MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Technical infrastructure capacity in schools: The current situation.

NEN Trial Evaluation Report Series: Report N^{0} 5

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Foreword: Considerations for the programme

This report describes the technology infrastructures in 46 schools from across the NEN Trial. While the low number of respondents has restricted our ability to undertake detailed statistical analysis of these data there are some key messages for the programme looking ahead.

Currently, few schools have made any real commitment towards BYOD. Access to computers for students remains largely limited to shared resources, such as laptops on wheels and desktops in computer rooms. Should there be a move to BYOD across the sector the impact on the current capacity of school networks would be substantial. Further, the actual levels of infrastructure in schools are relatively low if one considers student to device or classroom to device ratios. While schools currently report reasonable levels of satisfaction with both the speed and reliability of their networks there is no surety this would be the case in the future; should they move to a more digital, let alone networked, model of teaching and learning.

School wide wireless networks were not common. Again, linked to greater student access, it is likely that schools will increasingly need to consider a wireless solution. Half of the secondary schools in the survey (n=10) reported that they intended to alter their network structure in the 12 months following the survey (through to June 2012), with others indicating they might do so. The majority of these were related to SNUP. In addition, a number of schools appear to be considering a shift to cloud storage for at least part of their requirements. In most instances they reported maintaining their core services onsite.

Primary and secondary schools tend to have very different models of management of their infrastructure systems. The former appear to be more reliant on external companies and to have less internal expertise. Similarly, primary schools were more likely than secondary schools to report external management of their Internet content filtering. Half of the primary schools (n = 12, 50%) in the survey utilise a Ministry product; a further 7 (n=29%) utilise a loop solution. Only two use internal management systems. Conversely, 45 % (n=9) of secondary schools report managing content filtering internally and 30% (n=6) use a Ministry product. These differences between primary and secondary schools are likely to be related to size and internal capacity. They suggest that primary schools are, at least initially, likely to be more receptive to a managed network providing similar services at a reasonable rate.

It is noteworthy, that while primary schools focus on laptops on wheels (or similar) secondary schools focus on desktops. This will be primarily due to the use of computer rooms for the teaching of ICT. Both are similar, in that they are a shared resource that requires preplanning by teachers and movement of either students or technology. Highlighted in our Ashburton case studies was the need for students to have access to technology, if their learning experiences are to be altered. These data suggest few students have the type of ubiquitous access to technology in their classrooms that they are likely to have in the world beyond the school gate. We would argue that for digital technologies to transform teaching and learning this level of access is necessary.

There is a recursive cycle in digital technology implementation: without use there can be no impact on student outcomes; without impact on student outcomes it is difficult to promote use to those not instinctively aware of the potential benefits of digital technologies. Transformation can only occur through use; use will only occur when there is desire; desire only occurs because of perceived benefit.

The main driver for teachers to support an initiative (beyond compliance) is that it enables them to achieve something they perceive to be important; it is preferable to their current practice. What this is can vary from managing student behaviour to promoting authentic learning opportunities and everything in between. For the N4L to be successful, desire will need to be built at the same time as the infrastructure; teachers (and parents) will need to understand why the N4L is a solution that is worth implementing. Further, school infrastructures will need to be developed concurrently with the N4L; enabling the solutions to be implemented effectively. These data, combined with the other baseline data, suggest there is much to be done.

Finally, a key issue for the programme moving forward is ensuring some level of future proofing. If the programme is successful in promoting the benefits of a networked learning environment, of 21st century teaching and learning, it will be critical the network can handle the demand that will generate. Promoting BYOD and student use of technology, for example, will not be successful without wireless capability. The result could well be a viscous cycle, where frustration means teachers actually do less with technology and rather than realising benefits the N4L could, potentially have a detrimental impact on the use of technology in classrooms.

1.0 Executive Summary

1.1 Participants.

There were only 46 respondents to this survey out of a total sample of 102 schools in the NEN Trial. This was a disappointment but not unsurprising. Other surveys requesting technical information from schools such as the 20/20 Trust and TELA surveys are equally limited in responses. There appear to be two main reasons for this. First, it is likely this is not an area of sufficient interest to many school leaders to motivate them to complete the survey. That there were more responses to the leadership survey would seem to confirm this. Second, many school leaders will not know the exact nature of their school infrastructure; this information is likely to reside amongst a number of people and in different budgets/data sets. Further, the level of technical expertise required to answer the questions with any uniformity is not readily available in many schools.

However, the demographic data we have shows we have representation from across the four loops (Proof of Concept, Ashburton, Nelson, Christchurch). There is also close to equal representation between primary (n=24) and secondary (n=20) schools with two special schools also completing the survey. While this split is not representative of New Zealand schools it does allow us to make some comparisons between these two core sector groups. Further, given primary schools are also generally much smaller than secondary, we can draw some conclusions about size differences.

The range of positions held by respondents reflects the diversity of people within schools who have responsibility for their technical infrastructures. The majority of respondents (78%) specifically mentioned ICT in their role suggesting they were answering with some expertise.

1.2 Technology in schools for student use

The most commonly reported devices in schools were desktops in classrooms and digital cameras (n=43, 93% of respondent schools). The only other technology reported by more than half of the respondents were desktops in computer labs (n=28, 61%) and laptops stored in central locations (n=27, 59%). When we determined an approximate ratio of students to devices (laptops, desktops, tablets, gaming devices and/or hand held devices) the mean was four students per device; the median was three. Five schools reported one student per device. Two of these were private schools; one a recognised pathfinder in BYOD (bring your own device) and other initiatives and two were very small rural, high decile primary schools. These findings highlight the extent to which schools are still relying on technology for students to share.

1.3 BYOD in the schools

BYOD is not common in these schools. Even where schools do have a BYOD plan it would seem that this is for specific groups of students only. Less than half of the respondents (n=19, 46%) report that students in their schools bring their own laptops while four respondents reported that students had their own tablets.

For both primary and secondary schools there were outliers with large numbers of devices reported. Within the proof of concept clusters are schools with BYOD initiatives in place and these will have influenced these data. The mean number of students was 59 in the secondary schools; which is very small number when one considers the size of most secondary schools. However, the median was

only two suggesting that, in many instances, the students with their own devices will be those with special education needs requiring technical assistance. In primary schools the mean was 27 and the median was 0.

1.4 Presentation technologies in schools

Data projectors are very common across all schools; either fixed in common areas (n=34, 76% of respondent schools), fixed in classrooms (n=39, 85%) or portable for teacher use (n=42, 91%). Interactive whiteboards (IWBs) are also common in classrooms with 30 schools (65%) having at least one. The mean number of IWBs was only four and the median two overall; highlighting that in most schools they are not yet in all classrooms.

1.5 Future purchases of technology

The most common technologies that schools report intending to purchase are desktops (n=24, 52% of respondents) and laptops (n=25, 54%). More primary than secondary schools reported they intend to purchase tablets (46% compared with 15%); hand held devices (17% compared with 10%). Secondary schools were more likely to report intentions to purchase data projectors (45% compared with29%) and desktops (70% compared with 33%).

