MINISTRY OF EDUCATION
*Te Tāhuhu o te Mātauranga*
New Zealand

CONTRACT RESEARCH

# A Summary of the Key Findings of the Evaluations of the Digital Opportunities Pilot Projects (2001–2003)

A Summary Report to the Ministry of Education

**Janet Rivers and Lewis Rivers**

RESEARCH DIVISION
Wāhanga Mahi Rangahau

**ISBN 0-478-13234-4**
**ISBN 0-478-13235-2 WEB**



*Research reports are also available on the Ministry's website:* www.minedu.govt.nz *under the Research heading.*

# A Summary of the Key Findings of the Evaluations of the Digital Opportunities Pilot Projects (2001–2003)

**Janet Rivers and Lewis Rivers**

# Contents

# Overview

This summary identifies and discusses the key findings of the evaluation reports of the four Digital Opportunities Pilot Projects – Generation XP, FarNet, Notebook Valley, and Digitally Boosted Study Support Centres – which took place in 2002 and 2003. The report will be of interest to schools and teachers, particularly those who are considering a complex Information and Communication Technology (ICT) project, and the research community.

It outlines the key features of the digital opportunities model, followed by a brief description of each project and each evaluation.

It then identifies key findings from across the four evaluations. The findings are grouped into the following categories:

- student-related findings (retention, achievement, use of and attitudes to ICT, and access to computers);
- teacher-related findings (professional development, and teacher attitudes to and use of ICT);
- implementation-related findings (roll-out of the projects, collaboration and cooperation between schools, school-wide use of ICT, staffing, partnerships, and external factors);
- findings related to ICT infrastructure; and
- findings related to sustainability.

The summary finishes with a discussion of the findings and a conclusion which examines the implications for future initiatives of this nature.

The full evaluation reports can be accessed at www.minedu.govt.nz/goto/DigiOpps.

## *The digital opportunities model*

The digital opportunities model was conceived as a three-way partnership between the Ministry of Education, businesses and schools to provide information and communications technologies in schools. This was to be trialled through four different pilot projects – Generation XP, FarNet, Notebook Valley and Digitally Boosted Study Support Centres.

The model was based on the assumption that technology use and competency is an important and necessary component of an internationally competitive 21st century 'knowledge economy'. The use of ICT in schools would help students gain the skills needed to operate in the digital age, and would have flow-on effects for the wider economy. Mathematics, science and technology were chosen as the target subjects because they are considered core subjects for a knowledge economy.

The model was based on the premise that the introduction of ICT can improve student learning, and the model's overall objective was to increase student engagement, achievement and retention in the target subjects, and to improve students' skill base.

The model also aimed to bridge the 'digital divide'. The concept of the digital divide assumed that a lack of access to technological resources would contribute to a social divide between those who were 'knowledge' and 'information' rich and those who were not. The model therefore focused on schools in remote areas or areas of economic disadvantage, with the aim of removing barriers of access, ability and attitude to ICT by providing hardware, software and associated infrastructure such as high quality bandwidth, and providing ICT-related professional development opportunities for teachers.

The digital opportunities model assumed that ICT has the ability to transform and improve teaching practices, over and above developing teachers' skills in the use of ICT, and that this, in turn, would have a positive effect on student learning. The role of ICT in education is also linked to the notion of school change. As discussed in the FarNet evaluation, there is an international trend to introduce a greater ICT presence in schools, in part to ensure people are ICT-literate but also because it is seen as a way to change how schools teach, and to make them better at what they do.

## *The four digital opportunities pilot projects*

The four pilot projects shared the goals of the model, namely to raise student achievement and increase student participation, particularly in the areas of mathematics, science and technology.

The schools in the projects all received computers and network hardware, software, high quality internet access and professional development.

However, as four separate and distinctive projects, they each developed differently and had their own specific goals.

### Generation XP

Generation XP involved students and teachers in eight secondary schools in West Auckland and Gisborne. The students were provided with the opportunity to gain Microsoft Office User qualifications, with the intention that these would be part of the NCEA framework. In addition to providing the ICT hardware and broadband access, the business partners provided courseware related to Microsoft Office Specialist (MOS) and other Microsoft qualifications, professional development for teachers, and access to the Microsoft examinations.

### FarNet

The FarNet project aimed to develop virtual professional learning communities of teachers in 10 Far North schools. The ICT included a dedicated FarNet website that was intended to provide the 'hub' for the development of the professional learning communities.

### Notebook Valley

The Notebook Valley project provided laptop computers and the associated ICT for Year 12 and 13 science and mathematics students and their teachers in three schools in the Hutt Valley area. The aim was to encourage teachers to develop resources suitable for posting on the project's website, and to enhance retention rates amongst senior students in science and mathematics.

### Digitally Boosted Study Support Centres

The Digitally Boosted Study Support Centres project provided ICT and an interactive website (WickEd) to four after-school study support centres based in three schools and one marae, in Christchurch and Invercargill. The centres catered for primary, intermediate and junior secondary school students.

## *The four evaluations*

The projects were evaluated separately to assess how well each achieved its aims, with the evaluation developed according to the specific nature of the project it was addressing. However, there were methodological similarities across the evaluations, with data collection techniques including surveys, interviews, focus groups, observations, school records, official statistics and other documents. Some evaluations also drew on the international research literature and the preliminary Digital Opportunities research: *Literature Review for the Evaluation of the Digital Opportunities Projects* (Boyd, 2002).

### Generation XP

The Generation XP evaluation collected data from all eight schools where possible. Questionnaires were used to gain information related to the whole population of participating teachers and students, rather than samples. It included data on student achievement, retention, aspirations for further study and careers, and employability. The evaluation also considered the credibility and transferability of the qualifications; the robustness and sustainability of the ICT infrastructure; and the impact on teaching and teaching staff.

Information was also obtained from meetings with the schools' programme coordinators; observations and interviews; surveys of students and parents; interviews with teaching staff, technical staff and principals; and from school records, business partner contracts and other documents pertinent to the project.

The evaluation was carried out by Michael Winter, of Ultralab South. The research was conducted while he was employed by the Christchurch College of Education.

### FarNet

The FarNet evaluation was carried out through the collection of data from a number of sources and through a number of different collection techniques. The data sources included NZQA statistics, website postings on the FarNet site, project reports and other documents, website visits, interviews, self report questionnaires, and focus groups, including focus groups of students. The focus of the data collection was on teacher confidence and skills in using ICT, the development and use of resources, patterns of inter-school and intra-school collaboration, whether or not teaching and learning practices altered with the use of ICT, and the extent to which the FarNet project contributed to enhancing student participation and retention.

The evaluation was carried out by Judy Parr and Lorrae Ward of the University of Auckland.

