and in locating appropriate technologies with links to the curriculum.

Meanwhile, the Web 2.0 savvy digital natives they teach are clamouring for their favoured mode of information seeking and learning to compile presentations and projects, and the digital immigrants are missing opportunities to learn the skills that they will likely need in their future work and leisure planning. Yes, there are digital immigrants among our primary and secondary school populations – those who do not have access to online resources at home due, perhaps, to lack of finance, parental lack of perceived need for ICT, lack of Internet connectivity, and even lack of electricity (as recounted by a school principal in 2009!). However, connected education technology can overcome the barriers and create benefits if three conditions are met:

1. The ICT-based exercise is able to be setup and usable within the first three to five minutes of a typical 50 minute class;
2. The teacher has the requisite training or access to technical support to can recover from a technology failure with grace, and
3. The use of the technology is appropriately linked to the curriculum goals of the class.

National, regional, and local networks are designed to assist by providing resources to meet these conditions and to enable connected education through increasing access and resource sharing among educators and across institutions. Pedagogy in this environment is about empowered students and teachers through extended richness and reach. Connected education is about a classroom where the expertise no longer resides with the adult at the front of the room or in the bottled wisdom of a dog-eared textbook. Students are empowered by ubiquitous knowledge from diverse sources, some of questionable quality which the student must evaluate. This is the climate in which digital natives are living. In this environment the role of the teacher as ‘learning leader’ has never been more critical – the teacher is coach, guide and mentor assisting their students to build critical information and media literacy skills alongside traditional literacy’s in a co-constructivist paradigm (Wesch). With support from Government, New Zealand educational institutions are moving toward connected education.

### **THE EMERGENCE OF CONNECTED EDUCATION IN NEW ZEALAND**

Until recently (the last 5-6 years) education connectivity had been provided largely by traditional telecommunications companies in the form of ADSL-based services such as Telecom New Zealand’s school-zone product. This is little more than a rebadged, domestic-grade, low bandwidth, asymmetrical Internet provision predicated on the assumption that users consume more content than they create. Schools, however, need to create and share content online with significant simultaneous connections. The one-size-fits-all model quickly caused schools to become dissatisfied with the constraints of low performance coupled with high prices. The Nelson Fibre Loop and the North Shore Education Access Loop (NEAL) pioneered open access fibre optic networks in response to these frustrations. These two initial initiatives were sponsored by government development funds and built by local power companies.

Following from those pioneering efforts, the Wellington Loop was established. It differed from earlier efforts in that Wellington already had a long established open access urban fibre initiative (CityLink). Initial build costs were substantially lower than might have been expected without Citylink as a foundation sponsor and partner. Open access networks separate service provision from connectivity and introduce choice and competition while bringing with them substantial increases in performance and variety in service offerings. Central government (Digital Strategy) and Ministry of Education funding supported the continuation of the project.

Building on the compelling cases of the regional loops, the National Education Network (NEN) emerged as a visionary ultra-fast broadband (UFB) to fulfil a perceived need. UFB is generally accepted as 1Gb/s or greater. The Minister of Education (Anne Tolley) announced in 2010 that the NEN aspires to connect ninety seven percent of New Zealand’s 2500 schools by 2016. Currently, the NEN is in an extended trial phase, extending its reach from the initial proof of concept trial with 23 schools to an operational trial of up to 200 schools.

The NEN is built on top of New Zealand's national research and education network (NREN) known as KAREN (Kiwi Advanced Research and Education Network). KAREN is a high speed network whose members include universities, technical institutes and crown owned research facilities. It has been developed over the past six years and has now brought its experience and knowledge of the education infrastructure for tertiary institutions to the schools setting. The injection of expertise from KAREN reduces the conceptual, pilot phases of NEN from the five years that typifies initiatives of this type to just a few years.

Without regional or national aggregation networks the ISP market can only provide "domestic" or "business" Internet service products to schools. Neither of these are suitable for the complex school setting. By aggregating demand, schools can use their increased buying power to achieve features such as uncapped data volumes (rate limited service) and use a shared demand model that can support ISP business models. This effectively causes the education environment to become an attractive customer for upper tier ISP's making the economics more favourable when compared to 2500 individual contracts.