1.6 Satisfaction with their network

Overall, schools were between moderately and very satisfied with both the speed (mean = 4.5) and reliability (mean = 4.7). For this question we looked at not only type of school but also the loop schools belonged to and their location. There were only very small differences by any of the characteristics considered. It should be noted that their level of satisfaction will be related to not only the network capacity but also the demands they place on it and their expectations. Should usage significantly increase with the network their satisfaction is likely to decrease.

1.7 Type of school network

The most commonly reported type of school network was described as a fibre backbone. This was true for both primary (n=8, 40% of respondents) and secondary schools (n=14, 70%). Very few schools reported that the best description of their school network was a school wide wireless network.

Respondents were also asked if their school had any plans to alter its network. Most respondents from primary schools (n= 14, 58%) reported there were no plans to do so within the following 12 months. However, 50% of the respondent secondary schools (n=10) said they did have plans to do so and a further 10% that they might.

1.8 School servers and storage systems

The majority of respondent schools (74%, n=34) reported that their current system was *stored and managed onsite*. For primary schools this was true for 83% (n=20) while secondary were lower at 65% (n=13). Only one school (a secondary) reported their system as *offsite physical storage*. Overall, only 9% (n=4) reported that their servers were *in the cloud*, although three others did mention virtual storage as part of a combination. In these instances the virtual storage appears to have been primarily for student use.

Interestingly, the majority of schools (n=31, 65% of respondents) reported that they had definite plans to alter their servers or were thinking about doing so. In most instances the changes included greater utilization of cloud services. A number indicated that even then they would retain their core services onsite.

The majority of respondent secondary schools (n=13, 60%) reported that their onsite servers/storage systems were currently managed by school based people. The percentage of primary schools reporting a similar arrangement was much less (n=3, 13%).

The next most common system of management was an external company providing support under an agreed contract (n=14, 31%). This was the most common form of management for primary schooosl (n=10, 42%). However, only four (20%) of secondary schools used external companies.

The type of management appears to be largely driven by size; larger schools will have the operational grants and capacity to employ personnel as well as an infrastructure that justifies the expenditure.

1.9 Internet content filtering

A similar difference exists between the management of content filtering in primary and secondary schools. Again primary schools appear to be more reliant on external management; either through a Ministry product (n=12, 50%) or a regional loop solution (n=7, 29%). In contrast, 45% of secondary schools (n=9) report internal management of their content filtering with 30% (n=6) reporting they use a Ministry product.

2.0 Method

As part of the NEN Trial participant schools were sent links to three surveys: a Principal Survey; a Teacher Survey; an ICT Infrastructure Survey. Principals were asked to forward the latter two surveys to the appropriate personnel within their schools. This report summarises the data collected through the Infrastructure Survey. The other two surveys will be reported separately before we synthesise the data we have from all three surveys.

The questions for the survey were developed in consultation with the UFBIS team members responsible for the initial design of the Network for Learning and the content and services to be provided. Our intention was to provide them with detailed information regarding the current state in these schools and to determine their capacity to fully utilise a Network for Learning.

Responses to all surveys were disappointing highlighting an ongoing issue for gathering of information to support the design of the N4L. The response rate for the infrastructure survey was only 45% (n=46). As Table 1 shows, however, the respondents were from a wide range of schools within the NEN Trial. For this reason we do believe these data are representative of schools within the Trial. Of particular note is the representation across the four loops[1]. Findings from the other surveys suggest there were some differences by loop.

The small number of respondents to this survey means our ability to complete detailed statistical analyses have been limited. Given the importance of size to the technical infrastructure required by schools we have presented data for primary and secondary schools as well as for all respondents. Not only are the requirements of primary and secondary schools likely to be different; they are also a ready indicator of school size. As indicated in Table 1 only three primary schools are large; only six secondary schools are small (n=1) or medium in size (n=5). Other work has shown[2] that size is a key determinant of school practices and need; it may be a greater influence than decile.

In some instances we have included both the median (the actual middle score) and mean (the average score) to highlight the skewed nature of the data. A noticeable difference between the mean and median shows that there are outlier schools impacting on the average (that is some have very high or very low scores).

Where there were missing data the decision was made to treat this as a zero response, rather than as a blank. This was because in all instances respondents had indicated numbers of digital technologies in columns after those which were empty.

[1] The NEN Trial schools are from four different loops: the Proof of Concept schools who joined the trial in xxx and three regional loops: Ashburton, Christchurch and Nelson.

[2] In the Network Learning Communities evaluation it was found that size was a key influence on the culture of schools.

3.0 Respondent Demographics

3.1 Participant School Demographics

Data from a total of 46 respondent schools have been used in the analyses described here. In total 24 (52%) of the respondents were from primary and 20 (44%) from secondary schools. The other two schools are designated special schools as they cater for students outside the regular schooling framework. These schools have been included in the overall data throughout this report but not broken into a respondent category to preserve anonymity.

Table 1 describes the key demographics of these schools both overall and for primary and secondary schools. Percentages reported in this table are of the total number of respondents within each category.

Key points to note are:

- There is a reasonably even spread of schools from across the four loops with slightly more representation from Nelson/Marlborough (33%).
- 37% of the schools are medium sized; 37% are large, very large or extra large; 24% are very small or small.
- The majority of the schools are high decile (54%); only 7% are low decile.
- There is a reasonably even spread between Primary and Secondary schools.
- The majority of the schools (52) are main urban schools.

Table 1: Participant schools demographics

	Overall		Primary		Secondary	
	n (46)	%	n (24)	%	n (20)	%
Loop						
Proof of Concept	10	22	4	17	6	30
Christchurch	10	22	3	13	6	30
Nelson/Marlborough	15	33	7	29	7	35
Ashburton	11	24	10	42	1	5
Size						
Very small	10	22	8	33	0	0
Small	2	4	1	4	1	5
Medium	17	37	12	50	5	25
Large	6	13	3	13	3	15
Very Large	9	20	0	0	9	45
Extra Large	2	4	0	0	2	10
Decile						
Low	3	7	1	4	1	5
Medium	18	39	9	38	8	40
High	25	54	14	58	11	55
School Location						
Rural	10	22	9	38	1	5
Minor urban	6	13	2	8	4	20
Secondary urban	6	13	4	17	2	10
Main urban	24	52	9	38	13	65

3.2 Respondent personnel within the school

Respondents were asked to identify their role within the school. This provided us with information relating to their (apparent) levels of expertise and knowledge. It also provides some evidence regarding who is responsible for infrastructures in schools. While not definitive it is worth considering.

Of those who responded 36 (78%) mentioned responsibility for ICT in some way. Seven (15%) listed their role as principal and two (4%) as deputy principal. There was also one officer manager.

The range of roles given related to ICT varied widely. The terminology included IT, ICT and eLearning. It is not clear how much schools differentiate between these terms. The roles mentioned reflect a wide range of seniority and suggested tasks from being a lead teacher through to the Director of ICT; from a technician through to a network manager. Following is a summary of their responses.

- Nine described themselves as a senior manager with responsibilities for ICT (one was a principal the others either a DP or an AP).
- One was a member of the Board with responsibility for IT.
- There were three lead teachers and one IT administrator/teacher.
- Three described themselves as the Director of ICT; while one was the Head of eLearning and IT services.
- Five described their role as ICT managers; three others were network managers; three were ICT co-ordinators.
- There were two technicians and a system administrator with three support people.