### Notebook Valley

The Notebook Valley methodology included sampling through student surveys and focus group interviews, teacher interviews, and classroom observations. In addition, the schools provided data on student enrolment and retention. The research focused on implementation

issues and professional development; the impact of ICT for learning and pedagogy; patterns of access and use of ICT by teachers and students; student motivation, attitudes, and self-esteem; and collecting baseline student information for comparison with end-of-year student data.

The evaluation was carried out by Rachel Bolstad of the New Zealand Council for Educational Research

### Digitally Boosted Study Support Centres

The Study Support Centres evaluation included regular visits to all four locations. Quantitative data, such as attendance figures and student use of the WickEd site was collected from the participants, from questionnaires, and from school records. The descriptive data was collected from interviews with participants and business partners, and observations of teaching and learning. Automatically logged monthly data concerning usage of the WickEd website was used to gain an impression of the growth and usage of the site.

The evaluation was carried out by Michael Winter, of Ultralab South. The research was conducted while he was employed by the Christchurch College of Education.

# Key findings across the evaluations

Although each project operated differently and had specific goals, they all had the common focus of (a) lessening the digital divide; (b) improving student outcomes, particularly in science, mathematics, and technology; and (c) providing an opportunity for trialling a government/industry/schools partnership model.

This section identifies key findings from the evaluations. Because the projects, and their evaluations, were all different, the significance of each finding has been assessed in terms of its relevance to the model and implications for future ICT initiatives, and its prominence across the separate evaluations.

The key findings from across the four evaluations are reported under the following headings:

- students;
- teachers;
- management and implementation;
- ICT infrastructure;
- sustainability.

However, in many cases the findings cut across more than one group.

## *Students*

The student findings are grouped into the categories of achievement, retention, use of and attitudes to ICT, and access to computers.

There was little direct evidence to link student achievement to the implementation of the projects, with the researchers noting the difficulties in trying to establish such causal links. In general, students considered their skills and confidence in use of information and communications technologies (ICT) had improved.

The evidence for student retention that was available indicated that none of the projects had a significant impact on either encouraging students to continue their studies in the target subject areas of mathematics, science and technology or on students' decision to stay at school.

In regard to students' use of, and attitudes to, ICT, students across the projects used computers to support their learning in a variety of ways. In respect to access, three evaluations reported that students had high levels of access to computers at home, while the fourth, the FarNet evaluation, did not collect data on this. In each of the projects where the data are reported, the percentage who had access to ICT through home rose considerably in the second year. It is not known if this increase in access was prompted by the provision of ICT within the projects or if it was the result of the general increase in home computers that would have occurred anyway.

## Student achievement

The most clear-cut data is from the Generation XP project. In 2002, 10% of the students who enrolled in MOS passed one or more MOS examination. In 2003, 13% passed, although the number of students who enrolled was less than the previous year (620 students and 292 respectively). However, one school trained eight students to Masters level (registered at Level 3 on the National Qualifications Framework). The school was seen as a world leader in its students' MOS results and one student was flown to Florida by Microsoft for a student convention. Two schools made the courses compulsory, and they had among the lowest pass rates. The percentages of Maori and Pasifika students gaining passes in MOS exams was low. In some schools, only Asian and Pakeha students passed, and the successful students tended to be high achievers rather than low academic achievers.

It proved difficult to follow up MOS students after they had left school. Only one person in the follow-up sample was in employment in an IT-based occupation, though others were involved in further study leading to computer or business qualifications. Some students worked successfully as part-time computer tutors at a local polytechnic, using their MOS skills.

The FarNet schools did not provide student achievement data so the evaluators looked at information on national qualifications from the New Zealand Qualifications Authority. The evaluators noted that it was difficult to compare national qualifications data over the course of the project due to the transition to the new qualifications system. Also, there were a number of other projects in the Far North at the same time so it was difficult to tie any trends to one particular project. However, the evaluators concluded that the results on the National Qualifications Framework appeared to support the perception of most teachers (57%) responding to an Information and Communications Technology Professional Development (ICTPD) survey that there had been no improvement in formal achievement. However, 71% of teachers in the ICTPD survey felt the students' range of skills increased and 58% believed students were more motivated.

Only one study centre school had longitudinal data on student academic progress. The data showed that membership of the centre had no consistent effect on student academic achievement in the areas for which data were available. However, in interviews and in exit surveys, students said that attendance at the centre had resulted in improvements in english, mathematics, spelling, technology, computer skills and completion of homework. A centre teacher also commented that classroom teachers had mentioned that students were thinking more about their work.

The teachers in Notebook Valley felt they had insufficient information to evaluate the impact of the laptops on students' science and mathematics achievement. However, some staff and some students felt the specialist subject software (e.g. Crocodile Clips) had helped improve students' understanding of concepts.

In Notebook Valley the data show a self-reported increase in students' knowledge, confidence and skills in ICT. In Generation XP, even though pass rates in the MOS examinations were not high, 80% of students considered they were competent or expert with Word and 65% that they were competent or expert with Excel after the MOS courses. The Generation XP students also considered they had gained good skills in Access, PowerPoint and Outlook. The

students' perceptions were supported by Generation XP teachers, who felt that students' ICT skills had improved.

### Student retention

In Generation XP, nearly 30% of the students sampled at the beginning of 2003 had taken the courses the previous year and more than 60% said the opportunity to gain MOS qualifications was important in their decision to stay on at school.

In FarNet, individual school rolls and overall numbers of students in the Far North fluctuated over the period 2000 to 2003, with an upturn in rolls in 2003 to close to the 2000 level. The reasons for this were not clear but two possible reasons were movement between Auckland and the Far North and movement around the North. There was no evidence to link the roll upturn to the Digital Opportunities project.

In terms of retaining students in the target subjects, the Notebook Valley data do not show significant impacts of the laptops on students' attitudes towards these subjects. In 2002 and 2003, students had positive attitudes towards the subjects at the start of the year and were similarly positive at the end of the year. Some junior students wanted to know what subjects they would have to take to get access to the laptops.

In Generation XP, the subjects of science, mathematics and technology were not directly relevant to the project's goals, while science and technology were not emphasised in the study centres, given the younger ages of many of the students.

In the study centres, computers and ICT were not major factors for most students for joining or re-joining, with most of those interviewed saying social factors were important in their decisions to re-join, and they would continue to use the centres if there were no computer facilities. However, students at the marae all mentioned computers as a factor in joining the centre.

### Student use of, and attitudes to, ICT

Students across the projects used computers to support their learning in a variety of ways, both at home and at school.

In Notebook Valley, some students used laptops to support their learning through using the Internet for research, creating PowerPoint presentations, and using subject-specific software and simulations at school and at home. Most students used laptops for word processing and spreadsheets for science and mathematics at school and at home. Many also used their laptops at home or at school to prepare assignments and reports for subjects other than mathematics or science.

