How two large New Zealand secondary schools manage their Information and Communications Technology

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Abstract

Reviewing research on how ICT is managed in large secondary schools shows a significant gap in research in this area. The ‘Review of Schools’ Operational Funding: ICT Resourcing Framework – Final Report (MOE, 2007b) describes a need for sound ICT management and strategic planning in schools yet no research was located to describe how this is actually achieved.

This research explores how two large New Zealand secondary schools manage their ICT systems. Two schools of differing decile ratings are examined and those involved in managing their ICT were interviewed, along with teaching staff in both schools. Making extensive use of direct quotes from the interviews a picture of the management structures, strategic planning and ICT alignment in each school is built and then the two compared. The pictures developed in these two case studies show significant complexity in the functional management structures found and pose a number of observations and questions for further study. In particular, the roles of the Director of ICT and of the ICT Committee are examined.

Given that schools essentially do not generate income the alignment of their ICT with the institution is explored from a perspective of justifying ICT in schools. Further, the users of the systems are examined and the impact that the different groups of users have on the alignment of ICT is explored. It is also noted that the schools in this study did not exhibit signs of significant strategic planning.

This research does not purport to describe best or even desired practise but is a ‘snap shot in time’ of the two schools. As such, its generalisability is limited but it is hoped it will spark further interest in research in ICT management in schools.
Acknowledgements

Getting to this point is a journey and like any journey there are lots of people you meet on the way. Some have a large part to play, some smaller but significant; some are with you the whole way whilst others only for a portion of the journey. In singling some out I will miss others so please, to all who have helped get me here, thank you.

I must thank Logan Muller and Noel Bridgeman for their support, encouragement, enthusiasm, encouragement, advice, encouragement and assistance with the whole process and in particular whilst putting the final document together. Without your ongoing help I would never be here. Also to Donald Joyce, thank you, for looking after all the details of both my being a student and of this research.

Thank you to the schools who let me talk with their staff and thus become the subject of this research. Without your enthusiasm and honesty I could not have completed it.

Dedication

I should like to dedicate this work to my parents, Stuart and Brenda Douglas, and in particular my mother who always wanted me to further my education and complete a post graduate degree. Sadly, she passed away a few short months before I began this journey.

This one’s for you Mum.
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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>asTTLe</td>
<td>Assessment Tool for Teaching and Learning</td>
</tr>
<tr>
<td>AR</td>
<td>Attendance Recording</td>
</tr>
<tr>
<td>eAR</td>
<td>Electronic Attendance Recording</td>
</tr>
<tr>
<td>BECTA</td>
<td>British Educational Communications and Technology Agency</td>
</tr>
<tr>
<td>BOT</td>
<td>Board of Trustees</td>
</tr>
<tr>
<td>CBT</td>
<td>Computer Based Training</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
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<tr>
<td>CFO</td>
<td>Chief Financial Officer</td>
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<tr>
<td>CIO</td>
<td>Chief Information Officer</td>
</tr>
<tr>
<td>COO</td>
<td>Chief Operations Officer</td>
</tr>
<tr>
<td>CT</td>
<td>Communications Technology</td>
</tr>
<tr>
<td>DP</td>
<td>Deputy Principal</td>
</tr>
<tr>
<td>FFP</td>
<td>Foreign Fee paying Students</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HOD</td>
<td>Head of Department</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>IWB</td>
<td>Interactive White Board</td>
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<tr>
<td>LMS</td>
<td>Learning Management System</td>
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<tr>
<td>MOE</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>NOS</td>
<td>Network Operating System</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation of Economic Co-operation and Development</td>
</tr>
<tr>
<td>OLE</td>
<td>Online Learning Environment</td>
</tr>
<tr>
<td>OS</td>
<td>Operating System</td>
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<tr>
<td>SAN</td>
<td>Storage Area Network</td>
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<tr>
<td>SISP</td>
<td>Strategic Information Systems Planning</td>
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<tr>
<td>SMS</td>
<td>Student Management System</td>
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Nomenclature for Interviewees

To preserve anonymity the persons interviewed are not names, not the school they work for. However, their position in the school is relevant and this research reviews ICT Management in two schools. Thus the following nomenclature has been used to identify interviewees:

S1  School One
S2  School Two
P1  Person One
P2  Person Two and so forth

Where staff were at a similar position in the school an A,B or C suffix was appended. Thus:

S1P1  School One, Person One
S2P3  School Two, Person Three
S1P5A  School One, Person Five – A
S1P5B  School One, Person Five – B, where persons A&B are at a similar level.
1 Introduction

In May 2008 the NZ Herald published an article reporting on the costs associated with ICT in New Zealand schools. This article noted that in 2005 schools were spending up to $245 million on ICT (Mckenzie-Minifie, 2008b). It was posted on the NZ Herald website and readers invited to append their comments on the article. Of the 54 responses reviewed, 21 (39%) talked about Microsoft products versus Linux or Apple computers. 13 (24%) assumed ICT was only in schools to teach about ICT (although this ‘tone’ could well be underlying a raft of other responses). A mere three responses made reference to pedagogy (two of them only in passing) whilst only two (from people who work in schools1) touched on the complexity of ICT in schools. (From Mckenzie-Minifie, 2008a)

Granted that an article such as this is not likely to produce a well rounded sample of opinion it still suggests that the general public do not know what ICT is used for in schools, nor do they see the complexity of ICT in large schools (or smaller ones for that matter). This complexity needs to be managed by people who understand how ICT is actually used and deployed in a school environment. This whole aspect of ICT in schools, the provision of quality ICT management and support, was not mentioned in any of the responses to the NZ Herald article.

This research examines how ICT is managed in two large New Zealand secondary schools. The two case studies give a picture of how the schools manage their ICT and plan for the future, and identifies issues that arise in the effective and perceived use of ICT in the secondary learning environment. Those staff in the school who were involved in the management of ICT, from the Principal down, were interviewed along with members of the teaching staff not associated with ICT management. The data gathered was

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1 One of these was the researcher
examined for themes and a picture of each school’s ICT management structure built up. The analyses of the two schools were then compared for commonalities. Throughout the analysis a number of observations were noted which are further explored and commented upon in Chapter 6.

A review of literature (Chapter 3) suggests that very little research has been carried out in the field of managing ICT in schools, and especially so in large New Zealand Secondary Schools. It is hoped that this research will contribute in this area of ICT research but more importantly, spark further interest and research in ICT management in New Zealand schools. Schools have a huge investment in ICT with Ministry of Education (MOE) data suggesting that combined together schools spent $245m on ICT in 2005. It was further estimated that schools spent $63m of their own operations funding on personnel (Technicians and non-ICT staff) (MOE, 2007b, p. 7) ICT Managers and school ‘line managers’ are included in this figure. Given this level of expenditure and the pervasiveness of technology in our society today, the key issues of managing, planning and strategic impact of such technology and investment in the school environment is worthy of researching.

It is anticipated that this study will provide:

1. Data on the ICT issues faced by schools and how they have worked to alleviate these.
2. Data on the factors that influence the alignment of ICT to school outcomes.
3. Data that will inform ICT decision making in other schools
2 Definitions and discussion

Some terms used in this research may be new to readers not familiar with schools and have been defined here to assist understanding. Other terms that could beneficially be defined before they are met in the text have also been included.

2.1 ICT

ICT is used as an acronym for Information and Communications Technology and refers to methods of storing, manipulating and communicating information. In the school context this includes, but certainly is not limited to, computer based technologies, digital imaging, the internet and telephony. In a large New Zealand secondary school this would include all file servers and data storage devices, network infrastructure, desktops and a laptops and internet connectivity.

The term ICT is embedded in much literature from the New Zealand Ministry of Education (MOE). The latest digital strategy publication, Enabling the 21st Century Learner: An e-Learning Action Plan for Schools 2006–2010 (MOE, 2006b), did not define the term ICT and so an earlier MOE reference was sought. The Digital Horizons - Learning Through ICT document contained the following definition of ICT

“(IT) is the term used to describe the items of equipment (hardware) and computer programs (software) that allow us to access, retrieve, store, organise, manipulate, and present information by electronic means.”

“(CT) is the term used to describe telecommunications equipment through which information can be sought, sent and accessed”

(MOE, 2003)
2.2 e-Learning

The MOE used the term e-learning in their document Enabling the 21st Century Learner: An e-Learning Action Plan for Schools 2006 – 2010. They define e-learning as

“Learning and teaching that is facilitated by or supported through the smart use of information and communication technologies.”

(MOE, 2006b, p. 2)

e-Learning is not learning about ICT, nor is it the use of computer software to teach, such as Computer Based Training (CBT) systems. Rather, it is about students learning through the use of technology that supports the students in their learning. Schools use the term ICT as the ‘Communication’ element of ICT is highly important. For example, the use of Wiki sites, online discussion boards, chat sessions or school based Learning Management Systems (LMS) to facilitate group work amongst students. The ICT is simply a medium by which student learning is enabled.

2.3 Learning Management System (LMS)

The MOE define an LMS as

“A software package to manage and deliver learning content and resources to students, usually comprising a variety of applications amalgamated as an “integrated” package and used within an OLE.”

(where an OLE is an Online Learning Environment)

“The complete online environment where a learner can access a range of applications or resources.”

(MOE, 2006b, p. 2)

Schools initially developed intranet systems as a mechanism for passing content to students in a way that was not limited by locality and time. As more uses for these systems, and more tools have been added to them they have been developed into packages termed learning management systems. Some systems are available ‘off the shelf’ or some schools have developed their own systems using tools such as Moodle.
2.4 Student Management System (SMS)

A Student Management System is a software package that is used to enrol, monitor and record information about, and report upon, students in the school. The use of these packages is now mandated by the MOE who have reviewed and accredited seven packages for use in New Zealand schools with a view to consistency of information and to enable interchange between schools as students move. (MOE, 2008e) These packages have essentially become ‘core applications’ for schools. Their deployment and use has a significant impact on how teachers work, the school is administered and hence are a significant factor in the alignment of ICT to the school.