These responses suggest the majority of individual respondents were in a position to provide ICT infrastructure information. Although the survey was sent to the Principal at each school it would appear most have handed it on to the relevant staff member. The range of titles and roles reflects the varying importance placed on ICT infrastructures and the extent to which schools are able to employ a specialist person.

Not surprisingly school size appears to be the major determinant of the seniority and specialisation of any ICT role. It is the larger schools who have Directors of ICT or similar roles.

4.0 ICT Infrastructure in the school

Respondents were asked a number of questions regarding the infrastructure in their schools and its availability.

4.1 Technology for student use

Respondents were firstly asked to identify the digital technologies available for student use in their school from list they were given (Table 2). School size is an important determinant of the amount of technology available. However, given the small sample size we have not tried to allow for size when analysing these data but would need to do so in the future. Rather, we have reported overall minimum, maximum, median and mean scores for the total number of respondents (n=46). We have also reported these figures for primary (n=24) and secondary schools (n=20). We have also reported how many schools reported none of a particular technology.

Some of the key points to note from these data are:

- There is no one technology that is available in all schools.
- The most common technologies respondents report being in their schools are desktops in classrooms (n=43, 93%) and digital cameras (n=43, 93%). Those schools without desktops in classrooms are all secondary with large numbers of desktops in computer labs.
- Also common are laptops stored in a central location (n=27, 59%) and desktops in a computer lab or multimedia room (n=28, 61%); reflecting the extent to which teachers share student devices in many schools.
- Seven (29%) primaries report having desktops in a computer lab; these are the larger primaries. The majority of secondary schools (n=11, 55%) do not have portable laptop systems.
- BYOD is not common amongst these schools. Only 41% (n=19) of the schools report having laptops owned by individual students; 9% (n=4) report that students own their own tablets. The student to device ratio data, reported subsequently, suggests that in most instances not all students in a school have access to a digital device even where schools are moving towards BYOD. Of particular note is the very high ratio of students to devices in the special schools.
- Very few schools report having tablet computers either in a central location; for individual student use or provided to individual students for their use.
- Very few schools report having either handheld devices or gaming devices for student use.
- The number of desktops reported in classrooms is of interest. Our experiences in Ashburton suggest there could be concerns with the usability of many of these[3].

[3] The case study report highlights the number of desktops in the classrooms visited that were not working or of limited use.

For most devices the range of responses is very large and the median number of devices is generally much smaller than the mean. In most instances this is due to the very large number of devices the larger secondary schools report owning. The influence of one or two ‘pathfinder’ schools in the area of BYOD and student access is also noticeable. Those schools with particularly high numbers of devices are worth investigating further; particularly in terms of their Internet demand and the impact large numbers of student devices could have on the requirements of a school. We are currently developing a research project to consider this in more detail.

Table 2: Digital technologies available in schools for student use.

	Overall (n=46)				Primary (n=24)				Secondary (n=20				Frequency	
	Min	Max	Mean	Median	Min	Max	Mean	Median	Min	Max	Mean	Median	n	%
Desktops in a computer lab or multimedia room	0	350	73	15	0	33	5	0	22	350	162	185	28	61
Desktops in classrooms (not computer labs)	0	190	29	18	1	120	28	18	0	190	31	24	43	93
Laptops stored in a central location for transfer to classrooms (COWS etc)	0	160	15	6	0	75	15	9	0	160	17	0	27	59
Laptops owned by individual students	0	475	40	0	0	340	27	0	0	475	59	2	19	41
Laptops provided to individual students for their use	0	170	9	0	0	50	5	0	0	170	13	0	19	41
Tablet computers (e.g. iPads or Galaxy) stored in a central location	0	25	1	0	0	16	1	0	0	25	1	0	8	17
Tablet computers (e.g. iPads or Galaxy) owned by individual students	0	50	1	0	0	0	0	0	0	50	3	0	4	9
Tablet computers (e.g. iPads or Galaxy) provided to individual students for their use	0	9	0	0	0	9	1	0	0	2	0	0	3	7
Handheld devices (e.g. iPod Touch or Android) for student use	0	60	2	0	0	60	3	0	0	3	0	0	6	13
Gaming devices (e.g. Playstation or Nintendo) for student use10	0	4	1	0	0	4	0	0	0	0	0	0	4	9
Digital cameras (still or video) for student use	0	45	13	10	0	40	13	11	0	45	13	10	43	93

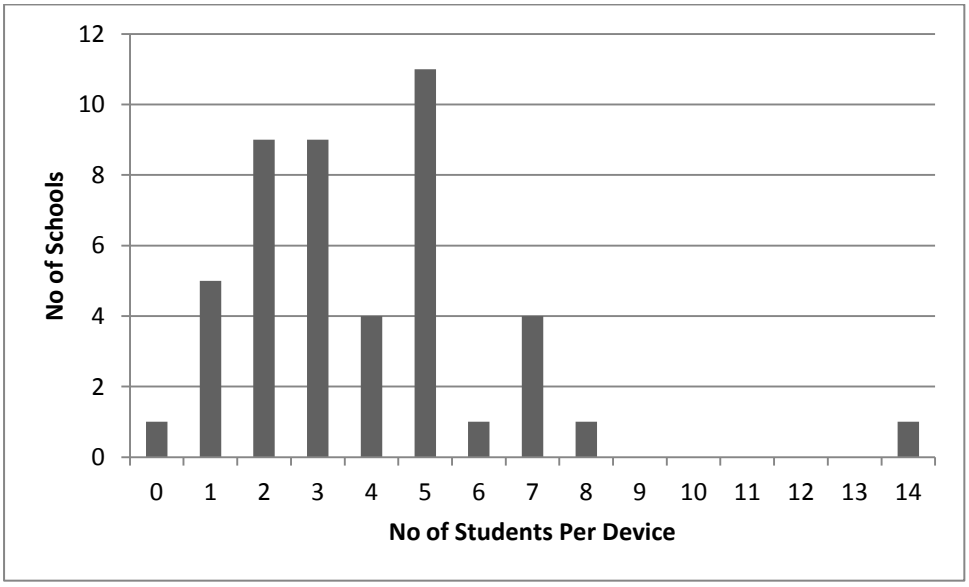
We were also interested in the number of students per device in each school. Our observations in Ashburton had highlighted the extent to which students are sharing devices. This sharing occurs between classrooms (devices are only available on a rostered system) and within classes (students share devices when they do have them in their classes).

Figure 1 displays the average number of devices per student as indicated by the data collected in this survey. The number of devices was determined by adding all devices reported in Table 2, with the exception of digital cameras. The number of children in the school (as per the latest Ministry information) was then divided by this number and rounded to the nearest whole number. Key findings from these data are:

- One school reported a very low number of students per device (0.2). This was a regional health school and as such would be a very specialised case.
- Five schools reported one student per device. Two of these are private schools (a secondary and a primary); two are very small rural, high decile primaries. The other is a low decile, large primary school known as a pathfinder in the area of BYOD.
- The most commonly reported ratio was five students per computer (n=11).
- There was one extreme outlier reporting 14 students per device; a large intermediate school with a focus on desktops in computer labs.
- The mean number of students per device was 4. The median was 3.