A regional, and by extension national, network creates new challenges for educators and planners by highlighting the need to address items such as federated identity and access management where students and teachers can gain ready access resources beyond their traditional school boundaries using federated technology – something that has been growing in the tertiary education sector for some time. Done well, learning and administrative resources that were previously too hard to access become 'within reach'. The Wellington Loop Trust sought to take advantage of this reach.

### **THE WELLINGTON LOOP**

The Wellington Loop Trust (the Loop) was formed in 2007 by six Wellington inner city secondary schools. The objective was to set up a pilot project to provide high speed uncapped Internet access and shared applications for its member schools. The six schools (Wellington College, Wellington Girls College, St Mary's College, Wellington East Girls College, Wellington High School and The Correspondence School) were all close to an existing urban fibre loop network provided by CityLink. City Link had begun as a city council initiative and subsequently became an innovative, community-minded company that advanced city-wide broadband communication. It offers open access to fast, reliable services to a community of service providers and users.

The Loop was initially funded by a grant from the 'Digital Strategy 2005 Community Partnerships Fund' and by an 18 month sponsorship from CityLink to provision an urban fibre loop network on their existing fibre infrastructure. The grant was matched by the donation of 'in-kind' resources from the participating schools for the start-up period. More recently, a further grant aimed at up-skilling teachers and school technologist has been secured.

The key components offered to schools by the Loop are:

1. Access to the Wellington Loop's fibre via Citylink's managed layer 2 fibre infrastructure. Each school pays Citylink directly to connect to the fibre. For the initial set up period, access is provided by Citylink free of charge. At the end of the start-up period Citylink is expected to charge their normal rate for the access,
2. Access to the private Loop server infrastructure which provides connectivity for the schools, servers and storage for using the Loop's private applications, access to the commodity internet (aka the World Wide Web), and access to KAREN.

The Wellington Loop Trust deed (Chapman Tripp, 2007) defines one of the purposes of the Loop as "establishing, maintaining and promoting a high speed fibre optic learning network" (emphasis added). With this definition, there is an assumption that the private loop infrastructure is one product made up of all the identified components. By restricting access to the Loop to schools with access to fibre (and therefore a minimum of 100mb/s speed), the Loop is establishing an entry criteria that must be met by all potential participants.

The participating schools sought high speed access to the Internet to enable them to exploit new technology in their teaching practices, particularly the use of resource intensive applications such as streaming video and audio, video conferencing and Web 2.0 tools. They understood that the Loop would provide them with access to the educational resources available on advanced networks through a connection with KAREN, for example, video and voice conferencing, learning management software, web content management software, a video repository, and an e-portfolio tool which allows students to store and access their digital artefacts. It would also allow the participating schools to collaborate with teachers in other schools to enhance the learning experiences for their students.

Further, most schools needed applications such as identity management, web content management, email, web filtering, learning management, and library catalogs. Joining the initiative was expected to reduce overall costs through use of centrally located common tools. Although members had to pay a one-off access fee to connect to City link, they expected their participation in the Loop during the trial would cost no more for Internet access and common school applications than their previous arrangements, and if the pilot was successful they would benefit from future economies of scale obtained by sharing the fixed costs. At the end of the sponsorship period, the Loop would have to pay for its use of CityLink's fibre.

A goal of the initial participants was to establish a set of applications to demonstrate benefits to other potential members, thereby gaining their participation and further benefitting from economies of scale. Each school which joined the Loop would have to pay to connect to the physical network and pay a membership fee to cover the services used. There were interested schools in the wider Wellington area, but distance from the CityLink network fibre would make connection exceptionally high.

The Loop now runs as a not-for-profit organization which generates revenue to cover the costs of maintaining and supporting the infrastructure required to host the shared applications, network access, license and support costs for the application software, user training, and service enhancements. The Loop members believe that six schools will not provide sufficient scale to meet these costs without imposing a great financial burden on them and is, therefore, interested in attracting other secondary and primary schools. However, primary schools are not well funded and many will not be able to meet the same level of costs that high schools can sustain. Recently additional schools have joined, including one primary school and two private schools, including one which uses a proprietary microwave link to overcome fibre-reach constraints.