2.5 School decile rating

A school’s decile is a rating of the socio-economic ‘status’ of its client community that is assigned to it by the MOE.

The MOE applies a rating system to schools to establish the socio-economic status of its client community, which is then used as a determinant for the level of assistance the MOE will offer the school. The rating system assigns a 1 to those 10% in the lowest socio-economic areas, up to a 10 for those 10% in the highest areas, with the rating system using all values from 1 to 10.

“A school’s decile indicates the extent to which the school draws its students from low socio-economic communities. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students. A school’s decile does not indicate the overall socio-economic mix of the school.”

(MOE, 2005b)

This measurement is carried out by the MOE.

The final comment regarding how the decile rating does not necessarily reflect the actual students that may appear at the school is pertinent to many schools where the decile of the school may not accurately reflect that of the students attending. This can occur where caregivers elect to send their
children to other, ‘better’ schools as out of zone enrolments. This then reduces the ‘calibre’ of the students in the local school whilst not affecting the ‘calibre’ of the community used for the school’s decile rating.

2.6 The CEO, CFO, CIO and COO

These are terms commonly used in describing senior roles in a commercial organisation and are used in this research as a comparison.

CEO – Chief Executive Officer or the executive in charge of the organisation. This is normally the ‘highest’ salaried position in the organisation and appointed by the organisation’s board.

CFO – Chief Financial Officer or the executive in charge of all financial practises and reporting in the organisation.

CIO – Chief Information Officer or the executive in charge of all IT and data for the organisation

COO – Chief Operations Officer or the executive in charge of the day to day operations of the organisation

An in depth discussion of these roles is well beyond the scope of this research and the titles are only used for comparative purposes. The interrelationship and relative ‘position’ of these positions can give a significant insight to the priorities and structure of an organisation.

2.7 What is meant by ‘Alignment’ of ICT

Alignment is essentially the ‘fit’ between ICT and the organisation in which uses the ICT. It can be summed up deceptively simply by asking the question ‘does the ICT in place do everything that the organisation requires of it in an effective way?’

A discussion of alignment of ICT to business practice is a huge field in itself. Further, there appears to be little or no research on alignment of ICT in schools. Weiss, Thorogood and Clark give a good starting point in stating that
a study of alignment helps “key decision-makers answer the question, ‘How does IT contribute to business objectives?’” (Weiss, Thorogood, & Clark, 2006) Others describe alignment as being the strategic fit between the elements of the organisation. (Jonkers, Lankhorst, van Buuren, Hoppenbrouwers, Bonsangue & van der Torre, 2004; Kuwaiti & Kay, 2000) Thus, in an educational context the concept of alignment of ICT suggests a discussion of how the school’s ICT helps to achieve the core objectives of the school. The question is immediately raised as to what these core objectives might be, which will vary from school to school depending upon each school’s vision.

Jonkers et al state that, “Obviously, the world of business alignment is as diverse as it is complex” (Jonkers et al., 2004) and so this discussion is limited to more recent research on ICT alignment, all of which is conducted in a business context, which will then be applied to the educational context.

Much of the literature discusses the obtaining of a competitive advantage through the alignment of their ICT (Jonkers et al., 2004; Kuwaiti & Kay, 2000; Weiss et al., 2006) which to an extent is not appropriate for a state secondary school environment regulated by zoning. Schools do try to lure students, especially foreign fee paying students, however ICT is seldom mentioned more than obliquely in such marketing. However, alignment of ICT also looks at the area of organisational effectiveness of their ICT.

“Business alignment is commonly recognized as an important instrument to realize organizational effectiveness. Organizational effectiveness is not obtained by local optimizations, but is realized by well-orchestrated interaction of organizational components” (Jonkers et al., 2004)

Thus, for ICT to be ‘aligned’ with the school it must be well planned (‘orchestrated’) across the institution. The outcomes for the institution are realized by improved effectiveness. This is becoming readily apparent in schools as they deploy Student Management Systems (SMS) to manage their students.
2.7.1 Definition of significant alignment

Mackey and Mills propose a four stage maturity model for ICT alignment (Mackey & Mills, 2003) which is further refined in section 4.9.3. If this were used as a basis for analysis then a highly aligned school would be characterised by ICT strongly supporting the organisation and functioning of the school, strong ICT knowledge vested in senior management with constant discussion between the parties regarding how ICT can assist and support the school in its core outcomes. Deployment of ICT would reflect both pedagogical and administrative requirements of the institution.

2.7.2 Further considerations on alignment of ICT

One significant outcome from this review is that there does appear to be two schools of thought regarding CEO’s (Principals) and CIO’s (Directors of ICT or IT Managers). In the business context McAdams states that:

“It's up to CIOs to be well versed in both business and technology to avoid the problem of IT shops and business units failing to understand each other”

(McAdams, 2006, p. 42)

The implication is that the CIO must fully understand both the industry they work in, and the IT that supports or could potentially add value, and it is their responsibility to ensure the institution is aware of the potentials that IT offers it. This also suggests that the IT manager should have ‘come through the ranks’ so as to be aware of the business context.

However, citing other researchers, Kearns and Sabherwal note that:

“some articles have examined the enablers of alignment, with top managers’ knowledge of IT being the most prominent such factor”

(Kearns & Sabherwal, 2006, p. 132)

This also lines up with the research of Mackey and Mills (2003) that noted better levels of alignment of ICT in New Zealand Primary schools where the Principal was also versed in ICT.
This review suggests that both these ideas are true to an extent, but a more important factor for ICT alignment, is the communication between the two senior managers (the Principal/CEO and the IT Manager/CIO) and other senior managers.

“A company’s CEO, COO, CFO, and CIO must be of one voice, or there will be misalignment from the beginning.”
(Holland & Skarke, 2008, p. 46)

In a school context, this is the Principal (CEO), SMT (COO), Bursar (CFO) and Director of ICT and/or IT Manager (CIO).

2.8 Managers and Users

For the purposes of this research it is important to make a distinction between the users of ICT systems and those who manage them. The Online Compact Oxford English Dictionary supplied the following definitions.

Manage:

“verb 1 be in charge of; run. 2 supervise (staff). 3 administer and regulate (resources).”
(Oxford Dictionaries, 2008)

Manager:

“noun 1 a person who manages an organization, group of staff, or sports team. 2 a person in charge of the business affairs of a sports player, actor, or performer.”
(Oxford Dictionaries, 2008)

User:

User – “noun 1 a person who uses or operates something.”
End User – “noun the person who uses a particular product.”
(Oxford Dictionaries, 2008)

To accurately picture all actors in the management of ICT in a school it is necessary to define what is meant by managing (Manager) as opposed to using (User or End User). Using the dictionary definitions above the key difference between a manager and a use is the aspect of ‘being in charge of’ or ‘supervising” Initially this seems a simple enough but quickly becomes complex when ICT systems are considered. Users may in fact be sole users of a particular system giving them the appearance of managing that system. In
ICT jargon there is the term ‘Power User’ which is used to denote one who has significant depth of knowledge and/or ability with a particular ICT system. Does this then make them a manager of that system?

Further, management authority may not in fact be formally delegated, but can be assumed by a power user who gains more knowledge in a system than any other person in the organisation, and thus begins making decisions regarding the deployment or use of that system.

For the purposes of this research a line is drawn at the point of control and the following definitions used:

**User**
A person who makes use of ICT systems but does not have any direct control over those systems.

**Power User**
A person who makes extensive use of, and has a deep knowledge pertaining to an ICT system or systems, but does not exercise any form of control over those systems.

**(ICT System) Manager**
One who makes control decisions regarding an ICT system or systems. This includes, but is not limited to, deployment, access, upgrade and version control, purchase or disposal. No distinction is made between assumed and delegated managerial authority.

It is conceded that there will still be some blurring of the line between Power Users and Managers.

**3 Literature Review**
Throughout this section and in much of the following research, extensive use has been made of the Ministry of Education website, WWW.MINEDU.GOVT.NZ. This is the main portal used by the MOE to provide
current information to New Zealand schools. In particular, the MOE’s Review of Schools’ Operational Funding: ICT resourcing Framework – Final Report (MOE, 2007b), is a good indicator of the MOE’s thinking on ICT and the management of ICT in schools.

This literature review is broken into the following sections

1. Section 3.1 explores why ICT is used in schools and the implications of this for managing the ICT.
2. Section 3.2 examines the complexity of ICT in schools, how it is used and deployed and in particular, the complexity of this deployment.
3. Section 3 reviews current research on managing ICT in schools and points out a gap in research regarding the management of ICT.

3.1 The importance of ICT to schools

3.1.1 Why ICT in Schools?

Why use ICT in the education of school students? Why would teachers want to use ICT in their teaching regime? Loveless (2003) suggests that it is about giving students the best possible alternatives to learn from and through.

“If education is about learning – cognitive, social, emotional, spiritual, moral and physical – then teachers must consider the best experiences, resources and environments in which these can be supported.”

(Loveless, 2003, p. 96)

However, Loveless also suggests that teachers should carefully consider claims that ICT contributes to children’s learning, noting that:

“these claims do not assert that children placed in front of a computer will automatically learn more effectively across the curriculum. Indeed, there is evidence to suggest that for a variety of reasons, computers in classrooms have had a disappointingly limited effect so far”

(Loveless, 2003, p. 96)
However, the MOE is very keen to see ICT used in New Zealand schools stating that:

“Used effectively ICT has the potential to bring about improvements in educational outcomes for all 21st century learners. To achieve this, however, it is vital that ICT becomes better integrated with teaching and learning.”