The key finding from these data is the limited number of schools utilising BYOD and the focus on technology that is shared across classes; whether through its location in computer labs or as portable laptop systems. Even those schools reporting BYOD appear to be in the early days of the initiative in that not all students in their school have access to their own technology.

Figure 1: Frequency of schools by number of students per device available



Highlighted in our Ashburton case studies was the need for students to have access to technology if their learning experiences are to be altered. These data suggest few students have the type of ubiquitous access to technology in their classrooms that they are likely to have in the world beyond the school gate. We would argue that for digital technologies to transform teaching and learning this level of access is necessary.

4.2 Technology in the school

The next question asked how many of each of a given list of digital technologies respondents had in their school. In this instance we were interested in digital technologies that would be used at a class level; rather than for the individual student. As for the previous question we have reported overall data; primary and secondary schools separately.

Data projectors are the most common device reported. Nearly all the respondents (n=42, 91%) reported their school had portable data projectors; seven (15%) reported they did not have them in their classrooms; eleven (24%) reported they did not have them in common areas. However, only one school did not have any data projectors at all. Interestingly, this was a secondary school.

Interactive whiteboards were rare in common areas but appear to be reasonably common in classrooms. Sixteen (35%) of schools reported they had no interactive whiteboards. However, as our Ashburton visits highlighted, schools do not have them in all classrooms necessarily. This is confirmed in these data where the mean for primary schools is only two interactive whiteboards and for secondary it is six. It does appear that where classrooms do not have IWBs they are likely to have data projectors (see Figure 2).

Only 17 (37%) schools reported having a video suite; of these 14 were secondary. One of the tools being discussed as a high end user of Internet capacity is video conferencing. However, this suggests few schools have a dedicated video suite. With the increasing capacity of desktop conferencing it is likely few will need video suites moving forward; although it should be noted that there is still a push amongst some loops for the purchase of these.

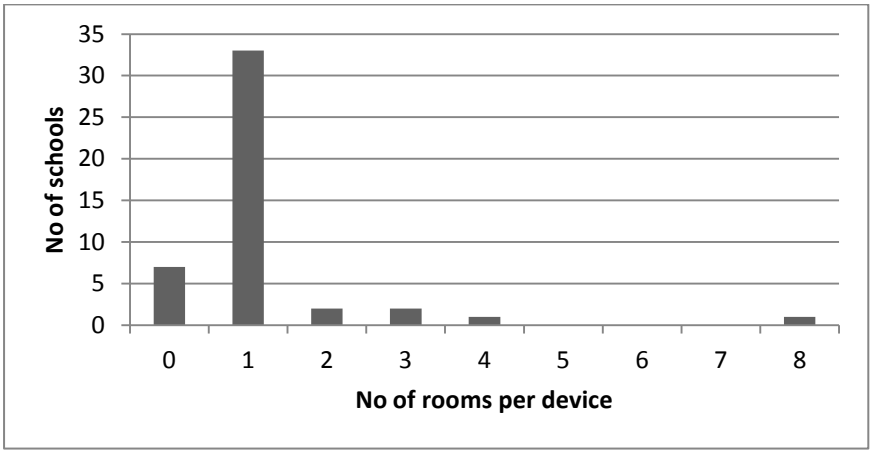
Table 3: Digital technologies available in schools.

	Overall (n=46)				Primary (n=24)				Secondary (n=20)				Frequency	
	Min	Max	Mean	Median	Min	Max	Mean	Median	Min	Max	Mean	Median	n	%
Data projectors fixed in a common area (computer room, multimedia room, school hall	0	12	3	2	0	9	2	1	0	12	5	4	35	76
Data projectors fixed in classrooms	0	100	21	11	0	35	8	6	0	100	38	33	39	85
Portable data projectors available for teacher use	0	8	2	2	0	8	2	1	0	5	3	3	42	91
Interactive whiteboards in a common area (computer rooms/multimedia rooms)	0	2	0	0	0	1	0	0	0	2	0	0	4	9
Interactive whiteboards in classrooms	0	24	4	2	0	11	2	2	0	24	6	3	30	65
Big screen TV's in classrooms	0	10	1	0	0	10	1	0	0	8	1	0	15	33
Video conferencing suite	0	6	1	0	0	1	0	0	0	2	1	1	17	37

We utilised teaching spaces per school data (available at the Ministry of Education) to consider the extent to which teachers have access to a central presentation device of some kind. We have included data projectors; interactive whiteboards and television sets in this category of device. All have the capacity to display digital material when linked to a laptop or similar.

As Figure 2 shows most schools (n=33, 72%) report having one device per teaching space. It should be noted that these figures have been rounded to the nearest whole number. In reality 27 schools reported less than one teaching space per device. Three schools reported they had no data projectors; interactive whiteboards or television sets in teaching spaces. All three reported portable data projectors.

Figure 2: Frequency of schools by number of classrooms per device available



4.3 Plans to purchase in the near future

Respondents were also asked if their school had any plans to purchase additional technologies in the 18th months following the survey (Table 4).

As these data show, the focus on purchasing new technologies remains desktops and laptops. The majority of respondent secondary schools (n=14, 70%) reported they intended to purchase desktops. Just over half of the primary (n=13, 54%) and secondary (n=11, 55%) schools reported intending to purchase laptop computers. Primary schools are more likely to report buying tablets in the near future (46% of primary respondents compared with 15% of secondary).

Table 4: Number of schools with intentions to purchase technologies

Technology	Overall (n=46)		Primary (n=24)		Secondary (n=20)	
	n	%	n	%	n	%
Desk top computers	24	52	8	33	14	70
Laptop computers	25	54	13	54	11	55
Tablets	15	33	11	46	3	15
Interactive whiteboards	16	35	8	33	7	35
Digital cameras	15	33	6	25	8	40
Hand held devices	6	13	4	17	2	10
Gaming devices	1	2	1	4	0	0
Data projectors	17	37	7	29	9	45
Big screen televisions	5	11	5	21	0	0
Video conferencing suites	3	7	1	4	2	10

4.4 Use of "new" technologies

Respondents were also asked whether their school had ever utilised either desktop conferencing tools (e.g. through a webcam) or personal student devices (e.g. telephones, mp3players, personal computers). Key findings from this question were:

- Overall 46% of the respondents said their school had used desktop conferencing; for primary schools this was also 46%; for secondary schools it dropped to 40%.
- Only 25% of the primary schools had used personal student devices compared with 60% of secondary. Overall the percentage of schools was 41%.

What these figures highlight is that secondary schools are further down the path of BYOD than primary. This is likely to be due to a greater acceptance of student laptops in schools; rather than smart phones or other hand held devices. That secondary schools are slightly lower in terms of desk top conferencing could be due to their use of video conferencing for senior school subject areas; they already have video suites.

5.0 School networks

Respondents were also asked a series of questions related to the nature and quality of the network in their school.

5.1 Satisfaction with current network

They were firstly asked how satisfied they were with the speed and reliability of their network. A six point scale was used where 1=not at all, 2= very slightly, 3=slightly, 4=moderately, 5=very and 6=extremely satisfied. Overall, schools were between moderately and very satisfied with both the speed (mean = 4.5) and reliability (mean = 4.7). It should be noted that their satisfaction will be related to not only the network capacity but also the demands they place on it and their expectations.