Goals sought by the initial participating schools included:

- Collaboration within the user group using video conferencing, email, and shared digital resources,
- Access to resources from participating schools and other sources via KAREN,
- Dedicated time for selected teachers to build guides for teaching materials to be made available through the network for use by other teachers

Shared access to teaching materials prepared by all contributors, similar to the US K20 initiative which makes available applications such as SeaMaven, a web-based application designed to enable science students to engage in collaborative learning through real-time observational network of oceanographic sensors. (<http://k20.internet2.edu/projects/58>)

Each of the schools within the Loop has the ability to set up an independent infrastructure for their own use to provide their students and teachers with access to the Internet. Some of the schools have already invested in making this available and connected to Citylink for access to the Internet. The initial member schools identified network effects in participating in the Loop in two distinct areas:

- The schools view the collaboration opportunities as becoming increasingly valuable to each school as the number of other schools they can collaborate with increases, and

- The infrastructure and access costs of the Loop are largely fixed so that with more schools participating in the Loop, economies of scale will mean that each school pays less for their access.

The Wellington Loop can be described as an information intermediary or “infomediary.” Using the criteria for an infomediary outlined by Bhargava & Choudhary (2004), the Loop is:

- Aggregating buyer demand and seller products by providing a standard set of products and tools for all participating schools to access.
- Providing trust between participants – schools are very concerned about the safety of their students and this extends to their access to the Internet. The Loop provides filtering of content available via the commodity internet and KAREN also filters content available through its advanced network. These provisions allow the schools to trust that their students will not be exposed to any inappropriate content.
- Facilitating market transactions – in the Loop the market transactions are the ability to use the tools provided to create, access and share content. The infrastructure provided by the Loop ensures that all users use common tools and this removes any barriers to collaboration.

The platform provided by the loop can be defined to include the Citylink fibre however it is technically possible for potential participants to use a different provider to connect to the shared infrastructure; in this situation the Loop can set a minimum standard access speed that new members must be able to meet as a condition of membership.

Citylink have advised the Loop that its fibre network is accessible to approximately 80 schools in the Wellington region - this means that the remaining 135 schools in the region would have to choose another provider. This can be seen as an example of multi-homing where each school can choose the network provider that can provide high speed access to their location. The Loop has competition from large telecommunications companies who offer similar services and access to the Internet. Telecom currently offers the SchoolZone product (refer <http://www.telecom.co.nz/schoolzone> ) which contains some of the same sort of tools the Loop is offering though it requires participants to use its ADSL network for connectivity. Telstra Clear provides high speed internet access as well. Currently these providers are perceived by the Loop members to be unable to offer the same speed, flexibility and reliability offered by the Loop. However these large companies have significant resources and could see an advantage in enveloping the Loop’s platform by offering similar or better services at significantly lower prices. As schools have limited funding, some may prefer to pay less for these services than the Loop charges and accept that they will miss out on some of the opportunities the Loop offers.

A common feature of two-sided markets is that one side is subsidized to attract users (the subsidy side) and the other side pays to participate in the market (the money side). Eisenmann et al’s (2006) suggest that the group which is most price sensitive is the one that should be subsidized. For the Loop, the students and teachers are clearly price sensitive and therefore should be the subsidy side as they will only use the tools provided by the Loop if it is offered without charge as part of their usual learning and teaching activities. Requiring a usage payment directly from each student is likely to disadvantage students who are unable to pay and this inequity will not find favour with the teachers. The money side, then, is the school as a business organization which will pay a fee per student per period (that is, per year) for access to the Loop’s services and technology. The school will likely recover this cost from the students via the school fees charged to their parents. Generating revenue through advertising is possible but not supported by Loop members, being inappropriate for a student audience. However, seeking grants and sponsorship from government and commercial organizations and recognizing these contributions on the Web Portal would be considered appropriate.