The Notebook Valley students generally used the laptops for a wider variety of purposes at home than at school, both for school-related uses and personal and recreational use (games, email, music, and movies). At school, laptop use was sporadic across most classes and varied between individual students. Within science and mathematics (the target subjects) laptops were used most for physics and biology and least in mathematics. Students' laptop use across all their subjects was variable between individuals. For example, while some students said they 'never or hardly ever' used their laptops in english, other students said they 'often' used their laptops in english.

Some students ended up not taking their laptops to schools because they found the laptops too heavy, there was nowhere to store them when they were not in use, or teachers did not encourage, or in some cases did not allow, the use of laptops in class. In 2002, 43% of students reported using their laptops at school less than once a week. In 2003, the figure was 58%. Also, students felt for the most part it was left 'to the individual' to find ways to use the laptops to support learning – an attitude held by some teachers as well.

In FarNet, the evaluation found there was no change in the way students engaged with ICT as a result of FarNet. Students mainly used the computers for research and for presenting work using word processing and graphics software, but these activities were undertaken no more than once or twice a term. Focus groups of FarNet students reported varying levels and types of use of ICT in class, which they attributed to different teaching styles and to teacher attitudes to ICT.

In Generation XP, students consistently reported that they used Word for assignments, Excel for mathematics, accounting and data processing, and PowerPoint for presentations. The students increasingly regarded the MOS applications as useful everyday tools. With regard to reasons for taking the courses, a greater proportion of students cited getting the MOS qualification or the value of the qualification for future careers as their reasons in 2003 than in 2002 (39% in 2003, 25% in 2002). However, there was evidence of some student resistance and demotivation in the two schools where the MOS courses were made compulsory.

In terms of individual school rolls, Pakeha students were proportionately over-represented in Generation XP courses compared with Maori and Pasifika students. Likewise, the number of Maori and Pasifika students in the school-based study centres was proportionately lower than in the whole school population where the centres were sited.

Students in the study centres combined ICT-based activities with more traditional learning activities such as completing homework. ICT activities included research for projects using search engines, presenting work using Word and other programs, using the email, designing web pages, and working with the WickEd website.

### Access to computers

A high proportion of students had access to computers and the Internet at home.

In 2002, 77% of the Notebook Valley students had computers at home and 58% had access to the Internet. In 2003, 96% had computers at home and 88% had access to the Internet.

In Generation XP, for both 2002 and 2003, 80% or more students had access to computers at home, with the majority saying they had easy access to the MOS programs outside of class.

Study centre data show just over half (56%) of the students had computers at home in 2002 and two-thirds (65%) in 2003. In both 2002 and 2003, approximately three-quarters of these students said they were allowed to use the home computer. However, the percentages of students with home computers varied from centre to centre and from year to year.

The FarNet evaluation did not provide data on students' access to computers at home.

## *Teacher findings*

The teacher findings are grouped into the categories of professional development, attitudes to ICT, and teacher use of ICT.

Professional development was provided in all the projects but there was considerable variation within and across projects in terms of planning, quality, timing, and who received it.

Teacher attitudes to ICT also varied within and across projects, with many citing a lack of time to prepare for, and reflect upon, ICT use as an impediment to effective implementation. Generally, though, they liked having access to the hardware and software. In many instances, teachers reported an increase in ICT skill levels and confidence in using ICT and that the initiatives had helped raise the profile of ICT in participating schools.

Teachers from across the projects made use of the ICT for planning, preparation and administration purposes, and their use of ICT tended to increase with time. In addition, a number of schools/teachers across the projects commented on the positive change in schools' ICT culture as a result of the projects. However, there was little evidence that any of the ICT projects had a significant impact on the way teachers taught.

### Professional development

In Notebook Valley, professional development involved a range of in-school and out-of-school meetings, conferences, and training activities related to the project. Each school had some in-house professional development or training. One school brought in an external training group. Other in-house professional development involved peer-group sharing in informal circumstances, or during departmental staff-only days after students finished school for the year. Many teachers felt there was not enough professional development or release time.

In the first year of the project, several inter-school meetings and conferences were facilitated by the Learning Centre Trust (LCT) in order to familiarise the teachers with the project. The LCT team also sought teachers' ideas on how LCT could support them to develop materials and resources to share on the Notebook Valley on-line learning community website. Many teachers expressed disappointment at the inter-school meetings and the focus on producing resources, and in 2003 the LCT team, which provided most of the professional development, focused on working with each school individually in small group or one-on-one sessions rather than on the Notebook Valley website. This included work with science and mathematics departments to develop ICT profiles for the school, the department, and individual teachers. These profiles were used to plan programmes of teacher professional development, and to help set individual and departmental goals and plans of action to achieve these goals. The professional development facilitators in 2003 came from a background of teacher ICT professional development.

However, the professional development experiences of individual science and mathematics staff, and the extent to which the plans were implemented, varied considerably. Some had only one or two brief sessions with LCT staff in 2003, while in other cases whole departments had several sessions. The reasons appeared to be the difficulties in establishing suitable timeframes and schedules for working with staff, as well as difficulties maintaining regular

communications between LCT staff and Heads of Departments to organise and implement professional development plans.

The FarNet professional development was provided by a separate ICT project in Northland – the Information and Communications Technology Professional Development (ICTPD) – with the FarNet schools making up one cluster in the ICTPD programme. Although ICTPD and FarNet were two discrete projects, with differing objectives, they became closely linked and school staff and the evaluators found it difficult to delineate them. Most teachers were satisfied with the professional development, but both the professional development itself and teachers' goals for their professional development were focused more on improving ICT skills and using ICT for administration than on integrating ICT into classroom practice or developing resources.

Although the thrust of the FarNet project was to develop an online professional learning community, the data from the evaluation show that online learning was among the teachers' least favoured form of professional development. Rather, the FarNet teachers considered release time (two or more separate days) to attend workshops, seminars or to work with a mentor as the most effective form of professional development.

Teachers' confidence and skills in using ICT increased but as there were other ICT initiatives in Far North schools at the same time, the improvements could not be attributed solely to FarNet.

In Generation XP, up to nine teachers from each school, including some non-Generation XP teachers, attended the initial professional development. There was a mixed response from teachers to the training, with most of the teachers interviewed feeling they had not received adequate professional development to run the courses. They found the courses unfocused, with no clear objectives, and not enough emphasis on how to teach the programmes. However, the Generation XP teachers found the Navcon conferences valuable, as did teachers from the other projects who attended, and the professional development in the Generation XP schools also helped raise the general profile of ICT.

Professional development opportunities for Study Centre project teachers included staff working with LCT to develop resources, receiving training in the use of *Smart Tools,* attending conferences, and receiving on site training carried out by the LCT liaison teacher. These professional development opportunities were widely used by teachers in the participating schools, and they generally found the professional development effective and appreciated the professional development support provided by the LCT liaison teacher.