(MOE, 2007b, p. 1)

The MOE further describes the NZ Government’s goal to create a ‘knowledge based economy’ and ensuring that all school graduates are able to participate within it; one that

“equips all New Zealanders with the knowledge, skills and values to be successful citizens in the 21st century”

(MOE, 2007b, p. 12)

Thus schools are seen at the forefront of developing an ICT capable society which implies not just learning about ICT but using ICT as ‘a matter of course’, enabling the learner in other learning tasks. ICT is to be embedded in what students (and teachers) do.

However, the same research does issue a warning about ICT in schools, noting that ICT is not an end to itself but is a support for the teaching and learning in the school. They suggest that school leadership (Board of Trustees (BOT), Principal, Senior Management Team (SMT)) have a role to ensure that ICT developments have clear and appropriate outcomes for the school.

“school leadership has an important role in ensuring that a clear educational rationale exists for ICT initiatives and interventions, otherwise there is a danger that it will become technically driven rather than educationally driven.”

(MOE, 2007b, p. 22)

Hence the level of ICT understanding of the senior management team of the school, and their involvement in the process of ICT planning, is crucial to the overall educational results. (Mackey & Mills, 2003; MOE, 2007b)
3.1.1.1 Alignment

A fundamental question to any study of ICT in schools would be whether ICT is important to schools. Is ICT important for teaching, for student learning or for school administration. In other words, what does the institution as a collection of users, want from the ICT? Research carried out by the British Educational and Communications Technology Agency, BECTA, points to improved student outcomes through the use of ICT (BECTA, 2003a), calling ICT a basic educational utility (BECTA, 2006, p. 2). This research further identified five factors for the development of ICT learning opportunities. These factors are:

- ICT resources
- School leadership
- ICT leadership
- General teaching
- ICT teaching

(from BECTA, 2003a, p. 2)

The first three items have to do with the deployment of ICT (ICT Management), the vision for the school (School management and leadership) and leadership in ICT, whilst the latter two roles are very much related to the quality of teaching within the school. The first three roles are clearly separated by the BECTA research and it is interesting to note that Lai and Pratt found similar functions being performed by a single individual in their research into ICT Coordinators. (Lai & Pratt, 2004)

As part of their six fundamental principles for ICT in school the MOE state that

“ICT can be used to bring about improvements in educational outcomes by supporting effective teaching”

“all New Zealand students should be able to access ICT at school and have the opportunity to become confident and capable users of ICT”

And that

“ICT can improve the efficiency and effectiveness of educational administration both at the school level and across the system as a whole.”
(from MOE, 2007b, p. 2)

Put together these three statements suggest key elements of what the MOE may define as alignment criteria for ICT in schools; supporting teaching, access for students and supporting school administration.

In further research BECTA notes that:

“Using ICT to enhance teaching and learning and support institutional development depends on the existence of a coherent and reliable technical infrastructure within schools.”

(BECTA, 2003b)

This is also echoed by the MOE, in particular in developing infrastructure in schools. (MOE, 2007b)

BECTA also found that “there is a necessary concern for those schools which do not have the base levels of leadership and teaching on which to build.” (BECTA, 2003a, p. 2), and that a vital enabler for student achievement is the provision of good ICT resources (implying good ICT Management), stating that:

“Good ICT resources must be present for a secondary school to offer good ICT learning opportunities to pupils, although good ICT resources alone will not guarantee good ICT learning opportunities.”

(BECTA, 2003a, p. 2)

As BECTA note, both teaching and infrastructure must be in place to promote student outcomes. This research will look at how schools manage the infrastructure so as to provide an enabler for student achievement.

ICT comes at a price however. BECTA (2006, p. 4) have further researched the cost of ICT infrastructure in secondary schools, producing values for the Total Cost of Ownership (TCO) in pounds sterling, at £246 per student, or £1,036 per PC. It is noted that this data is not directly applicable to New Zealand schools and the ascertaining of a relevant New Zealand figure would be an interesting topic for further research. However, the BECTA research does indicate that ICT services (hardware, software, infrastructure and consumables) constitutes 38% of the Total Cost of Ownership for ICT, with
formal ICT support being a further 35%. (BECTA, 2006, p. 3). The research goes on to discuss ways UK schools used these findings to inform ICT management within the school. Similar information would be of significant value for New Zealand schools and the MOE is mooting the development of a tool to give data on TCO to inform management decisions in New Zealand Schools. (MOE, 2007b, p. 22)

One significant factor from the BECTA (2006) research on TCO was that in regard to outsourcing ICT support they found that

“no single method of providing technical support (e.g. through in-house assistance or external provision) was clearly more cost-effective than others in every situation.”

(BECTA, 2006, p. 5)

The decision of whether or not to outsource ICT support is frequently debated in New Zealand schools.

3.1.1.2 Pedagogy, ICT and Capability

As noted earlier by Loveless (2003), simply giving students access to ICT will not make necessarily make them learn more or better. Rather, she suggests that students need to be taught more than how to use ICT, they must also be taught why and when to use ICT. (Loveless, 2003)

Students need to be taught to “apply understanding and competence to the general process of dealing with information.” In other words, students are qualified and confidently able to use ICT actively by choice and with understanding of purpose of the application and how it relates to the task at hand. (Loveless, 2003, pp. 10-11)

Loveless (2003) goes on to discuss involving students in talking about the application of ICT to, and its effects upon, their work.

“making the connection between the art of teaching (pedagogy) and the children’s experience of ICT (practice) lies at the heart of the development of ICT capability for teachers and children”

(Loveless, 2003, p. 20)
“ICT Capability is characterised by an ability to use ICT tools and information sources to analyse, process and present information, and to model, measure and control external events. This involves using information sources and ICT tools to solve problems and support learning in a variety of contexts, understanding the implications of ICT for working life and society” (Loveless, 2003, p. 101)

It is comforting to see Loveless assert that the teacher’s role is secure and not to be supplanted by a ‘teaching machine’.

“ICT will not replace teachers, at least not effective teachers who see their role as encompassing more than being a ‘knowledge base’, providing input and feedback to correct responses. ICT can be a catalyst, however, for thinking about one’s roles and responsibilities as a teacher.” (Loveless, 2003, p. 17)

Loveless cites much research showing ICT and pedagogical change working together, with teachers acting more as guides for student learning and less like a ‘sage’ where knowledge and learning is concentrated. (Loveless, 2003)

Thus, the teachers responsibility is to “to provide both support in skills and techniques for the operation of the resources, and a quality of understanding of the field of knowledge involved in the task” (Loveless, 2003, p. 19). In other words, to be actively instrumental in the students journey to learning through the medium used, such as ICT.

The role of a teacher is held as ‘Loco Parentis’ or in place of the parent. It is the responsibility of the teacher to ensure the safety and well being of the students they teach and this very much extends to the use of ICT. Loveless points out the problem of assuming how students relate to their ICT experiences.

“teachers, parents and carers are not always familiar with the ‘digital culture’ in which their children participate and often make assumptions about the nature of their experiences” (Loveless, 2003, p. 79)

This is a significant issue in an institution such as a large secondary school where the majority of system users will be students who are legally children and for whom the school must act as ‘parent’. Schools must act to prevent both accidental and
deliberate access to material deemed harmful or inappropriate to the students, adding another layer of complexity and management on the ICT in the school.

3.1.1.3 Conclusion

ICT is part of the arsenal of teachers but not a means in itself. ICT will not create a good teacher but certainly good teachers will use ICT creatively to promote learning. However, BECTA (2007b) noted the need not just for good teachers and sound pedagogy, but also the need for sound ICT infrastructure which raises the importance and requirement for effective ICT Management in schools to provide this infrastructure.

3.1.2 Impact of ICT on School

ICT affects the whole school.

“Technology, however, is different. It’s a ‘whole-school’ issue that, if its power is to be fully harnessed, requires a sea change in the way schools or colleges go about their business.”
(BECTA, 2007a, p. 16)

ICT is not an isolated pocket in one department such as Mathematics, or something that students ‘do’ in a computer laboratory. The impact of ICT is on the entire organisation, both structurally and in people. Thus, those tasked with managing the ICT in the school must be aware of the impact that any change or outage may have on all areas of the school. They must be aware of what are ‘core systems’ and ‘core times’ so as to schedule and prioritise maintenance and repairs effectively in the school.

3.1.2.1 ICT and change in schools

Educational institutions are not renowned for quick changes in direction, due to ‘cultural lag’ which is:

“the tendency for some elements of culture to change less rapidly than others. Specifically, changes in technology in our culture commonly occur more rapidly than changes in values and attitudes.
(Maddux, Johnson, & Willis, 2001, p. 9)
Maddux et al describe the process of change being a product of cultural values. They cite industry as viewing the outcomes from the adoption of ICT being in line with their values (productivity and profit) whereas schools have a mismatch in values where teachers value interaction between the teacher and the students, and between the students, with the perception that computers may limit or remove entirely this interaction. They note that those who control (manage) education need to be assured of the value of the outcomes of investing in ICT. Not only productivity improvements as discussed for industry, but also pedagogical improvements must be made apparent.

“If they are not convinced that computing can lead to the achievement of these and other goals, as well as the consequent improvement of the school environment, they may not support the high cost of educational computing”

“Thus it is critical that computer using educators (1) make reasonable claims about what computers in education can accomplish and (2) provide evidence that computing benefits are being actualised.”