For this question we looked at not only type of school but also the loop schools belonged to and their location. This was to see whether there was any difference in satisfaction by region/loop. As the following figures show there were only very small differences by any of the characteristics considered. This is, perhaps, not surprising given the standardised nature of what schools are provided with as part of the NEN Trial. However, it does also suggest that all of the schools have the same expectations and requirements.

Figure 3: Satisfaction with the speed and reliability of their network by school type and overall

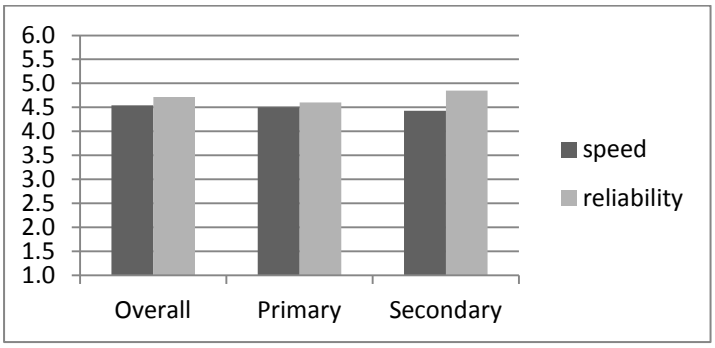


Figure 4: Satisfaction with the speed and reliability of their network by regional loop

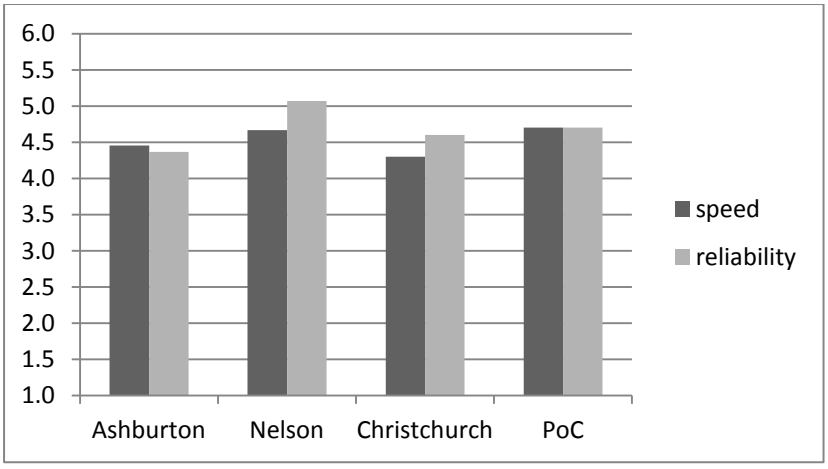
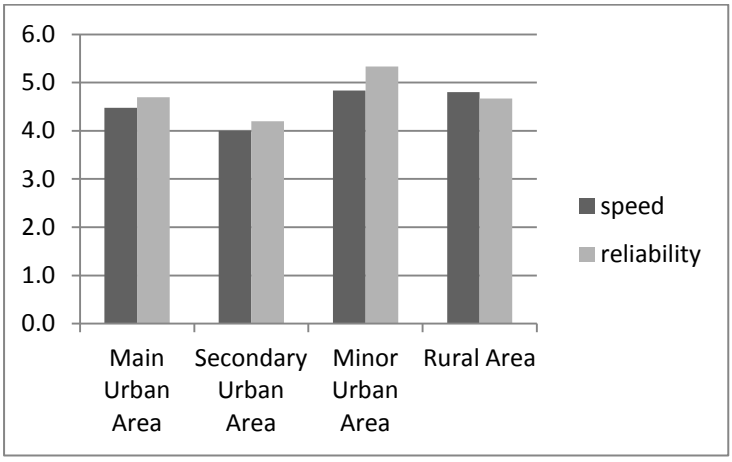


Figure 5: Satisfaction with the speed and reliability of their network by location



5.2 Networking in classrooms

The respondents were also asked what percentage of their classrooms were networked. Overall 43 of the schools (96%) reported that more than 90% of their classrooms were networked. One secondary school reported that between 30 and 50% were networked; one special school and one primary reported between 70 and 90%.

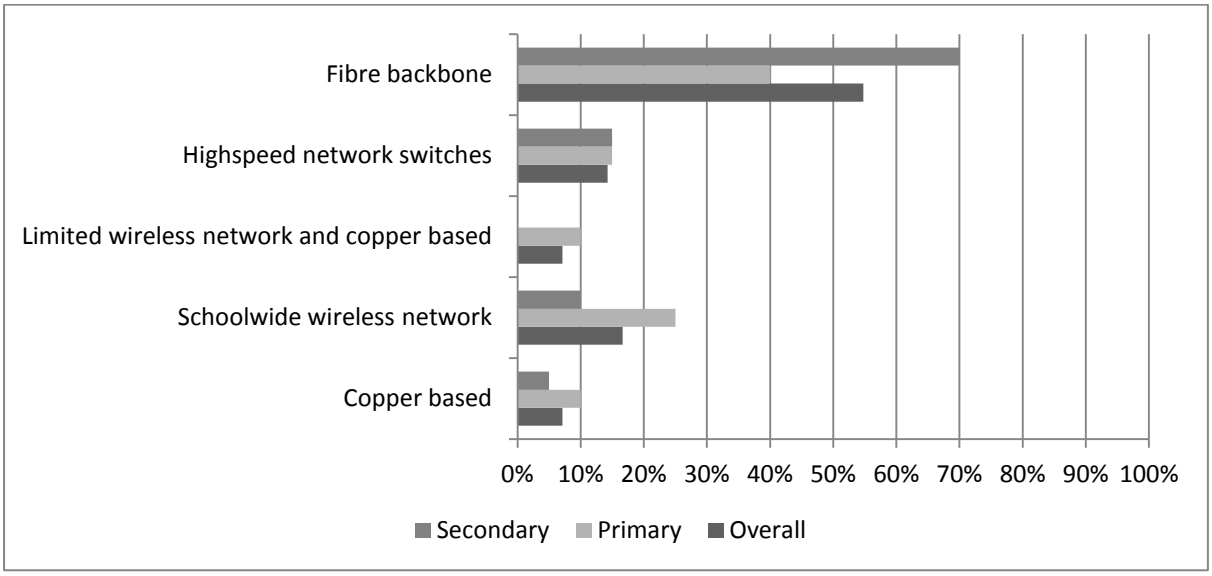
5.3 Type of school network

The next question asked which of five options best described their school network (Figure 6). They could also indicate that they did not know or provide another response. Four of the primary school respondents did not know how to best describe their network. Their responses have not been included in the data reported here.

One primary and two secondary respondents gave other responses which we re-coded as school-wide wireless. Their responses were:

- Copper backbone, school wide wireless, Gig switches (primary).
- Wireless, recent SNUP 3 so all new and high speed in 90% of the school (secondary).
- Full managed wired network with fibre back bone. Full ruckus managed wireless network (secondary).