A theme emerging from across the evaluations was teachers' preference for block release time to attend workshops, seminars and conferences, or to have some one-on-one or small group training. Also, although professional development was seen as essential, it was considered important that it was tailored to needs of individuals and groups. The evaluations indicated a need for better planning and carry-through in professional development. For example, several teachers in Generation XP said ongoing professional development was needed, in part because of staff turnover which had resulted in some schools using teachers who had not been trained to run the courses. Teachers in Notebook Valley also emphasised the importance of follow-up professional development, as did the FarNet evaluators.

## Teacher attitudes

In Notebook Valley, the most positive staff tended to be those whose classes had network connections, who were comfortable using computers in their teaching, who had access to peripherals such as subject-related software or data projectors, and whose students all had laptops. Conversely, staff without those features found the project the most frustrating. Teachers with the fewest skills to start with were the most positive about their personal ICT skill development at the end, and most teachers were grateful for the opportunity to have the laptops, and enjoyed using the equipment.

In Notebook Valley, many teachers commented they did not have time to explore and experiment with different ICT resources and to adapt them for their particular teaching programmes. However, there was a greater sense of ownership of the projects in the second year, and the schools started adapting the projects for their purposes. There was also greater staff confidence in using ICT for teaching.

FarNet teachers were reluctant to use the FarNet site, and they were also reluctant to contribute to it, partly from a reluctance to share resources when they were not sure it would be reciprocated, and partly because they lacked confidence in the quality of their own material and did not want to 'go public' with it. They were more comfortable about posting resources on their own school's intranet.

As referred to earlier, online and e-professional learning were the least favoured modes for professional development by FarNet teachers, and more than half said that FarNet had little or no impact on their professional lives.

In Generation XP, teachers at schools where courses were compulsory were the least satisfied with the initiative. The evaluation notes that these schools appeared to have less qualified or less committed staff. The most successful schools were those which had both the institution and the teachers committed to the success of the project, and the staff made extra efforts to support the students with additional resources and encouragement.

Most coordinators in Generation XP schools reported dissatisfaction with the rigid pedagogical approach of the courses, and with the course books.

## Teacher use of ICT

In Notebook Valley, there was no consistent increase in the use of ICT across senior science and mathematics classes. In the second year, the schools focused on using ICT in junior classes, which included one school using its 'class set' of laptops for junior science and mathematics students.

In the FarNet project, some teachers perceived changes in their teaching practice, with more than half (54%) stating in a survey that their teaching was more student-centred. However, other data suggested there was no fundamental change to teaching practices as a result of the FarNet resources, which the FarNet evaluators suggest was because the professional development focused on ICT skills rather than on the use of ICT in teaching. Few teachers posted resources on the website, apart from the resources posted by the Maori curriculum group and the biology group, but, as noted earlier, teachers were more comfortable about posting resources on their own school's intranet.

Teachers used ICT extensively for report writing and emailing; however, these practices were often mandated by school policy, so this could not necessarily be attributed to the FarNet initiative – although it may be that the provision of bandwidth and access to sufficient hardware made it possible to mandate the practices.

In Generation XP, three of eight schools taught MOS material in stand-alone courses. The others integrated MOS teaching with that of other ICT-based courses, although they did not find this a straightforward process and did not like the pedagogical approach of the MOS courses. Several coordinators and teachers commented on the contrast in style of the MOS courses and felt the rigid training model was unsuitable for New Zealand schools. There were also adverse comments about the text books. Teachers reported that students had difficulty understanding the material, which had reading ages up to four years higher than common New Zealand texts used in ICT classes, and some schools generated their own resources. Several teachers felt they did not have enough time to prepare adequately for the courses.

The schools used the Generation XP computers for a wide variety of applications other than MOS courses – for example, teachers used them for writing reports, and for research.

All the study centre coordinators emphasised numeracy and mathematical skills in their programmes, and te reo and tikanga Maori were prominent in the marae-based study centre. However, the centres did not emphasise science and technology.

As the project progressed, coordinators became more confident and comfortable with technology and students increased their use of ICT and the balance of activities in most centres shifted from activities such as doing homework which had no ICT component to activities which were mostly ICT based – by the end of 2003, two centre coordinators reported 80% of the activities were ICT-based, and a third reported more than 50% of activities were ICT-based.

The use of the WickEd material tended to increase with time as teachers became more confident and as the quality and quantity of resources increased, although the science and technology resources, and some mathematics resources, were considered less effective than other resources on the site.

The coordinator at one centre kept in touch with what was taught in the children's various classes, and tried to support the class work with activities in the centre.

At one centre, teachers used the ICT resources for a variety of purposes, including searching for information and preparing class activities. Email was used as a general communications tool in the school.

## *Management and Implementation*

In most projects the roll-out took longer than anticipated. Also, the teachers who were to be most directly involved with the projects were often not consulted or included in the planning, and there was little inter-school collaboration within projects.

In all the projects there were instances of modifications and adaptations to the original schemes after the start of the projects, with many of the schools using their computers for purposes other than the projects, and some providing the computers for community use.

### Roll-out

The roll-out of the project in Notebook Valley was complex, and it took longer than anticipated to get up and running. There were not enough laptops supplied for all students and it took time to decide which teachers and students would get the laptops. The resulting "pepper-potting" of laptops throughout classes influenced how teachers could use the computers in their classes.

Most science and some mathematics teachers were not fully involved or briefed in the initial stages and were unclear of the project's goals and aims, and its implications for them and their classroom programmes. For some, it was not until they had attended an out-of-school meeting or conference that they found out the aims of the project and who else was involved.

There were few opportunities for the staff to make pedagogical decisions about the way the project would run in their school. Teachers had no input into deciding which subject areas or student year levels would benefit from access to laptops; whether teachers should have laptops for several months prior to them being allocated to students; or how the laptops would contribute to or change their existing science and mathematics teaching programmes. However, the teachers thought the implementation had gone reasonably well, although there were concerns about the processes for allocating laptops to students and teachers.

In FarNet, the implementation of the ICT equipment ran a different course in each school, with one school waiting more than 12 months for all issues to be resolved and the system to work efficiently. There was a sense in some schools that 'one day the computers just arrived', indicating teachers were not prepared for the project.

In the study centre project, the marae was not included in the initial contract and therefore did not receive the same ICT services as the other centres, which caused ongoing problems.

### Collaboration and cooperation

In the three school-based projects, cooperation and collaboration tended to be within schools rather than across schools.

Although two of the three in-school initiatives (Notebook Valley and FarNet) were intended to develop as cluster projects, there was little posting of materials on the projects' respective websites and little inter-school sharing of resources. Generation XP, while not a cluster project as such, set out to have online student learning in the second year, but this aspect of the project did not eventuate. Nor was the Generation XP website used beyond the initial stages, when it was used to get information about the project to the schools.