(Maddux et al., 2001, p. 11)

It is interesting to consider what Maddux et al are suggesting; that where a commercial enterprise will expect to see a tangible return on their ICT investment schools can not necessarily do so. If a teacher uses ICT to teach a concept there is no way to prove (or disprove) that the students learned better because of the application of ICT than they would have without it. The core business of a school is learning, a thing that has many different meanings, flavours and values, and inherently can not be measured.

Maddux et al break ICT applications into two groups with Type 1 applications being those designed to make it easier, quicker or more efficient to teach topics, whereas Type 2 applications are those that provide a new and/or a better ways or teaching, and may promote higher order thinking. (Maddux et al., 2001)
3.1.2.2 MIS Systems

Warner commented on the application of Management Information Systems to schools back in the late 1990’s, describing them as effective tools to show trends and progress (Warner, 1999) even as this book was published there were several Student Management Systems (SMS) available on the New Zealand market, with the MOE now accrediting seven such systems and mandating that one must be used. (MOE, 2004c) Warner also sounds a cautionary note regarding the adequate protection of data stored in such systems, stating that “Of course, you will need to ensure that your data is kept secure, both from loss and from unauthorised access” (Warner, 1999, p. 231) ICT Management in schools must be aware of the value of their data and take appropriate steps to secure it from loss and unauthorised access, adding yet another level of complexity to ICT management in schools.

Thus we see that whilst schools can not expect an increase in their core business or a strategic (commercial) advantage, they now have a requirement to use ICT to manage the business more effectively and to report to the MOE (MOE, 2007a). The deployment, access to and security of this data places another burden on school management.

3.1.2.3 How much does ICT cost schools?

Whilst the MOE has released ICT costs for all schools (MOE, 2007b) it is very difficult to quantify how much ICT costs a given school. A recent newspaper article commenting on the 2008 Budget has shed some light on this. “Rangitoto College's roll has grown by 681 pupils since 1999 and information technology costs went from almost nothing to $565,000.” (McKenzie-Minifie, 2008c). Putting this in perspective, Rangitoto College has approximately 3000 students. Further articles regarding the 2008 Budget show Government acknowledgement of ICT costs, with $65.3m of funding, over four years, for schools to meet the costs of ICT. The minister acknowledged that “A funding review in 2006 found schools had cost pressures around ICT and support staff “ (Herald, 2008) Whilst $65.3M may sound significant it is
spread over four years and all New Zealand schools. As this research was being finalised the Principal of School One commented to the researcher that this funding amounted to an additional $62,000 per annum to support ICT in the school. (S1P1, Personal communication, February 12, 2009) Presumably Rangitoto College will receive a larger amount but it is unlikely to be more than 15% of the actual annual cost of ICT to the school.

A further NZ Herald article gave details of a previously confidential report on the costs of running ICT in schools. The article cited the report as stating that in 2005, schools spent $150 million on ICT however the full annual cost of ICT in schools was estimated as $245 million and noted that this, not surprisingly, was putting pressure on the operational funding that schools receive. (Mckenzie-Minifie, 2008b; MOE, 2007b) The reasons cited for this level of expenditure by schools were:

1. The expectations of parents and teachers
2. Pace of change in technology
3. Increased reliance on technology by students in their daily lives
4. MOE requirements for SMS, online enrolment register and electronic NCEA communications

The MOE goes on to say that the cost of ICT was putting significant pressures on schools.

“The Review of School’s Operational Funding found that ICT was one of the factors putting pressure on schools and the system as a whole.”
(MOE, 2007b, p. 6)

The review, using the same figures as the NZ Herald article, goes on to suggest that ICT consumed 16% of a school’s operational funding in 2004/2005. (MOE, 2007b, p. 7)

MOE documents after the 2008 budget also show an ongoing commitment to providing laptops to teachers via the TELA scheme.
“The government is committed to increasing the use of ICT in schools to help improve student achievement and teaching practice. Additional funding for the Laptops for Teachers scheme allows for further expansion to an already successful scheme.”
(MOE, 2008a)

However, schools still have to manage the lease, deployment and integration of these units into the school. They have to provide the infrastructure to support the effective use of these resources and provide ongoing user support to the teachers with TELA laptops.

3.1.3 Ministry of Education requirements

The Ministry of Education also makes demands on a school’s ICT as they now require data to be interchanged in an electronic format. For example, the MOE mandates not only the format of Electronic Attendance Registers (eAR) but also the software (SMS) that may be used to record this data. (MOE, 2006a)

Thus, schools are faced with an expensive resource they are mandated and encouraged to use, but have little support in funding to achieve the MOE’s requirements, let alone their own objectives. eAR in particular has a significant impact on the school’s network as teachers will need access to enter attendance data. This is especially the case if real time eAR is used as teachers need access in their teaching space which can range from classrooms to the school hall, specialist subject rooms and even the school fields for PE teachers. This further complicates the management of ICT and especially so in a large secondary school.

3.1.4 Review of ICT Maturity in Schools

Maturity would suggest a school that is effectively using ICT to promote its core business, learning. However,

“It is not difficult to find classrooms where computers are being used in innovative and interesting ways; however it is easier to find classrooms where they are used in ineffective and boring ways”
(Maddux et al., 2001, p. 12)
Many researchers note the lack of impact that ICT has had in the classroom, especially when compared to its impact in industry. Leuhrmann states that “the Information Revolution had profound effects in nearly all walks of life but bypassed our schools” (Leuhrmann, A. 1994, cited in Maddux et al., 2001, p. 14)

BECTA (2008b) have developed a self-review framework to explore internal change brought about by ICT. This review framework is linked with an accreditation scheme called the ICT Mark which determines whether the school has reached a recognised standard of maturity in its use of technology. Currently over 1,000 UK schools have achieved this mark (Next Generation Learning, 2008) suggesting that UK school’s have a long way to go before they are all effectively deploying and using ICT. There is no reason to assume that New Zealand schools are any different. BECTA also have a programme called The Strategic Leadership of ICT (SLICT) programme which assists head teachers to think strategically about the adoption of technology. (BECTA, 2008a)

The MOE has identified six stages of adoption of ICT.

“Six stages of adoption of ICT, as identified by G. Knezek and R. Christensen

Awareness
They are aware of ICT but have not used it – perhaps they’re even avoiding it.

Learning the process
They are currently trying to learn the basics. They are often frustrated using computers.
They lack confidence when using computers.

Understanding and application of the process
They are beginning to understand the process of using ICT and can think of specific tasks in which it might be useful.

Familiarity and confidence
They are gaining a sense of confidence in using the computer for specific tasks. They are starting to feel confident using the computer.

Adaptation to other contexts
They think about the computer as a tool to help them and are no longer concerned about it as technology. They can use it in many applications and as an instructional aid.

Creative application to new contexts
They can apply what they know about ICT in the classroom. They can use it as an instructional tool and integrate it into the curriculum.”
(MOE, 2005c, p. 88)

When it comes to using ICT for learning and teaching it is not a case of simply providing a computer, but that the technology must be deployed and maintained in such a fashion that it supports and promotes students’ learning and teachers’ teaching. ICT Management in schools must not only be aware of the technical deployment but also of pedagogical perogatives and the institution’s requirements (objectives).

3.1.5 Conclusion
As can be seen there are three key areas of ICT use in schools; learning, teaching and administration. Satisfying the requirements of these in terms of infrastructure, software and support is a very significant task, especially so for larger schools. Thus, a strong and effective regime of ICT management is required to leverage the best from what is a very expensive cost to the school. Research has shown a strong link between effective ICT management and effective use of ICT in the school. In the next section the complexity of this ICT in schools and the impact of this complexity on managing the ICT will be reviewed.

3.2 Management of ICT in Schools

3.2.1 – Why ICT – the background
It is easy for a school to count the number of computers they own and then discuss the student / computer ratio with parents. However, the number of computers in the school is only one small part of the ICT equation.

“The interaction and understanding between the people in a school promotes the quality of learning, not the amount and type of equipment provided. It is, however, the equipment which is the easiest to spot and quantify on a first visit to a school”
(Loveless, 2003, p. 96)
Loveless talks about questions that any visitor should ask when visiting a class using ICT. These questions include:

1. Resources – what equipment and software is available and how is it organised to allow access for students?
2. People – who manages the ICT and experiences? Who is the trouble shooter?
3. Planning – how is ICT capability planned in and across the curriculum?
4. Assessment – what are the students actually learning, how does it relate to their use of ICT in the larger environment and how are their achievements and needs monitored and assessed?
5. Practice and policy of the school – what are the underlying policies that guide the work? What about those that underlie the management of ICT in the whole school? Is there an ICT Coordinator (or other staff) to organise resources and professional development? How does the school monitor and review its use and provision of ICT?

(from Loveless, 2003, p. 95)

Later Loveless poses the question of “who is the first person to call?“

“Is there an ICT technician in the school or servicing a consortium of schools? Is there an ICT coordinator in the school with technical and educational expertise to support staff? Who is responsible for managing the software and hardware resources? Who is the first person to call if there are any difficulties? Is this a technician, teacher or child?”