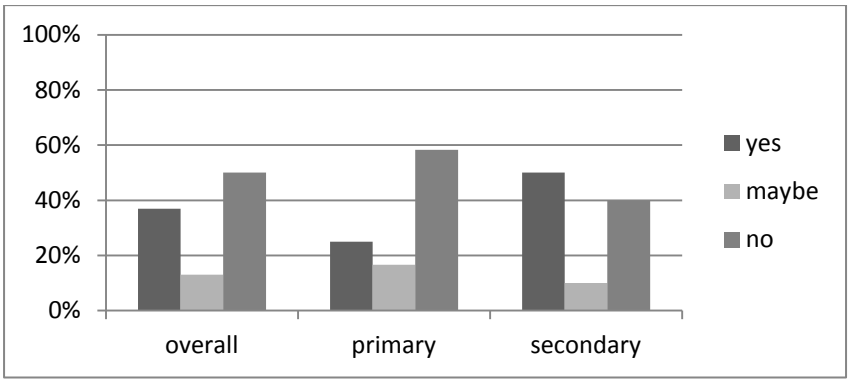
Figure 6: Percentage of schools for each description of school network overall and by school type



5.4 Plans to alter their networks

Finally, in this section, respondents were asked if they had any plans to alter the network structure in their schools over the following 12 months (through to June 2012). As Figure 7 shows most respondent primary schools have no plans to alter their school networks within the following 12 months (58%). However, 50% of the respondent secondary schools said they did have plans to do so and a further 10% that they might.

Figure 7: Percentage of respondent schools with intentions to alter servers/storage systems overall and by school type



Ten primary respondents provided information about plans to alter their school network:

- five mentioned improvements to their wireless network;
- three referred to SNUP; and
- two mentioned fibre optic connections to their server.

Responses from the secondary schools were similar:

- eight mentioned SNUP;
- one referred to a fibre backbone upgrade;
- three referred to wireless improvements; and
- two mentioned major changes due to the earthquake.

6.0 School servers/storage systems

The next group of questions related to the school servers and storage systems.

6.1 The current system

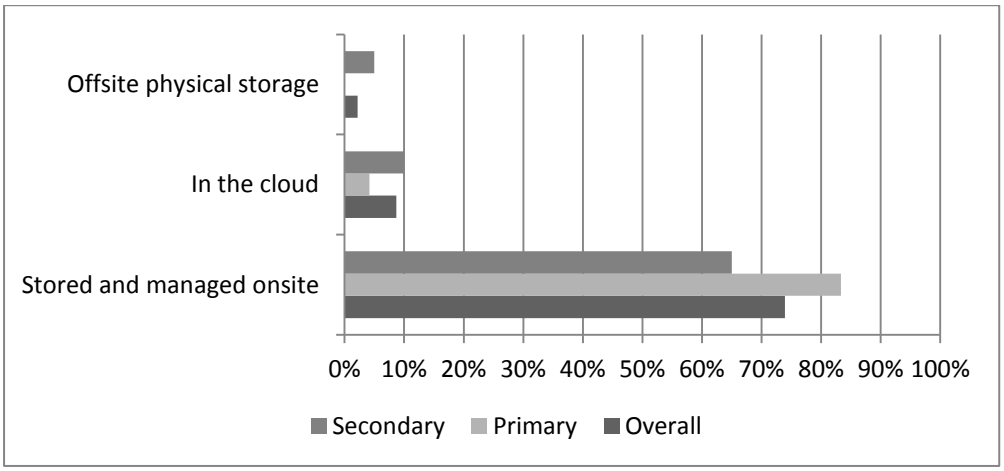
Respondents were firstly asked to choose the response category that most closely described the current system in their school (Figure 8). Again they were able to choose "other".

The majority of respondent schools (74%, n=34) reported that their current system was *stored and managed onsite*. For primary schools this was true for 83% (n=20) while secondary were lower at 65% (n=13). Only one school (a secondary) reported their system as *offsite physical storage*. Overall, only 9% (n=4) reported that their servers were *in the cloud*, although three others did mention virtual storage as part of a combination. In these instances the virtual storage appears to have been primarily for student use.

Of the seven respondents who indicated another description three were primary and four secondary. Their responses were different combinations of on and off site and in the cloud as indicated below:

- Stored onsite, managed remotely offsite (primary).
- Onsite and in the cloud (primary).
- Mixture of virtual and locally hosted services (primary).
- Distributed - onsite and offsite (secondary).
- Onsite with offsite back up (secondary).
- Both onsite and offsite (secondary).
- Virtualised servers managed onsite (secondary).

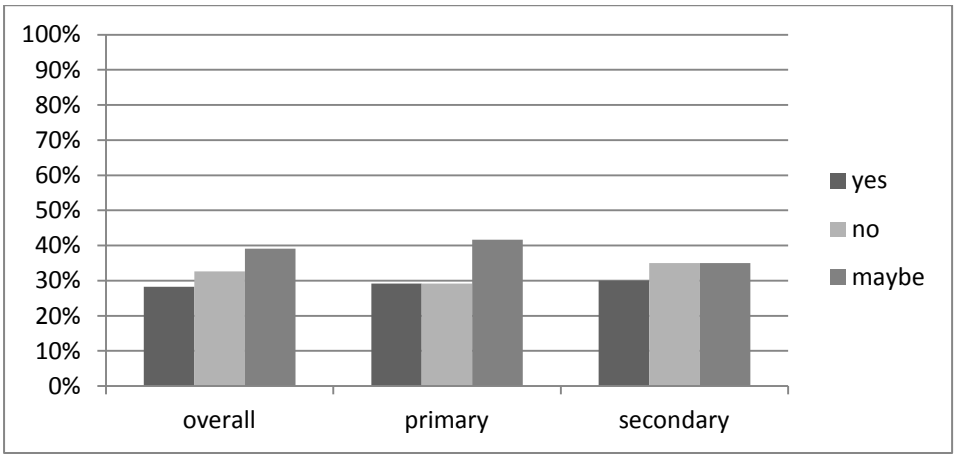
Figure 8: Percentage of schools for each description of school network overall and by school type



6.2 Plans to alter their system

Respondents were asked whether their school had any plans to alter their servers/storage system within the following 12 months (to June 2012). Overall 65% (n=31) of respondent schools indicated that they might change their servers or had plans to do so. For primary schools this was true for 71% (n=17). Of respondent secondary schools 65% (n=13) said they might make changes or had plans do so. Figure 9 summarises their responses to this question.

Figure 9: Percentage of respondent schools with intentions to alter servers/storage systems overall and by school type



Those who indicated yes, or maybe, provided detail about their intentions. In most instances these related to utilising more cloud-based services. In a number of instances the respondent stated they would retain their core services onsite. Aging, or inadequate, servers were mentioned as was the need to consider offsite backup of files. Below are the more detailed responses to this question:

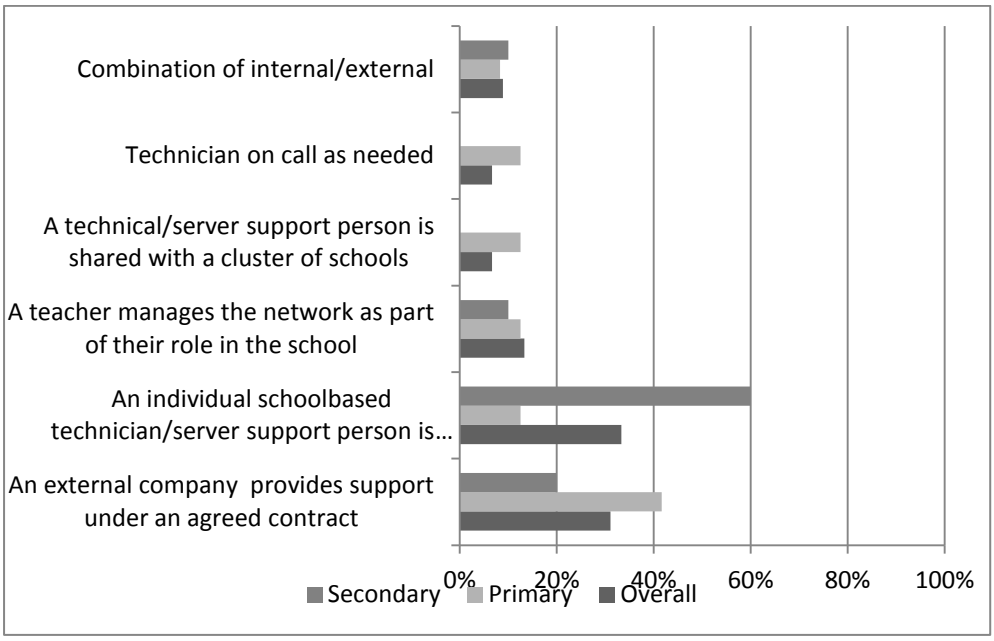
- We will start backing up into the cloud in the next 6 months
- Our server needs to be upgraded to cope with high speed data transfer; either onsite or remote through The Loop server (not yet available)
- Either cloud storage or a new server
- We are looking at basing some of our systems in the cloud.
- We have begun moving some of our storage onto external hard-drives for individuals and our email is now cloud based.
- Ashburton Schools are planning to join together and investigate a cloud server hosted by Electricity Ashburton.
- Additional offsite servers Investigate cloud storage for some or all student users.
- Looking in to the possibility of offsite backups and some data storage
- We will need to replace some our physical onsite servers due to reaching end-of-life. We will look to utilizing Loop co-lo for virtual servers and/or onsite hosted virtual server infrastructure.
- May go to the cloud for back up but will always maintain a school based one as well
- We are investigating off site backup to an offsite server - perhaps reciprocating.
- How: Virtualising servers, possibly moving several services to offsite hosting. Why: Cost, hosted solution provides backup services/better hardware
- Some services currently in the cloud - this will increase. Core of services will be hosted onsite.
- Likely to move to a mixed cloud and onsite system for flexibility and security.
- Move more servers to cloud based solutions including email. Google as a basis for documents and mail.
- We may be looking at going virtual or offsite physical, because most of the computers in our school currently have the storage capacity of our file server on a single unit. We had only a

small schools upgrade 5 years ago and technology has moved past the capabilities of our physical resources.

6.3 Management of onsite servers/storage systems

Respondents with onsite servers/storage systems were asked how these were currently managed. They were provided with a number of options to choose from and an "other" category (Figure 10). One of the options given was that a volunteer from the community supported the school in the management of their servers. None of the schools selected this option.

Figure 10: Percentage of schools for each description of the management of onsite servers/storage systems



The majority of secondary schools (60%, n=13) reported that they utilised individual school based people. In the raw data this number was slightly lower. We have re-coded three other responses from secondary schools into this category as they were also an internal model of management. These responses were:

- Full-time network manager and technician
- Three full time technicians
- Network Manager with ICT support team

The combinations of internal/external management were:

- We have a school based support person on a set number of hours and an external company with a contact who maintains the servers.
- Mixture of external and teacher (Principal)
- Myself and 2 technicians, along with a third-party support provider
- Competent technician onsite and professional IT consultants

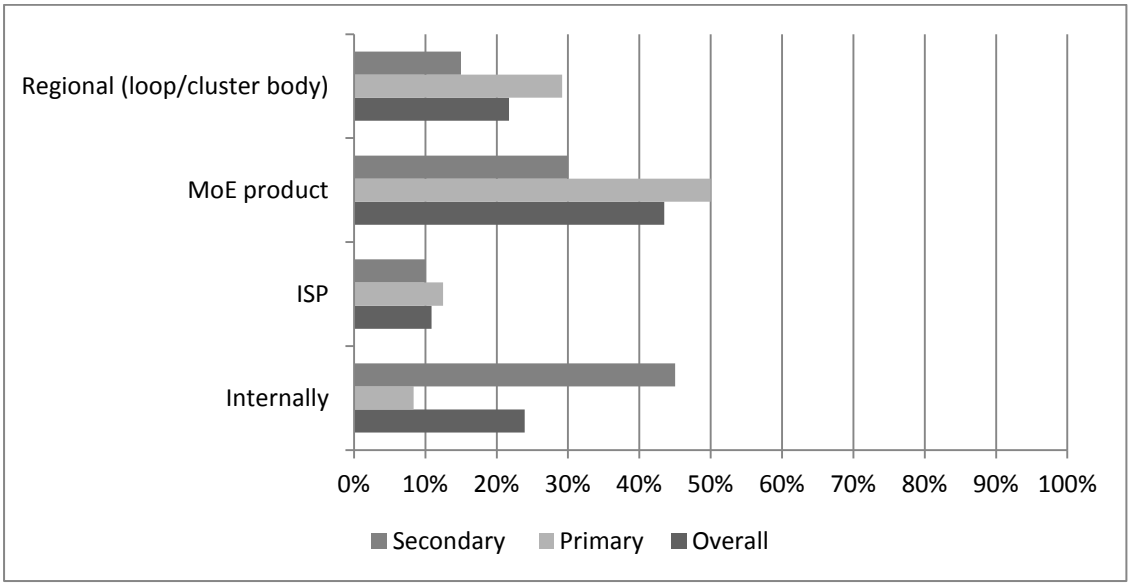
One respondent commented that they had a technician on call but that this was not their preference. They had wanted a contract/service management but the local supplier was not interested and others were too expensive. This was a very small primary school in a rural area and reflects the issues many of these schools face.

7.0 Internet content filtering

Respondents were asked how Internet content filtering was being managed at their school. They were given a list of four options and could also respond other. The options they were given were:

- Managed internally (we have our own firewall protection and filtering rules in place)
- Managed by ISP (with our filtering rules or oversight)
- Managed by a Ministry provided product (e.g. Watchdog or Schoolzone)
- Managed by a regional governing body (i.e. at the cluster or loop level for all schools in the grouping)

Figure 11: Percentage of schools for each description of the management of Internet content filtering



8.0 Belonging to the NEN Trial

Respondents were asked what the biggest challenge and biggest opportunity was that their school had faced related to their connection to fibre and the NEN Trial? A full list of each of their comments is appended. Table 5 and Table 6 summarise these responses into broad thematic categories.

As Table 5 shows there was no one category of challenge that dominated. This is probably a reflection of the diversity of respondents and their schools. The three most common types of challenges were related to the speed and reliability of their connections (n=7, 15%); the use of KAREN and being on the NEN Trial (n=6, 13%); the need to change their current systems to those required from their loop (n=5, 11%).