In Notebook Valley, most teachers thought it would be beneficial to share or collaborate with teachers from the other schools, but they felt the coordination and cooperation between schools was not successful. Most cited lack of time as the main reason for this, and several suggested there were not enough opportunities to establish a collaborative approach. Some staff commented on the difficulty of establishing a collaborative approach between schools which were operating in a competitive climate for students.

Several staff in the Notebook Valley schools said that successful collaboration needed clear goals and pathways for staff, with well-structured planning, support and guidance.

As the Notebook Valley project progressed, the focus shifted from shared development across the schools to each school working separately. This shift included the Learning Centre Trust, the main provider of professional development, working individually with schools to provide support and assistance in areas determined in discussion with each school, or in some cases, each science and mathematics department.

FarNet nominally continued as a cluster project but the data show little in the way of collaboration or sharing. The FarNet teachers showed little enthusiasm for inter-school collaboration, even though the purpose of the project was to build cross-school professional learning communities.

The exception in FarNet was the Maori curriculum group, which was the most successful group in terms of resources posted and level of repeated use. This group had the services of a full-time Maori coordinator in 2003 to collect and post resources, but the coordinator still had to find people willing to provide resources. The evaluators reported that Maori teachers felt responsibility for all Maori students regardless of the school they attended or the subjects they took. They also felt collective responsibility for each other, not just as teachers of Maori but as Maori teachers in general.

Both FarNet and Notebook Valley schools showed increased intranet use. For example, as Notebook Valley progressed, there was more cooperation within departments at individual schools, with preparation of resources which were posted on the intranet. However, in most cases, school intranet development was part of a broader school-wide focus on greater ICT use.

### Wider school and community use of ICT

Most Generation XP schools integrated their MOS computers into their wider school networks to make the fullest use of them, rather than keeping them separate as had been envisaged in the original plan. The computers were in constant use and used for a wide variety of applications other than MOS courses. Some schools made the computers available outside class hours and one school made them available to the wider community. One set up an internet cafe for students.

The three study centres attached to schools made extensive use of ICT facilities to support classroom teaching, and teachers used the computers for planning and research. These schools also made the technology available to their wider communities. One school ran a computer programme involving students and adults, and two ran computer classes for community members, offering basic computer courses and access for research and email. All regarded the community use as beneficial for the school and the community; they felt they benefited from the positive publicity and increased visits by community members, and that community members acquired skills and self confidence in ICT use. The marae centre made use of the computers during the day for alternative education students.

### Staffing

In several of the projects, changes in staffing had an effect on the implementation. For example, in one study centre, the coordinator in the first year (who was also the LCT project coordinator) left at the end of the first year which had an effect on the way the project was implemented. In Notebook Valley, the entire LCT team responsible for professional

development changed over the two years, and this affected the continuity of professional development.

There was a high turnover of staff teaching the Generation XP courses, which put pressure on getting new teachers trained to run the courses, and in the second year in Gisborne a teacher was appointed part-time as project coordinator.

In the small schools in FarNet, one person often had many responsibilities, and ICT and FarNet became just one more added to the load. Getting relief teachers to free teachers for professional development was also a problem.

### Partnerships

The various partners had varying levels of interaction with the schools.

In Notebook Valley, the Learning Centre Trust (LCT) team had the most interaction with the schools and teachers. It took the main responsibility for interactions and communications within and between the schools and other partners limited their roles to providing hardware, software and online access, and technical assistance as required.

Most Generation XP schools did not see the project as true partnership between schools, businesses and MOE, and felt more consultation was needed with schools and teachers both at the beginning of the project and throughout it.

Two schools in the study centre project noted a lack of interest from most of the business partners.

### External factors

External factors, such as the implementation of NCEA and teachers' industrial action, impinged on the implementation of the Notebook Valley and the Generation XP projects.

## *ICT infrastructure*

All of the projects had some ICT infrastructure problems, but these were generally resolved. These included problems with hardware, internet connections, and the integration of the ICT with existing networks.

There were problems with the roll-out in Notebook Valley because not all the classrooms were networked and there were not enough laptops for students. There were technical difficulties in the set up and in integrating the technology into the existing infrastructure. The software and hardware was not always compatible with other ICT in the schools. For example, in one school, an infrastructure upgrade in mid-2003 meant the laptops could not network into the new server system, and neither the intranet nor Internet could be accessed from the laptops.

Overall, Notebook Valley schools reported satisfactory delivery of services, although there were some problems organising student Internet accounts in 2002. Some students reported that the time it took to start up and log on made it impractical for use in classrooms.

The establishment of the Generation XP infrastructure took longer than anticipated. There were software problems, particularly in the initial stages, because some schools decided to

integrate the new machines with existing school systems rather than running the Generation XP machines as a stand alone facility, as was originally envisaged by the business partners. Many principals commented that they needed to integrate the computers with the school networks in order to get maximum use from them. There were also problems setting up testing software, both in the initial stages and as a result of upgrades. All the schools experienced difficulties caused by batch of faulty hard drives and, in one school, by overheating.

In the study centre project, one school-based study centre had problems with multiple email accounts and another had router problems After these were resolved, the centres were happy with the reliability of the systems. However, two study centres which ran proprietary filtering software had problems with its compatibility with Smart Tools.

The marae study centre experienced problems resulting from its late addition to the project as it did not get the same ICT provisions as the other centres. Difficulties included ongoing problems with email and with the broadband facility.

The study centres' hard drives began to fail from late 2002. The computers in the centres were heavily used and it was suggested that the hard drive failures were the result of normal wear and tear.

The study centres had varying experiences when attempting to get problems resolved. One centre found the fault fixing service was sometimes hard to contact but when contact was made, the service was friendly and helpful and the problems were solved effectively. In 2003, one school server filled up quickly with emails, which affected the reliability of system. At the marae study centre, the coordinator was frustrated with the service provided by business partners. For example, there was no response to a request to have Smart Tools removed from centre's system.

In FarNet, the level of existing infrastructure varied from school to school. The greatest disparity was Internet access: in two schools, all computers had access to the Internet while in another school only 30% of computers had access. It took one school 12 months to get problems relating to the installation of hardware and software resolved.

## *Sustainability*

Findings regarding sustainability are ambiguous. In all the evaluations there was a sense that the projects were sustainable, but that the sustainability was dependent on continuing external support, such as funding from the Ministry of Education.

There is also the issue of sustainability in terms of the concept being incorporated into schools' cultures, and in this respect all the evaluations found that the projects raised the profile of ICT in the schools.

Specific issues raised by various participants included the fact that ICT equipment dates very quickly so there was a cost factor in replacing or upgrading hardware and software. The cost of providing adequate ongoing technical support was another issue, as was the cost and availability of getting appropriate professional development.

Sustainability was also linked with the need to have the full support of the participating teachers and a close and effective working relationship between partners.

In FarNet, the issue of sustainability was related to the fact that that there was not a strong pre-existing professional learning community across the schools prior to the project. The evaluators concluded that building a virtual learning community could be enhanced by strengthening and building on existing in-school learning communities.