(Loveless, 2003, p. 100)

Clearly ICT can not just be placed in a school and expected to function yet that appears to be much the attitude in the comments in the NZ Herald article noted in the introduction (Mckenzie-Minifie, 2008b). There must be suitable management of these resources that not only understands the resource but is also the environment and way in which it is used, and is also capable of relating this to the teachers using the ICT. The MOE stated simply that “the management of ICT is an issue for some schools” (MOE, 2007b, p. 10)
3.2.3 How ICT – Access and Organisation

There are different models of access to ICT resources in schools, each of which have their own implications in practicality and pedagogy. Commonly these include

- An ICT suite of networked computers
- An ICT suite that is stand-alone
- A cluster or pod of networked computers in a class, subject or other shared area
- A cluster or pod of stand-alone computers in a class, subject or other shared area
- A single computer in a classroom or work area
- A single computer in a classroom or work area attached to a data projector
- A single computer in a classroom or work area attached to a data projector and networked
- Portable computers (often referred to as Computers on Wheels or COWS) that can be made available on demand

(adapted from Loveless, 2003, p. 96)

Other ICT resources such as printers, scanners, data projectors, digital still and video cameras and so forth are made available in different ways in schools. (Adapted from Loveless, 2003, p. 96)

Loveless continues to discuss the ways in which such resources are deployed, including the physical environment, support materials and health and safety. The latter is of particular interest in a secondary school where not only physical safety is of importance but also a student’s emotional welfare must be considered. Loveless mentions in passing, policies for use of e-Mail and the Internet by students (Loveless, 2003, p. 97) however as the use of the internet has grown so have the issues and dangers of its use. Schools must be mindful of protecting the students from harm and also protecting students from
themselves. Schools also act in loco parentis, that is, in place of the parents, and must also be aware of community, cultural and individual expectations of what is deemed appropriate or inappropriate.

Schools must also take appropriate steps to safeguard their own data and systems from both within and without.

Thus, schools must be mindful of both the nature and needs of the users. This includes the teachers, students and the wider parent community.

“Government and societal expectations of the schooling sector and the education sector as a whole have changed over time and continue to evolve. This is particularly true of the role of ICT. The role schools are now playing in terms of preparing students to succeed in an increasingly technological age is ongoing, and is likely to increase in line with the fast pace of technological change and the demand for a more highly skilled workforce.”
(MOE, 2007b, p. 9)

3.2.3.1 The Internet

Researchers of the last ten years have ascribed great educational value to the Internet and the World Wide Web.

“the establishment and growth in size and popularity of the Internet and the Web may become known as the most significant development of the second half of the twentieth century. However, because of the unprecedented growth outlined above, a reasonable case could be made that the Internet and Web already represents the most important development in human communication in modern times!”

“That honour has traditionally been assigned to the invention of the printing press. However, in the case of the printing press, centuries passed before books were affordable and widely available for common people to purchase.”

“with regard to the World Wide Web, however, growth from 50 pages to one billion pages occurred in 8 short years!”
(Maddux et al., 2001, p. 3)
Certainly, the rapid explosion and acceptance to the Internet and World Wide Web makes a mockery of most books written about ICT in schools in the late 1990s and early this century (Loveless, 2003; Maddux et al., 2001). The MOE ICT Report reserves a whole section for a description of how staff, students and principals are making use of the Internet, from e-mail to specific MOE websites. (MOE, 2005c).

Deployment of the internet around a school requires both high speed access to a quality ISP, good reliable network infrastructure to distribute the internet, and strong filtering and monitoring to ensure the safety of their users.

3.2.4 The Complexity of ICT in Schools

3.2.4.1 Networking

The MOE definition of a ‘networked’ school is where “80% or more classrooms are linked by cable” or using wireless technologies. (MOE, 2005c, p. 5). At risk of splitting hairs, this definition talks only of classrooms whereas there are many other ‘teaching spaces’ within a school such as a hall, theatre, dance studio, gymnasium or the school playing fields and netball courts. Whether the MOE definition encompasses these spaces as classrooms is moot as they are still spaces where connectivity can be required. For example, with MOE initiatives in Real Time Attendance schools need to have connectivity wherever classes are held. One of the schools in this research utilises wireless networking to allow PE Staff to record attendance on the netball courts.

Further, the MOE standards for networking specify eight data ports per learning space as a minimum with associated 230v power outlets. (MOE, 2004a, pp. 5-6) However, the majority of schools were built well before the use of ICT and often have only one or two power outlets. Brick buildings and older style, double story Nelson Blocks in secondary schools are difficult and expensive to cable for data access.
Using the definition above, the 2005 survey found 66% of schools were networked with cable whilst 10% were networked wirelessly. It is not clear if those schools using wireless connectivity were also represented in the copper cabling as well. Only 1% of secondary respondents said they had no networking. 94% of respondent secondary schools stated that they would be ‘fully networked’ within 12 months of the survey date. (MOE, 2005c, pp. 49-50)

Network operating systems are somewhat harder to quantify as the 2005 ICT Survey does not detail the size of the schools involved. However the following table shows the relative proportion of Network operating systems. Included in the “other” figure are 10% of schools using Windows XP as their Network OS.

<table>
<thead>
<tr>
<th>Network Operating System</th>
<th>% of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server (2000 or 2003)</td>
<td>63%</td>
</tr>
<tr>
<td>Windows NT Server</td>
<td>6%</td>
</tr>
<tr>
<td>Novell Netware</td>
<td>6%</td>
</tr>
<tr>
<td>Linux</td>
<td>6%</td>
</tr>
<tr>
<td>Various Apple Server</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>13%</td>
</tr>
</tbody>
</table>

(adapted from MOE, 2005c, p. 50)

This research is exploring the management of ICT in large NZ secondary schools and it would be a safe assumption that schools of 1200 or more students would be using a genuine Network Operating System such as Windows Server, Novell, Linux or Mac OS X Server. The report also noted that 48% of secondary schools provided remote access for students and/or staff. (MOE, 2005c, p. 51) More recent surveys put this at 70% of schools providing remote access for teachers. (MOE, 2007b, p. 7)

MOE research shows ICT network infrastructure as both a key factor in the use of ICT in teaching and learning, and also a barrier where the infrastructure is
not adequately in place. The research cites complex arrangements of equipment, software and support contracts as key elements in the problem. (MOE, 2007b) Of particular note to this research was the MOE’s comment on networking in large schools which suggest that the large secondary schools reviewed in this research in fact find the complexity of the network infrastructure they require is a significant factor in cost. “It can be argued that small schools suffer from lack of economies of scale, as the fixed costs associated with the network infrastructure must be spread over fewer students. But, large schools may suffer from diseconomies of scale due to the complexity of networking required. There are similar difficulties in terms of school type. For example, the introduction of the NCEA has resulted in secondary schools needing to store, archive and maintain increasing amount of data” (MOE, 2007b, p. 19)

Adequate support of a file server running a Network Operating System (NOS) is not a trivial exercise, especially when E-Mail, Proxy, SMS, remote access and other systems, and attendant data and access security are involved. For larger schools this implies a multiple server environment. Specialist knowledge is required to establish and maintain these systems.

### 3.2.4.2 Computing Devices

The MOE 2005 survey points to a stability in the ratio of computers to students at one computer per four students. The decile rating of the school appears to have a minimal impact on this ratio with a tendency for decile seven schools to have a slightly higher ratio of students to computers. (MOE, 2005c, pp. 34-35)

The computing devices in schools are mainly desktop and laptop computers. Of the computers, the MOE 2005 report noted 91% as PC and 7% as Apple or Macintosh units. However, the age of these units bears some study.
This data suggests that for a large number of schools the reality is that the computers in use are more than three years old. Adding a further perspective to this figure is what was the MOE’s minimum specification computer (in 2005) of Pentium III, 1GHz, 128MB, 20GB hard drive. (MOE, 2005c, p. 37). Although this greatly exceeds the minimum specification supplied for Microsoft Windows XP (Microsoft, 2007) it is extremely doubtful that either of the systems specified would give an acceptable level of performance for students or staff. Maddux et al noted that “many schools have antiquated computer hardware and software” (Maddux et al., 2001, p. 117)²

Interestingly, more recent MOE publications suggest a much more powerful unit for schools as being appropriate. This may suggest that the MOE has realised that older computers in school do not perform the tasks required by 21st century learners. The new speculations for computers less than three years old are a Intel® Core 2 Duo Processor T5600, 512Mb RAM, 80Gb SATA HDD (5400rpm), 10/100Base-T Ethernet, 128Mb Dedicated Graphics card and 19” widescreen LCD with 8ms response time. (MOE, 2007b, p. 27) This is even

<table>
<thead>
<tr>
<th></th>
<th>Secondary Schools (N=135)</th>
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<tbody>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>25% or less</td>
<td>16</td>
</tr>
<tr>
<td>26% to 50%</td>
<td>25</td>
</tr>
<tr>
<td>51% to 75%</td>
<td>36</td>
</tr>
<tr>
<td>76% to 100%</td>
<td>22</td>
</tr>
</tbody>
</table>

(adapted from MOE, 2005c, p. 37)

² To put this comment further in context consider that the authors then go on to talk about schools ensuring the computers have modems and the classrooms telephone lines. In 2003! (Maddux et al, 2003, p. 118) This must be a ‘hold over’ from the first edition of the book which at the time of the time of the 3rd edition should have been updated.
further out of reach for most schools. It is also worth noting that the actual processor to use is specified.