The Loop aims to build a community of schools in the Wellington region and to connect, via KAREN, to other education communities in New Zealand and internationally. While taking into consideration the concerns of Van Alstyne and Brynjolfsson (2005) that increased connectivity can lead to less integration, teachers believe that by sharing their resources, and consolidating their efforts to find and

filter appropriate content, the technology opportunities offered by the Loop allow them to work with their students to enable them to become confident 21<sup>st</sup> century learners.

The teachers firmly believe in the benefits of belonging to an interconnected community of schools. Denise Johnson of Wellington Girls College sees the Loop as “opening new channels of communication that will challenge the comfort zone of some teachers”. The teachers also refer to Prensky’s (2001) Digital Natives and see the use of collaborative tools as a way to engage with the students using the technology the students have grown up with.

Some of the schools have already invested in some of the applications the Loop plans to provide, such as learning management and content management systems, and are looking forwards to the emergent benefits of the collaborative opportunities offered by the Loop. There are some of the initial member schools who have little existing investment in technology and these are looking to learn from the others about how to maximize their use of the applications.

### **ISSUES FACED BY THE LOOP**

The Loop has been provided a finite amount funding for the initial phases of development. After this period, the Loop must sustain itself. The sustainability plan states that the Loop will be sustainable by offering increased value in terms of delivering more learning opportunities for schools while reducing overall costs through shared resourcing.

A key theme that recurs in discussions with Loop members is that the cost of participating in the Loop must be the same or less than the current costs the schools face to provide applications and internet access. Each school has implemented these differently so the costs to each school are likely to be different. The Loop will need to persuade the initial members, and potential new members, that charging is equitable by being transparent about its own costs. It will also need to convince schools that the Loop cannot be charged for on a strictly cost recovery basis as there is a need to continually re-invest in maintaining and improving the infrastructure and technology, as well as providing school staff with appropriate training and support to maximize the benefits the Loop can deliver.

Some of the member schools have already invested individually in some of the tools the Loop shares on its common platform. For example, Wellington Girls College has a learning management system that is significantly integrated within the teaching practices of the school. The Loop needs to consider whether schools with existing investments will be reluctant to pay for a bundle where some of the bundle components duplicate existing applications. However, for simplicity of administration, and reduced administration costs it may be preferable to offer a fixed price per student per year and allow the schools to choose which of the applications they wish to use.

Schools are concerned with equity of access for disadvantaged members of their community and some teachers have expressed an interest in seeing schools with fewer resources (e.g. primary schools and lower decile schools) subsidized to participate in the Loop. The cost of the initial connection to the fibre infrastructure will possibly be the biggest barrier to participating. Currently, this cost is borne by each school and is external to the costs of the Loop. Incorporating this cost into the Loop’s costing could distort the prices the Loop can charge and might prove counter-productive as it will impact all member schools. It may be more equitable for disadvantaged schools to apply to government or charitable agencies for funding through grants to establish the connection to the fibre infrastructure.

As schools will always have limitations in their funding, the Loop may need to consider a coordinated approach to seeking external funding to subsidize the Loop’s operations and thereby reduce the cost to the participating schools. This might take the form of grants, sponsorship, or specific funding from the Ministry of Education

### **CONCLUSION**

Schools in New Zealand have put the telecommunications industry on notice. They have sent a clear message that open access high performance networks that provide maximum choice, flexibility and availability are required and if the traditional business models won’t supply it they will go it alone.

Communities like the regional loop aggregators and the Wellington Loop are one such case example has provided the proof that a national education network is not only feasible but essential for New Zealand. Without it educators will struggle to provide the education direction required to produce the next generation of technology literate leaders necessary for New Zealand to participate on a global stage. The National education network is not yet fully realized. Our message to researchers is “watch this space”. The world of connected education is still nascent and emerging but the successes are already evident and there is no turning back. A participant at a recent education conference summed it up with the comment “Well, we are the last cohort that has had a choice about using [ICT] in our classroom - embrace it - or embrace extinction” (Derek Wenmouth).

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