In Generation XP, schools and businesses regarded the programme as being sustainable in the future. Achieving NZQA approval and credit inclusion was seen as important in attracting students to the courses in the future. However, schools were concerned at ongoing costs associated with maintenance, upgrading and being an accredited centre, and the examination costs for MOS, even at subsidised rates, were seen as a possible barrier to students.

The study centres, in general, saw this project as sustainable although they also raised concerns over ongoing costs, staffing and system maintenance.

# The model and its implementation

While each of the pilot projects was different, and each had its specific goals, they had the same overall objectives of bridging the digital divide through the introduction of an ICT initiative in schools, delivered by means of a partnership between the government, businesses and schools. When the pilots are considered as a whole, in the context of the project model, the evaluation data highlights a number of issues for consideration in any future initiatives.

### Bridging the digital divide

The digital opportunities initiatives were intended to help bridge the 'digital divide' by ensuring schools in low socio-economic or remote areas had access to ICT. However, as the data from the evaluations show, access itself was not always an issue for students. In Generation XP, for example, there were few barriers to out of school access to computers or MOS computer programs for the majority of students.

While access is important, particularly, for example, in areas of New Zealand without access to high quality broadband, the emphasis should not be on providing access to the hardware and associated infrastructure as an end in itself – a point made in the Boyd literature review. Rather, it should be on how the ICT is used to improve teaching and learning, and how it can enhance an individual's participation – economically, socially and educationally – in society.

The provision of ICT to the schools in the projects was welcomed by the principals, and it led to an improvement in teachers' skills and confidence in the use of ICT, and raised the culture of ICT. However, as discussed later in this section, there was no fundamental change in the way teachers taught. In short, access is important – but on its own, it is not enough.

### Improving teaching and learning

There was an implicit assumption in the model that ICT would change the way teachers taught and this would have a positive effect on student learning. However, the evaluations showed that, on the one hand, there was little significant in the way of pedagogical change, and on the other, linking changes in student achievement to a particular initiative is a difficult task.

The issue is raised by the FarNet evaluators, who suggest too much is being claimed for ICT. They discuss the lack of empirical evidence on how the use of ICT can raise student achievement – a point echoed in the Notebook Valley evaluation – and say the research literature to date suggests only modest results in terms of the effect of ICT on student achievement, school reform or pedagogical change. There is, they say, an ICT research–rhetoric gap.

The FarNet researchers point to the difficulties in linking ICT use directly to student achievement, as technology is only one of number of factors that affect student learning. They say that to assume the use of ICT will lead to enhanced learning through changed teaching practice understates the complexity of the relationship. Research indicates quality teaching is the most important factor in student achievement and the extent to which ICT enhances learning depends on whether teaching practice is consistent with quality teaching. If this practice is not consistent with quality teaching, ICT may act as a lever for reform, but it will not, on its own, be a catalyst for reform.

There is a related issue of how to establish a link between a particular ICT initiative and any improvements in student use or achievement. In the case of FarNet, there were several concurrent ICT and non-ICT initiatives in the Far North, any one, or all, of which may have contributed to changes in teachers' and students' use of ICT.

Also, whether ICT is seen to have an impact or not may depend on how the impact is defined and measured. The benefits of learning from ICT may not be able to be measured by traditional standardised assessments because these assessments tend not to measure higher order and critical thinking skills. This is discussed in both the FarNet and Notebook Valley evaluations, and in Boyd's review of research on ICT interventions in schools. Boyd, for example, says indicators that are specifically tailored to the goals of an initiative and to the way ICT is being integrated into the classroom, such as the ability to handle mathematics and science data, appear to be more valid indicators of the impact of an ICT initiative than generic achievement tests.

In summary, the data – or lack thereof – from the four evaluations suggest the model was too ambitious and too vague in its objectives, and unclear about how ICT would achieve pedagogical change or how the success of any changes would be measured. With respect to any future individual initiative, it would be important, as the Generation XP evaluator concludes, to establish realistic and meaningful criteria to work to, and for schools to establish effective monitoring and control systems.

### Establishing goals for an ICT project

A related issue is the importance of identifying a clear need for an initiative, rather than presenting the initiative as the solution to an as yet to be defined problem. In Notebook Valley, for example, it was not clear how laptops would enhance achievement in mathematics and science, or whether Year 11 and Year 12 mathematics and science were the best years and best subjects to target. Several schools in the Generation XP project found it difficult to integrate the MOS programme with other ICT courses. Teachers did not like the rigid structure of the course and found the text books unsuitable, leading them to question the suitability of an imported American course and qualification for New Zealand schools.

With regard to the study centres, the evaluator questioned whether the model's focus on mathematics and science was the best subject option, given the ages of the students and the trend of centres towards a more student-centred, rather than subject-centred, way of operating.

In FarNet, the evaluators suggest that making the schools' needs the starting point would have shown that the existing sense of community between schools – with the exception of the Maori curriculum group – was not sufficient to use as the base for building a virtual professional community. Teachers were unwilling to share resources with teachers from other schools on the FarNet site, partly because they lacked confidence that their resources were 'good enough' and partly because they felt no obligation to support teachers in other schools. The evaluators described trying to establish the virtual professional learning community in FarNet as putting the cart before the horse – it was essential to have a professional community first.

The success of the Maori curriculum group, measured by the use of the FarNet site and the number of resources posted as well as teacher feedback, demonstrated the value of starting with an existing sense of community and with an established need.

The need for clear goals is supported by a review of the international literature on ICT interventions (Boyd, 2000). The literature indicates programme developers can be more concerned about equipment than learning goals and professional development, and that there is a need to focus more on how technology will be integrated into the curriculum.

### Professional development

There is a general consensus, both in the findings of the evaluations and in the research literature, that professional development is central to the success of an initiative.

Each project received professional development as part of the partnership package, but its provision varied within and across the projects.

Teachers favoured individual and small group professional development, although some also found conferences – the Navcon conferences in particular – useful and stimulating.

In Notebook Valley, the school-based departmental-level professional development was the most successful, and included developing programmes based on individual and departmental needs. However, the programmes were not always carried out because the time could not be found to do it, indicating the need not only to plan the 'what' but also the 'when' of professional development – and to have the support of a school's leadership to ensure it is a priority and the time is made available.

Generation XP professional development was specific to the MOS programmes that formed the core of the initiative, and it helped raise the ICT profile in participating schools. However, teachers had mixed feelings about the professional development they were given at the beginning, with most finding it inappropriate and poorly planned, and focused more on learning about the MOS programmes rather than learning how to teach them.

The professional development provided for FarNet was part of a separate ICT initiative and as such was not well-tailored to meet the particular needs of the FarNet initiative, as it focused on developing ICT skills rather than on how to use ICT in the classroom. Teachers' skills and confidence increased, but the biggest change in teachers' use of ICT after professional development was its use in planning, preparation and administration, not classroom practice. The evaluators conclude that if ICT is to change classroom teaching practice, there must be a strong pedagogical element in the professional development.