In essence, schools appear to have older computers and thus it can be presumed, the attendant issues of hardware failure and support for newer operating systems and software. This 2005 MOE survey found 68% of schools using Windows XP\(^3\), 19% using Windows NT Workstation or Windows 2000 and 13% using Windows 95 or older. (MOE, 2005c, p. 39)

One interesting point in the MOE (2005c) report is that only 7% of secondary respondents indicated that they were leasing their computers (MOE, 2005c, p. 57). It would interesting to unpack this further to see if more schools are now leasing their hardware or if the wording of the question tended to make people answer otherwise; ie sourcing equipment from a reseller and then paying for the purchase via lease. 47% of secondary schools noted that they source their laptops via lease through the TELA Teacher Laptops scheme (MOE, 2005c, p. 63). The MOE has espoused an ongoing commitment to the TELA scheme for the next four years, stating that:

> “Research has shown that having a laptop has led to teachers having more flexibility in their time and place of work, increased confidence and competence in ICT use, and increased efficiency in lesson preparations.”
> (MOE, 2008a)

Not surprisingly, 40% of secondary schools noted the main factor in their decision making (for purchasing ICT equipment) was the purchase price. (MOE, 2005c, p. 57)

Comparison with OECD information shows New Zealand as being fifth out of 41 OECD in terms of student access to ICT with a ratio of one computer per four students.(MOE, 2007b, p. 6)

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\(^3\) No distinction was made between Windows XP Pro and Windows XP Home
3.2.4.3 Software

The MOE 2005 survey showed a broad range of software in use by schools however the actual survey question asked was limited in the range of software it explored and the overall usability of the results is questionable. It does show a big range of ‘top end’ applications (Pinnacle, Photoshop, Dreamweaver) to more simple applications (Kidpix, MS Works, Media players) and the report points out that the more top end applications are more likely to occur in secondary schools, which is hardly surprising. (MOE, 2005c, pp. 44-45)

3.2.5 How ICT is managed

The 2005 MOE report has some interesting data on how ICT is managed but it must again be stressed that this data does not show how this varies with the size of the school. The report shows that professional management of ICT, either by onsite staff or external support vendors is the norm for secondary schools. Where the teacher has been appointed as responsible for the network it has been assumed that the person is not an IT professional. Further, due to the size of large secondary schools it can be assumed that a shared technician is not used. (MOE, 2005c, p. 53)

<table>
<thead>
<tr>
<th>How is your school network managed?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>School-based technician / server support person</td>
<td>44%</td>
</tr>
<tr>
<td>Teacher appointed to the responsible for the network</td>
<td>22%</td>
</tr>
<tr>
<td>Hire technician / server support person</td>
<td>21%</td>
</tr>
<tr>
<td>Share technician / server support person with a cluster of schools</td>
<td>4%</td>
</tr>
<tr>
<td>Remote Managed System</td>
<td>2%</td>
</tr>
</tbody>
</table>
Very significantly for this research the survey shows that 44% of schools have a school-based support person i.e. someone who is employed by the school to support the ICT.

A more recent review by the MOE explores the area of how ICT is managed in New Zealand schools. As already stated, the report noted that "the management of ICT is an issue for some schools" (MOE, 2007b, p. 10). The document then describes several potential scenarios for assisting schools with their management of ICT including centralised purchasing, standards for ICT and centralised support. It also suggests the use of remote SAN storage to protect schools data. (MOE, 2007b)

3.2.6 Total Cost of Ownership (TCO)

Schools expend considerable sums of money on purchasing and deploying ICT infrastructure. This then raises the question of how much is spent on maintaining the ICT.

"Maximizing our investment in technology requires a clear vision of our goals and well-developed plans for achieving them. Unfortunately, the rapid influx of technology into schools is, in many cases, running ahead of the educational vision and careful planning necessary to put technology to good use."

(Kleiman, 2006)

"the key determinant of our success will not be the number of computers purchased or cables installed, but rather how we define educational visions, prepare and support teachers, design curriculum, address issues of equity, and respond to the rapidly changing world. As is always the case in efforts to improve K-12 education, simple, short-term solutions turn out to be illusions; long-term, carefully planned commitments are required.”
Total Cost of Ownership (TCO) is generally defined as “assessing all costs associated with operating and maintaining a computer network” (Fitzgerald, 2004). In essence it is the true cost of the computers including up-front and after purchase direct and indirect expenses. It may include:

- Procurement costs
- Original equipment costs
- Software
- Service and support
- Training
- Upgrade costs
- Loss of productivity (down time, recreational computing)
- File server costs and cabling (Data and Power)
- Internet access
- Asset tracking and management
- Power

(Adapted from Moskowitz, 2001)

The MOE note that:

“whilst schools can often identify the immediate costs of ICT the total cost of ownership must be considered in order for the school to sustain a resource”

(MOE, 2007b, p. 18)

Actual numbers for TCO in schools are hard to find. Gartner have developed an online tool for calculating TCO for ICT in Schools (Gartner, 2003) however this is aimed at schools in the United States. The MOE suggest that tools need to be developed for New Zealand school to calculate the total cost of ownership of ICT to inform schools’ ICT decisions. (MOE, 2007b, p. 23) Other research suggests that ICT support alone can account for up to 34% of the TCO of ICT resources. (BECTA, 2007b, p. 1)
Research suggests that TCO for a school computer is less than that of a business for four reasons:

“Schools purchase less expensive PCs at larger discounts than businesses do; educational software packages are priced lower than business software applications; schools use roughly half the number of people that businesses do to support the same number of PCs; and schools typically use their computers for five years, compared to three years for businesses”  
(Consortium on School Networking, CoSN cited in Moskowitz, 2001)

Simply put, most schools do not know how much it costs to implement and maintain their ICT.

3.2.6.1 Software

In her book The Role of ICT, Loveless (2003) talks extensively about evaluating software for use within the school environment. Whilst outside the scope of this research, she does make the following observation.

“It is interesting to see which software available in the classroom is used most often by the children and the teachers. A wide range of software may be available, but only a small number ‘tried and tested’, either for educational reasons associated with the use in the curriculum, or for technical reasons related to the teacher’s familiarity and confidence with particular programmes.”  
(Loveless, 2003, p. 98)

It should be noted here that large New Zealand secondary schools will generally purchase multiple copies of a piece of software so that it can be loaded onto all of the computers in a laboratory. Thus, a programme with a unit price of $200 can be a very expensive proposition.

3.2.7 Conclusion

Research points to ICT being a significant cost to schools that is largely un-quantified in the New Zealand situation. Schools do as much as they can with what they have but even the MOE is now suggesting more powerful computers for school use. With multiple different deployment mechanisms and complex networking required, effective ICT management is vital to ensuring the best outcome for the school.
MOE (2005c) research show that 44% of schools employ one or more persons to manage their ICT whilst a further 22% appoint an existing staff member to the role. However, especially in larger secondary schools, this person must have an understanding of the NOS or combination of systems used by the school, the platform it runs on, the network that deploys it to the users and the hardware the users have to access it. They need to be aware of how the various users apply the technology and how to protect the student users from harm and the systems from unauthorised access. Simply, ICT Management in schools is not trivial and requires ICT professionals.

3.3 Current Research

3.3.1 Research gap

A review of literature has shown some significant, documented gaps in the area of management of ICT in schools. In his review of literature Passey comments that “little research work is being undertaken which considers aspects of ICT and school management” (Passey, 2002, p. 1). This comment is specifically targeted at using ICT to assist in managing the school, rather than managing the ICT. However, he goes on to state that “The outcome of the search showed that there is a paucity of current literature addressing the management of ICT in schools.” (Passey, 2002, p. 6)

3.3.2 Overseas

BECTA (2007b) have produced a document entitled ‘What the research says about ICT support for schools.’ Whilst not necessarily about the management of ICT in schools the report does make some interesting observations, noting that:

“There is limited research evidence relating to effective ICT support for schools, although some studies and reports have identified the key categories of support and have suggested ways in which various models of support can enhance the provision of ICT in schools.”

(BECTA, 2007b, p. 1)

Models of support noted by BECTA were in-house technicians, Local Education Authorities, managed services, peer support and Regional
Broadband Consortia involved in the procurement of internet services. Not all of these are applicable to New Zealand. BECTA also found that 92% of UK Secondary Schools had some form of in-house technical support for ICT. (BECTA, 2003b, p. 4).

The report concludes that:

“Lack of technical support, in terms of on-site technician support and web based and telephone support, restricts the effective use of ICT in schools”

And that

“ICT technicians often experience a lack of career structure and low pay, despite being highly qualified and undertaking a variety of tasks”

(BECTA, 2007b, p. 2)

One crucial finding of this review was that ICT Support staff need to know more than just technical aspects of ICT. Rather, professional development for ICT technicians should be specific to the education context and could well include pedagogical skills. Not surprisingly, the report also noted difficulties in obtaining and retaining such staff. (BECTA, 2007b)

3.3.3 New Zealand

Lai and Pratt (2004) discuss the role of the ICT Coordinator, although this role is largely undefined, but they do make a very strong case that there are two distinct aspects to it. One of these is being the ICT ‘Janitor’ who ‘fixes’ things and the other the coordinator, an expert in ICT and student learning, who’s “main responsibility is to guide ICT teaching and learning in the school.”(Lai & Pratt, 2004, p. 463). This person is a teacher foremost and concerned with the use of ICT for student learning, and is a guide and mentor to staff with a distinctly pedagogical view of the school and ICT integration.

This article is interesting as it flags the potential splitting of these two roles. The question is posed if this is because the schools involved in the survey were
smaller schools which could not afford full time staff. This was not mentioned in the research.

Mackey and Mills (2003) explored the nature of ICT strategic planning in some South Island primary schools. Though conducted in the primary sector, their work gives significant insight to the need to plan ICT in schools so that it aligns with the institution’s requirements rather than simply ‘happening’. Mackey and Mills provide a four stage model to measure ICT alignment with strategic planning, which has been adapted for use in section 5.3.4. (Mackey & Mills, 2003)

This work was generally focused on the planning for and use of ICT for administration however it acknowledges the broader use of ICT in schools. The requirement for all secondary schools to now utilise an accredited SMS (MOE, 2004c) now means that all schools have what is essentially a core MIS system which suggests this as being a very valuable area for future study.

3.3.4 Comment on research

The nature of research to date has been biased toward case studies which whilst valuable, are focussed on what ‘is’ rather than what ‘may be required’.