Table 5: Number of responses within each broad category of challenge

	Overall (n=46)		Primary (n=24)		Secondary (n=20)	
	n	%	n	%	n	%
KAREN/NEN Trial	6	13	4	17	2	10
Speed/reliability/connectivity	7	15	2	8	4	20
Technical expertise	2	4	1	4	0	0
Changes to current system	5	11	1	4	4	20
Resources; connection with other schools	2	4	1	4	1	5
Filtering	2	4	2	8	0	0
Other	7	15	6	25	1	5
None	3	7	2	8	1	5

The most common opportunities described were related to the *speed and reliability of their Internet access and the resultant connectivity* (n=19, 41%). *Resources and connection with other schools* was mentioned as an opportunity by 17% of respondents (n=8) as was *teaching and learning*. Secondary schools were more likely than primary to report the latter two opportunities.

Table 6: Number of responses within each broad category of opportunity

	Overall (n=46)		Primary (n=24)		Secondary (n=20)	
	n	%	n	%	n	%
KAREN/NEN Trial	2	4	1	4	1	5
Speed/reliability/connectivity	19	41	10	42	8	40
Changes to current system	1	2	1	4	0	0
Resources; connection with other schools	8	17	2	8	5	25
Teaching and learning	8	17	3	13	5	25
Improved hardware	6	13	4	17	2	10
Other	2	4	1	4	1	5
None	4	9	2	8	2	10

Appendix 1: Qualitative Comments

Appendix 1.1 The challenges faced

Primary school responses

- Keeping our KAREN routing reliable
- Money
- Sounds silly but our biggest problem has been reliability due to fuses being changed from 15 mA to 10 mA. Means we keep blowing fuses whenever the power has a surge or flux as it does often in the country!
- Finding out how to use KAREN
- Secondary schools access issues in terms of filtering.
- The Nelson LOOP working with KAREN, currently this isn't happening
- Infrastructure really good. No problems. Connection speed through the Loop was slow, but they have sorted it.
- Can't think of any
- Getting the fibre installed and working. Not having reliable hardware.
- DNS issues at the service provider level causing poor browsing performance, and filtering either blocking the wrong sites
- Our internal network is not that great and limits what we can do.
- Time, earthquakes,
- Still coming to grips with ICT and computer systems.
- Accessibility.
- Issues related to going back to a proxy system; blocked websites; automatic updates no longer work; unable to access our LMS website properly onsite; unreliable speed.
- PD in specific areas we want.
- Waiting for it to happen.
- New building completed at same time as connection.
- Bandwidth to Google.

Secondary school responses

- Finding applicable and useful teaching and learning resources that staff can incorporate into lessons.
- Technical: IT staffing and time required to setup and make changes.
- We have had slower speeds than expected and we don't know why. Quite a few people have been in to have a look and can't work out the answer either
- Ensuring the sustainability of the school cluster that acts as the aggregator and gateway to KAREN.
- speed during high use class time
- No fibre available. Reliant on a radio link with limited band width
- SNUP gave us fibre. NEN has barely eventuated.
- None really, other than justifying the cost. (As a Private school, there is no subsidy)
- Forced to change from Schoolzone which was very stable despite limitations. New systems have been difficult to adjust in filtering and email. e.g. bulk emails to parents during ChCh earthquake were blocked as spam by other ISPs - chaos! Essentially the hardware has been fine, the "software" has been frustrating, so it has been difficult to nuse the links as we wish.
- The need to change IP addressing and again moving to VC services
- Connecting to fibre was nice, but it did not make much difference to most teachers as the network speeds around the school did not change much. Getting the SNUP upgrade will benefit us hugely.

- Migration of gateway/proxy/filtering/mail server from Schoolzone where can be fully managed in-house.
- Poor communications regard when and how changes were being made.

Special school responses

- Connection of 7 sites across the south island
- We don't have vast expertise on our staff and as a small school, we have to rely heavily on outside help to manage the systems and to get advice. Much of the advice from experts is couched in language that is almost incomprehensible to the average person. We don't all "talk in letters and numbers".

Appendix 1.2: The opportunities

Primary school responses

- Having in excess of 450 simultaneous student users online concurrently
- Speed of connections
- Speed of access.
- Fibre is great NEN trial has made no difference
- High speed internet is invaluable, access to cloud facilities. eaSSTle
- We already have fibre, real fast internet access would be great
- All computers networked and we have mini pods in each class.
- The Nelson Loop
- Nothing so far, other than quicker internet speed.
- More speed
- Ultranet
- Inter school video conferencing
- When we had to share our school site we were able cope with the high usage.
- Nothing yet. It has caused more issues than opportunities.
- Karen and using touch pad technology
- Access to other schools and web based services at a reasonable speed
- Exploring the possibilities
- Having all components replaced as new.
- Increased client density, access to video conference bridge.

Secondary school responses

- Establishing a good relationship with our local aggregator.
- Speed and bandwidth
- A high speed, cost effective and reliable internet connection, offsite virtual server infrastructure, enhanced teaching and learning outcomes.
- Online learning - anywhere, anytime; has enabled us to move to netbooks for all students
- Directly related to the technology - virtualising and running server capability off-site. On the Learning and Teaching side - the relationship amongst the school cluster.
- Chance to access KAREN, speed and good pricing
- Power in numbers and being able to biggy back of larger schools and initiatives
- NEN unavailable
- None so far. We anticipate offsetting some of our traffic through KAREN, bu use of services such as eTV and live@edu.

- Despite many saying it is not just about the speed we have found the speed to be the key feature. e.g. Using ETV as a source of video material was simply not viable previously - 25 minutes to download 1 hour and then 3-4 mins to unzip. Now 3 minutes over NEN and the zipping has been removed so its ready for use. Google Earth is now functional and we do not have to count the cost. Speed and free access to educational resources are marvellous.
- Video conferencing.
- VC and fast connection speeds
- Getting a Video conference facility will be a big opportunity for us. As a smaller school, the opportunity to provide online learning for senior students in small subjects would be exciting.
- So far, fast internet. We are currently researching other opportunities relating to LMS and other learning tools.
- Cloud computing, better VC.
- Cloud services

Special school responses

- Improved internal site-to-site connection and possibility for direct interaction with other schools.
- Fast access to a range of teaching and learning tools. Opening up more of the world for our students who have special learning needs.

Appendix 1.3: General comments

Primary school responses

- Thank-you for allowing us to be part of the NEN trial. It has made a huge difference to us being able to move forward and afford our students excellent opportunities
- The greatest problem is the extra work load on teachers when it come to ICT and the implementation of this technology,
- In assets you talk about interactive white boards we are going down the path of Mimio pads and Capture scan units currently 2 in the school. More flexible than interactive whiteboards and work the same way.

Secondary school responses

- People keep expecting fireworks. This will come, but the real benefits are in the everyday areas where the tecdious becomes fast and efficient. As one with hearing issues it is like having all the background noise eliminated and being able to concentrate on just the important and relevant aspects. At last it just works without delays, repeats etc.
- We have not been able to make the best use of the NEN trial so far because of network and hardware limitations in our school. Also, informing busy teachers about the opportunities of the NEN Trial is not easy.

Special school responses

- The consequences of the Christchurch earthquakes have greatly limited our ability to give time and focus to pursuing the opportunities to collaborate in teaching and learning with other schools
- We are convinced the trial is worthwhile and once the "bugs" are all out of the system, the whole education system will benefit from it. We can see the huge benefits for students, and teachers and the increased involvement of families and communities in education.