The findings across the evaluations are broadly supported by those in the international research on ICT interventions, which, as summarised in the Notebook Valley evaluation, indicates that successful professional development in ICT involves teachers in setting the agenda for training; takes place in working classrooms; involves small group collaborations between teachers; builds on teachers' existing knowledge about curriculum and practice; is based on a specific project for teachers to use in their class; includes a practical introduction to educational theory; involves learning ICT skills on a 'need to know' basis; provides time for experimentation and reflection; provides ongoing support; and promotes incremental change. The Notebook Valley evaluation also makes the point that the staff who provide ICT

professional development must have both ICT skills and specialist subject teaching knowledge.

In summary, ICT professional development has to be appropriate for the purpose and participants, well-planned, and include a pedagogical component if it is to improve teaching practice beyond improving teacher skills and confidence in ICT. It must provide information on how teachers can use ICT in their classroom, be continuous, and include time for reflection.

### Professional learning

Professional learning, as distinct from professional development, was a specific feature of FarNet, in that the development of across-school subject-based virtual professional learning communities was at the core of the FarNet initiative. The evaluators describe a professional learning community as an ongoing, sustainable vehicle for teacher learning with a focus on improving teaching practice to improve student learning. It includes acquiring new knowledge of subjects, from the point of view of how to teach them, and challenging and critiquing basic assumptions about teaching and learning.

However, with one exception (the Maori curriculum group), none of the FarNet learning communities eventuated because the necessary pre-conditions were not in place. These include an existing sense of community, a strong collective responsibility towards teachers and students in other schools in the cluster, and a willingness to share resources and ideas. Teachers need to feel comfortable about sharing their resources and 'deprivatising' their practice, and this is less likely to occur in an online forum where participants are not known to one another.

The FarNet evaluation cited an example of a school with an emerging strong professional learning community. This school was led by a principal whom the evaluators describe as passionate about pedagogical change and meeting the needs of all students. Staff had professional development related to the integration of ICT and pedagogical change. Teachers were also encouraged and helped to create resources and place them on the school intranet for students and colleagues and a part of their appraisal involved the creation of ICT resources. They felt safe doing this within their own school first, and as a result they were willing to put the same resources on to FarNet for a wider audience.

### Involving teachers early

The data from the evaluations suggest that involving teachers early in the planning process, and getting their 'buy-in', would have minimised or eliminated some of the difficulties experienced in implementing the programmes.

The FarNet evaluators concluded that FarNet could be a powerful ICT initiative in the Far North but the implementation did not ensure teachers shared, let alone drove, the vision. The Notebook Valley evaluation suggests that involving teachers in determining the parameters of the project would have allowed for more discussion about how the project could contribute to improved or transformed pedagogical practice, in a way that might align with the schools' own pedagogical goals for students.

In Generation XP, the coordinators were dissatisfied with the pedagogical approach of the courses and the course books. If the teachers had been involved early, it may be that the

initiative would have proceeded in a different form that made it easier for teachers to integrate the MOS programmes with other, New Zealand, ICT programmes and qualifications. Where the project was most successful, it was because of the drive and initiative of individual teachers.

### Taking account of the 'real school' context

The Notebook Valley evaluation discusses the need for any initiative to take account of the contextual circumstances of schools. Contextual circumstances in Notebook Valley which limited the project's potential to transform the science and mathematics teaching practices for Y12 and Y13 maths, for example, included physical barriers (such as classrooms not being networked) and non-physical barriers (such as teachers' lack of skills, not knowing the science and mathematics software, and lack of time).

### Setting the parameters for partners

Partnerships were a key factor in the initial model, and the experience of participating schools in the various pilots shows it is important to establish clearly the roles and responsibilities of the various partners.

The evaluations raised the issue of some business partners lack of 'presence' after the initial stages, which led some schools to question the partners' commitment. Most of the Generation XP schools did not see the initiative as a true partnership – in the words of one school coordinator, they felt 'dumped on'. Study centre participants had a similar response.

There was comment from at least one business partner that it was not its core business to provide ongoing service, and it found this aspect of the partnership difficult to deliver on. The solution suggested was for partners to contract out any services that were not within their realm to deliver. This would help avoid a situation where schools felt that after the initial set up, it was left to them to solve any problems that surfaced later.

The Notebook Valley evaluation says the research literature supports a strong partnership model for ICT innovation, in which teachers need to have a high degree of involvement into the design, development and implementation of ICT innovations in their schools if those innovations are to have a significant effect on teaching practice.

The marae based study centre experienced ongoing problems with email and Internet access because of its late start in the project. To avoid these sorts of problems, the evaluator recommends that contracts with business partners should be flexible enough to cater for changing circumstances such as an institution joining a project after it has started.

### Planning and design

Several schools across the projects experienced problems in the roll-out of the initiative. Their experiences point to the need for careful project design and planning to minimise infrastructural problems; the need to ensure enough time is allowed for roll-out; and the importance of providing appropriate and timely technical support.

The experience in some of the projects, such as Notebook Valley, showed the time needed for the set-up phase was underestimated. Problems in this project and others included difficulties

integrating the new systems into the existing infrastructure. In some instances, existing proprietary filtering software, for example, was incompatible with new software introduced as part of the partnership package – software that was not always necessary. A solution to this suggested in the evaluation of the study centres was that a school should have a common system or, if different systems could not be avoided, there should be an inventory of each one.

Schools want to integrate computers into their existing systems and networks; they do not want stand-alone systems for specific purposes, so it is essential to ensure compatibility before an initiative starts.

In some cases, factors outside the control of the initiatives, such as the demands associated with the implementation of the NCEA, impinged on the projects. This highlights the importance of planning to ensure an initiative is integrated into a school's overall policies and programme. While such planning cannot prevent the unexpected, contingency plans can cushion the impact.

Planning may also help develop a sense of 'ownership'. In Notebook Valley, Generation XP and the Study Centre projects, the data indicates teachers would have preferred to be fully involved from the start of the project and have clearly established goals for what the projects were supposed to achieve. While the evaluation of Notebook Valley indicates a growing sense of ownership by teachers as the project progressed, it also suggests there would have been greater 'buy in' had teachers been consulted in the early stages.

### Sustainability

The evaluations found that most partners thought the projects were sustainable providing there was ongoing funding for equipment upgrades, professional development, technical support, and such. The Notebook Valley evaluation touches on the cost–benefit issue, saying the evaluation findings raise questions about the significance of the outcomes in proportion to the cost of the initiative.

Perhaps more important for sustainability is ensuring there is an ICT culture developed in schools, and that it includes ongoing professional development and a process of continuous review.