“How ICT is managed within both industrial and educational contexts is increasingly being documented. However, often this literature relies upon case study evidence which therefore by its nature identifies how current situations are managed, rather than how future situations might need to be managed.”

(Passey, 2002, p. 5)

The research interview questions detailed in Appendix A have been designed to endeavour to tease out comment regarding the school’s view of the future of ICT.

Passey (2002) further notes a lack of research pertaining to the school sector.

“It is clear that ICT and the management of ICT in education requires an increasing understanding and application of management of change approaches.”

(Passey, 2002, p. 10)
A review of research online at the Ministry of Education website did not provide significant material on the management of ICT within New Zealand secondary schools. However, one interesting piece of research was a report on two new secondary schools opened in Auckland in 2004. In their review of the schools the MOE noted that “Information technology is having a profound impact on teaching and learning in schools” (MOE, 2004b, p. 3) and that

“Schools need to provide access to technology across the whole school and to anticipate the use of computer and multi-media equipment for much longer hours.”

(MOE, 2004b, p. 3)

The research specifically discusses multi-media equipment and technology and not purely ICT and suggests changes in the ways that schools function. It is clear that ICT will play a significant role in this change.

Further to this, the research also discusses the concept of a ‘creative commons’ which is an area:

“designed to encourage self-directed learning, containing large number of computers and multi-media equipment, and organised to allow students easy access before, during and after school.”

(MOE, 2004b, p. 3)

Clearly, the future of technology and ICT specifically, is very much tied up with the vision schools have of their future.

More recently the MOE has started to examine management of ICT in schools in their Review of Schools’ Operational Funding: ICT Resourcing Framework – Final Report. One finding was a need for professional development of the designated ICT leader. They stated that one area of professional development required is:

“professional development for a designated ICT leadership role in a school. The advisory group argued that this leadership role should be provided as a staffing entitlement.”

(MOE, 2007b, p. 25)
What is intriguing is the suggestion that this role needs to become a specific position in the school, similar it is presumed, to a caretaker or other support role.

3.4 Further comment

Literature up to the early part of the millennium still seems to be wedded to the concept of a learning appliance where the software ‘toy’ can be programmed by students to achieve a desired result. In particular, LOGO is still mentioned. Only in the last few years with the explosion of the World Wide Web as a social and recreational tool, as an online collaboration tool and a raft of online applications, has a groundswell of new learning tools appeared.

More recent literature, from early this century forward, shows a distinct change in the way that ICT in classrooms is viewed. However there are some interesting ‘hangovers’ to earlier literature such as Maddux et al, who in their third edition in 2001 discuss the use of dial-up modems. (Maddux et al., 2001). Some comment discusses using a school website to “provide useful resources for pupils” (Pachler, 1999, p. 244) which is true as far as it goes, but does not mention Intranet or Learning Management Systems (LMS) which have come to fore more recently. The comment still shows a view of providing content via the internet as opposed to using the internet to enable learning.

3.5 Placement of this research

This research aims to provide data and to comment upon the research gaps identified in this literature review. These gaps are:

1. How do schools, especially large New Zealand Secondary schools, manage their ICT?
   What roles are in place to manage ICT and how do these roles map across the incumbents and job titles?

2. How do schools, especially large New Zealand Secondary schools, plan for their ICT?
3. How do schools, especially large New Zealand Secondary schools, ensure that their ICT aligns with the school’s vision and meets the needs of all their users?

The research examines two large New Zealand secondary schools and endeavours to fill some of the gaps identified. The questions and methods used are described in the following chapter.
4 Methodology

The research undertaken is aimed at closing the gaps identified in the literature review in the previous chapter. In this chapter the methods used in this research will be explored. This in includes the selection of participant schools, methods used to obtain data and its subsequent analysis. In particular, the researcher’s potential bias with regard to the analysis will be noted.

4.1 Research Questions

The starting point of any form of research is asking appropriate questions that can be answered and that extend knowledge in the area of study. Bouma (2000, p. 12) notes that “The first and probably hardest discipline required by the research process is learning to ask the right questions.” He then describes the nature of research questions as having two properties.

1. Limited in scope to times, places and conditions
2. Some relevant observable, tangible or countable evidence or data can be gathered.

(Bouma, 2000, pp. 13-14)

4.1.2 The main research question is:

How do large New Zealand secondary schools manage their ICT?

This question is significantly sizable and thus does not match Bouma’s properties as it is not sufficiently limited. To further limit this question in scope, place and condition this question was answered for two selected New Zealand secondary schools. (See section 4.4.1 for selection criteria.). Thus the question can be restated as:

How do two selected large New Zealand secondary schools manage their ICT?
4.1.3 Additional research questions

Other questions that make up this question may be elicited as the research continues (Gillham, 2000). Additional questions fall into three broad headings which will be used to identify pertinent observations in the research. These are:

1. Management Roles
2. Strategic Planning
3. ICT Alignment

These questions can be further expanded as follows:

1. What management roles do schools have in place for ICT?
   An exploration of what roles are performed to manage ICT and what staff are involved in supporting these roles. Roles are seen as being distinct from the person(s) fulfilling them. What is the impact of the incumbents on these roles?

2. Do schools plan their ICT to meet future requirements? If so, how is this done?
   With the ever changing nature of both ICT and education practice, the needs schools have for ICT will change in the future. How do the schools determine if and how their ICT will enhance their future vision? What infrastructure (hardware, software and human) is required to support this vision?

3. Do schools define desired outcomes and alignment criteria from their investment in ICT? If so, how do they measure and evaluate this?
   ICT in schools represents a considerable investment of resources, in capital and ongoing expenditure, time and manpower. How do schools determine the return on this investment and how do they
determine that their use of ICT is in alignment with the school’s core business? How do schools ensure that the needs of all users are met?

It is anticipated that this study will provide:
1. Data on the ICT issues faced by schools and how they have worked to alleviate these.
2. Data on the factors that influence the alignment of ICT to school outcomes.
3. Data that will inform ICT decision making in other schools

And thus provide some of the information missing in current literature.

4.1.4 Unit of Measure

This research is an exploration of two large New Zealand secondary schools, thus the unit of measure is Large New Zealand Secondary Schools.

4.2 Research Methods: Quantitative and Qualitative

Research methodologies are broadly described in two categories, Quantitative Research and Qualitative Research. Simplistically, Quantitative Research looks at empirical data that has boundaries. It asks questions such as: How many or How often? Qualitative Research is descriptive and asks questions such as: How do I or what is it like? Bouma states that “qualitative data tend to be expressed in the language of images, feelings and impressions.” (Bouma, 2000, p. 20)

This research question asks “How do large New Zealand Secondary Schools manage their ICT?” The use of the word “how” suggests a descriptive approach to this research, with Yin stating that “In general, case studies are the preferred method when ‘how’ or ‘why’ questions are being posed” (Yin, 2003, p. 1). Whilst it is possible to survey all New Zealand secondary schools, seeking information on how they manage their ICT, it would be problematic at best to obtain suitable data than can then be readily analysed. Gillham points out that the
results from survey instruments can be misleading, stating that “You get results, but are they ’true’ for the people concerned in the practice of real life?” (Gillham, 2000, p. 11)

As an example, one school may have a position titled Director of Information Technology, another titled Director Information Services and still another Information Technology Manager. Survey data would return these titles but may not give a clear indication of the roles actually performed by the incumbents. Without continuous, time consuming recourse back to the schools involved the researcher would find themselves making subjective decisions about these roles. The subjectivity of those who complete the survey would be a further complicating factor.

Thus, this research will focus on a limited selection of schools with an aim to fully describe their management practice for their ICT. The use of the word ‘description’ immediately suggests a qualitative approach to the research.

4.3 Qualitative Research Methods

Bouma states succinctly that qualitative research “answers the question ’what is going on here?’” (Bouma 2000, p.171) while Creswell notes that “qualitative research studies appear as broad, panoramic views rather than micro-analysis.” (Creswell, 2003, p. 182) This concept of a broad approach to the initial research question is also supported by Gillham. (2000)

The research question stated in 4.1.2 is designed to be a broad examination of how ICT is managed and to very specifically answer the question, what is happening within this area of these schools? Thus, the use of qualitative research methods is appropriate for this research.

Creswell further talks about qualitative research being interpretive with the researcher teasing out themes and categories before drawing conclusions or interpreting the data. Often this gives rise to further questions. (Creswell, 2003,
Again, this research is a description of a ‘snap shot in time’ which gives rise to further questions.

If a qualitative approach to the research is appropriate, the next question is how this research should be conducted. Methodologies for conducting qualitative research have been refined and documented during the 1990’s (Creswell, 2003) utilising the following strategies:

- Ethnography
- Grounded Theory
- Case Studies
- Phenomenological Research
- Narrative Research

(Creswell, 2003, pp. 14-15)

Again, the object of this research is to describe what is occurring within the area of ICT Management in the subject schools which suggests that a highly descriptive, unemotional ‘snapshot’ would be appropriate. To this end, a Case Study methodology would be appropriate.

4.4 Case Study Methodology

A case study explores a single event or activity, a single entity or case. It seeks to describe what is happening and is bounded in time to an occurrence or event. The researcher collects detailed information and attempts to describe or interpret what they observe. (Bouma, 2000; Creswell, 2003) Bouma further states that “In a case study, a variable or set of variables is measured for one entity at one point in time” (Bouma, 2000, p. 95)

Gillham defines a ‘Case’ as having the following attributes:

- “a unit of human activity embedded in the real world;
- which can only be studied or understood in context;
- which exists here and now;
- that merges in with its context so that precise boundaries are difficult to draw.”
Using this definition as a base, the management of ICT in schools can be seen as a specific human activity which is in a context of a specific school. The task is performed at this point in time and extends and impacts on many areas of the schools, to those involved in its management and teaching, along with those who are ‘consumers’ of its learning. The research is time bound in that it is one ‘snapshot’ of the process and does not seek to examine how the management of ICT may change over time with regulatory, requirement or staff changes, which would form a fascinating piece of further longitudinal research.