# Conclusion

The evaluations show that the initiatives had a positive effect in raising the ICT profile within schools and improving the skills of staff and students in using ICT. However, there were also several findings which, as discussed in the previous section, have implications for future initiatives.

The model had high level goals of bridging the digital divide and enhancing teaching and learning through the introduction of ICT. However, although it is important to have these high level goals, it is also critical to have achievable and realistic sub-goals for any particular initiative, and not to expect more of a project than it can deliver. Furthermore, there needs to be explicit links between high level goals and the project goals to ensure nothing is lost in the implementation.

The experiences of the four projects raised the issue of the extent to which ICT has the power to transform classroom teaching. There appeared to be an excessive expectation that ICT alone would change teaching practice, when in fact many other factors need to be apparent to complement the ICT. As the FarNet evaluators said, there is a gap between the claims made for ICT and the empirical evidence to show it can change teaching practice and improve student achievement.

The school effectiveness literature discussed in the Notebook Valley evaluation indicates that the introduction of ICT in schools will only bring about desired changes in learning and teaching when it occurs in the context of wider shifts in schooling practice. This evaluation also suggests both teaching staff and people with expertise in the educational use of ICT should co-construct the parameters of an ICT innovation to ensure it meets the needs of teachers and students, and that it stimulates self-sustaining change in teaching and learning practice.

Also, the data from the evaluations showed the concept of the digital divide, as conceived in the model, was not simply a matter of gaining access to the Internet or computers – providing access may be a necessary first step, but it is what is done with the ICT within the classroom that is important.

The difficulties the evaluations had in getting achievement information shows it is important to have appropriate and measurable pre- and post initiative data – data which schools do not routinely collect and analyse. Also, the model's high level aspirations for improved achievement and retention were difficult to measure. As the FarNet evaluators discuss, the relationships between teaching and learning are complex and, without sophisticated evaluation methodologies, it is unrealistic to expect that the difference that ICT makes can be measured, let alone be able to say that ICT improves student achievement. It was pointed out that current assessment tools may be limited in their ability to measure the types of student skill development that ICT can support.

The model focused primarily on science and mathematics at the senior school level as these subjects are considered important areas of skill development for the knowledge economy. However, there is some data to indicate the initiative could have been more useful in other subjects. In Notebook Valley, for example, there were indications that teachers in other subjects such as English found the laptops useful. There was also the indication that it could have been more useful with younger students – but because teachers were not involved in the initial planning stages, they were not able to have input into such pedagogical decisions. However, schools were beginning to take some of these decisions themselves, tweaking the projects to suit their needs.

The evaluations highlight the importance of integrating a professional development component into the model, and in particular a pedagogical component which shows teachers how to use ICT in their teaching, as opposed to heavily focusing on improving their basic ICT skills.

It is also important to ensure a 'match' between the identified needs and an initiative; that is, to identify the 'problem' and then find the technology to solve that problem, rather than starting with the technology that is available and assuming that the act of providing it will enhance student learning. In FarNet, online learning was the least liked form of professional development by teachers, yet the project aimed to build a community using online tools. There was also the complementary issue of the FarNet teachers, in the main, not being interested in establishing a school cluster learning community, as they had not identified it as a need. This indicates the need for the model to take account of 'real school context' when considering an initiative – to start from where the schools are 'at', and from their needs.

The FarNet project shows that teachers are more likely to deprivatise their practice – share resources and open their practice to the scrutiny of their colleagues – in an environment where they feel safe. Unless a positive professional learning community is established at an individual school level, or at least a departmental level, attempts to establish an inter-school professional learning community will be difficult.

Initiatives also need to be integrated into a whole-school ICT system. Ensuring an initiative fits with school-wide planning can help avoid a programme being 'isolated', minimise the infrastructural problems, and ensure the maximum use of computers and associated infrastructure.

The partnership experience in the various projects illustrated a need to establish clear parameters regarding the roles and responsibilities for each partner at the beginning of the initiative.

Cost was an issue, particularly in terms of sustainability. While the schools involved tended to consider the projects were sustainable, this appeared to be contingent on funding being provided by some other source. The cost of an initiative also needs to be weighed against the benefits, and setting an initiative in the context of whole-school planning would help make cost-benefit decisions.

In conclusion, as the Notebook Valley evaluation discusses, there is a need to rethink the educational aims underpinning the concept of ICT initiatives such as the laptop project, and the process by which such concepts are translated into practice in schools. The experiences of the four Digital Opportunities Pilot Projects hold several implications for future ICT interventions. To summarise, these include a need to:

- identify the need for an initiative and ensure the proposed project is the best means to meet that need. It is also important that an initiative is integrated into a school's wider planning and programmes, rather than being an isolated 'one-off' programme, and that the technology can be integrated into existing networks;
- establish clear and achievable goals, and ensure that what the project is expected to deliver is realistic. The focus needs to be on how the technology can improve teaching and learning, rather than on the provision of technology as an end in itself. However, it is important not to expect ICT alone to change classroom teaching – research shows the quality of teaching is the most important variable in learning, and the extent to which ICT

enhances learning will depend on whether teaching practice is consistent with quality teaching;

- identify at the outset how the project will be evaluated, and ensure that the appropriate data can be obtained, and that effective monitoring and control systems are in place;
- identify professional development needs and plan how those needs will be met. It should include a strong pedagogical component – that is, a focus on how to use ICT in teaching practice. Professional development for any particular initiative should be ongoing, and integrated into a school's overall professional development programme. Schools should be encouraged to develop learning communities where teachers engage in continuous professional learning;
- ensure the initiative is well-planned and designed, and potential problems identified so they can be avoided or their impact minimised. All the partners need to have a clear understanding of their respective roles and responsibilities, and teachers need to be involved early in the planning to ensure their commitment, and so they can have input into pedagogical decisions. It is important to ensure there is enough time for the roll-out, and that ICT infrastructural problems are ironed out before the technology is to be used in teaching;
- ensure that school management supports and leads the initiative, and that the initiative takes account of the 'real school' context. The commitment of school leaders will ensure the project takes place in a supportive environment in which, for example, sufficient staffing is provided or any changes needed to timetabling are made; and
- consider how the project will be sustained once initial funding or support is no longer available, and ensure that the benefits are sufficient to justify the cost.

# References

Bolstad, R. 2004. *Evaluation of the digital opportunities project.* Wellington, New Zealand: Ministry of Education.

Boyd, S. 2002. *Literature review for the evaluation of the digital opportunities projects*. Wellington, New Zealand: Ministry of Education.

Parr, M. & Ward, L. 2004. *Evaluation of the Digital Opportunities Project FarNet: Learning Communities in the Far North*. Wellington, New Zealand: Ministry of Education.

Winter, M. 2004. *Generation XP Evaluation Report*. Wellington, New Zealand: Ministry of Education.

Winter, M. 2004. *Digitally Boosted Study Support Centres Evaluation Report*. Wellington, New Zealand: Ministry of Education.