Yin (2003, p. 9) talks extensively about case study methodologies, stating that

“Case study has a distinct advantage when “a ‘how’ or ‘why’ question is being asked about a contemporary set of events over which the investigator has little or no control”

This provides a grounding for this research as whilst it would be highly informative to experiment with several different approaches to ICT Management in large schools it is singularly impossible. The researcher can not manipulate the schools’ approaches to managing ICT.

In this research two ‘cases’ will be studied to make available comparative data. Yin notes that the multiple case study approach is common when researching the education sector, stating that a common use of the multiple case studies approach is

“a study of school innovations (such as the use of new curricula, rearranged school schedules, or new educational technology), in which individual schools adopt some innovation. Each school is the subject of an individual case study, but the study as a whole covers several schools and in this way uses a multiple-case design.”

(Yin, 2003, p. 46)

He further states that:
“The evidence from multiple case studies is often more compelling and the overall study is regarded as being more robust”
(Herriott and Firestone, 1983, cited in Yin, 2003, p. 46)

Thus the use of multiple case studies alleviates to a small extent the issue of non-representative cases and allows commonalities to be teased from the data.

This research attempts only to describe current practice in the institutions being examined. It does not purport to describe best practise nor is it intended to be in any way critical of these processes. It fulfills the criteria noted by Bouma:

“An exploratory case study takes a very broad look at the phenomenon being investigated. The purpose is to gather information to build a description of what is 'going on’”
(Bouma, 2000, p. 91)

4.5 Data Collection

Two large New Zealand secondary schools were selected and all those involved in managing ICT within the school interviewed. The two schools were selected from schools with 1200 or more students, and having different decile levels. If a broader range of six or nine schools were used then more meaningful ‘cross decile’ comparisons could be made. However, the time involved in gathering and analysing the required volume of data precludes this. It would however, make for fascinating further study.

Depending upon the school structure those interviewed may include:

- Board of Trustees (BOT) representative
- Principal
- Senior Management Team (SMT) member in charge of ICT
- IT Manager / Director of ICT
- Network Manager / Other Staff – if applicable
- Staff representative(s)
Job Titles may well not clearly identify these personnel as it is apparent from the researcher’s background in ICT in Education that titles and the actual roles the incumbents fulfil vary considerably within schools. A matrix of roles was developed giving a visual indication of how they are spread within the school and fulfilled in the various job titles.

Participants will be interviewed and the interviews recorded via an audio recorder. These interviews were transcribed verbatim to ensure the interviewee is not misquoted. Analysis of the interviews was carried out using the tape recordings so as to capture impressions and emotions not seen in the text. The responses were coded to themes and these placed in a matrix to draw out a picture of what is happening. As this occurred several new themes presented themselves and these were included in the matrix.

4.5.1 Selection of schools (decile and range)

This research was limited to large secondary schools, with schools of more than 1200 students being selected as an arbitrary cut-off point. An analysis of 2005 MOE data for schools listed as being Y9 to 15 (secondary schools), shows that 25.8% of secondary schools (60 schools out of 233) had 1200 or more students and represented 46.9% of students in this group of schools. (MOE, 2005a). (To simplify this analysis Y7 to 15 and Y1 to Y13 schools were omitted.)

Thus the 1200 student figure appears to be a useful guide to the quarter of the nation’s secondary schools that are largest in size. A further rationale for this measure is that larger secondary schools will have a complexity of ICT infrastructure that requires a high level of management. Smaller schools will have similar issues but to a lesser extent and with fewer staff involved in managing ICT. Schools selected were state schools, not private, to avoid ‘skewing’ the data by exploring those schools with significantly more
resources to manage their ICT. A separate review of how private schools manage their ICT would also be an interesting further study.

The researcher has experience in the secondary education sector and at the time of commencing this research was employed as an ICT PD Facilitator. The researcher utilised these existing relationships to gain access to schools in the ICT PD Cluster. Creswell comments that such ‘backyard’ research can lead to compromises in:

“the researcher’s ability to disclose information and raises difficult power issues. Although data collection may be convenient and easy, the problems of reporting data that are biased, incomplete, or compromised are legend”

(Creswell, 2003, p. 185)

In the proposed research this issue is not considered to be significant. Although the researcher worked within the two institutions, his role is as an outside change agent and critical friend and he was not part of ICT Management team.

4.5.2 Data collection tools

Appropriate methods to gather data pertinent to the research question would be:

- Observation
- Questionnaires
- Interviews.

Actual observation of how a school goes about managing its ICT would be fascinating but by its very nature would require several years of observation to accurately describe, precluding this as data collection tool. Further, it is likely that this research would become a ‘moving target’ as schools change over time. Certainly this became the case in one of the both schools investigated in this research and this is noted in the data analysis section.
As noted by several authors, questionnaires and survey instruments are problematical for a variety of reasons. For this research, the job title ascribed to individuals in the school makes their accurate selection difficult. Bouma notes that questionnaires are dependent on the honesty of the respondent (Bouma, 2000, p. 69), to which could also be added issues of actually understanding the question being asked. Gillham (2000, p. 62) goes further, stating that “Questionnaire data in particular can appear (and usually are) thin, abstract and artificial”

The rationale for interviewing the complete management structure and staff representatives is to capture a holistic picture of what does happen rather than senior management perceptions of what they think happens. Gillham (2000, p. 13) notes that there is:

“A common discrepancy is between what people say about themselves and what they actually do. In an interview, people may be very convincing, because they are sincere”

To capture the full picture in context all levels of ICT Management, down to the consumer (in this case, the students, teachers and administrative staff, need to be explored in context. (Gillham, 2000)

It would be better to tease out pertinent information from the incumbent which would allow for the ‘unexpected’ to be explored and further reduce the impact of the researcher’s prior knowledge and suppositions, hence the use of semi-structured interviews. Many authors point out the unpredictable nature of Case Study research (Bouma, 2000; Creswell, 2003; Gillham, 2000; Yin, 2003) thus as additional questions arose they were asked within the interview.

A short set of question were developed and was passed to the interviewee well prior to the interview so that they could be both prepared and more at ease in the interview; i.e. less likely to be felt that they are ‘put on the spot’.
The researcher used active listening and prompted the interviewee as needed to elicit data.

### 4.5.3 Why the range of interviews

The aim of this research is to elicit how Large New Zealand secondary schools manage their ICT. To accomplish this all those involved in ICT management in the schools selected were interviewed. In general this included the following job titles:

1. BOT Member with responsibility for ICT, or representative
2. Principal
3. Senior Management Team (SMT) member in charge of ICT
4. IT Director
5. IT Manager
6. Staff Members (A random selection of three staff)

As noted earlier, the specific roles carried out will be mapped to the incumbents.

It is likely that there are one or more IT Technicians reporting to the IT Manager. It was not intended that this level be interviewed as they are generally involved in more ‘day to day’ matters rather than decision making regarding ICT in the school. However, if within a school this role had a significant input to the management of ICT they would also have been interviewed using the question schedule for the IT Manager. In the two schools examined this was not deemed as necessary.

The interviews were scripted with the questions set out in Appendix A. All interviews were recorded via a voice recorder and transcribed as rapidly as possible afterwards.
4.5.4 Structure of Questions

As stated in Section 4.1.3, several questions arose immediately the research question is proposed.

Each question to be asked was slotted into the matrix shown in Table 1 and the outcomes evaluated to ensure that all areas of interest were covered in the questions.
<table>
<thead>
<tr>
<th>Area of Interest</th>
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<tbody>
<tr>
<td>1. School demographics and structure</td>
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<tr>
<td>2. Staff member demographics</td>
</tr>
<tr>
<td>3. School vision for ICT</td>
</tr>
<tr>
<td>4. Alignment of ICT</td>
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<td>5. ICT Management structure</td>
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<td>6. Personnel and roles</td>
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<td>7. Future planning and Strategic Information Systems Planning (SISP)</td>
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Table 1: Areas of Interest for Interview Questions

Refer to Appendix A for the interview questions

4.6 Ethical considerations

Normal ethics approval has been sought and gained for this research.

The following steps were taken to ensure ethical responsibility by the researcher.

Interviews
1. Written permission was sought from the Principal of each school prior to proceeding.
2. Interviewees were advised in both written and verbal form, of the nature of the research and how the data will be stored and used, pursuant to the ethics approval gained.
3. A written consent to be interviewed and for the interview recorded, was sent to the interviewee along with the interview questions, prior to the interview taking place. This was signed by the interviewee prior to the interview commencing; if it was not signed the interview would not have proceeded.
Research Reporting

1. Schools are not identified by name or by actual decile rating as this could also lead to their identification. Rather, the schools are referred to by decile band: Low: 1 to 3, Medium: 4 to 7, High: 8 to 10. Schools are referred to as S1 and S2

2. Individuals within the school are identified in terms of the role they perform only, not their name. Further, direct quotations from interview transcripts will refer to Person P1, P2 and so forth unless the Job Title fulfilled by that person is pertinent to the material. Hence a person is described as S1P1, S2P3 and so forth

4.7 Potential Bias / Researcher’s Lens

It is appropriate to describe the researcher’s background prior to this research.

The researcher has worked in the Education Sector at both Secondary and Tertiary levels as follows.

- Secondary Teacher, Chemistry and Computer Studies
- Director of IT for a private school for girls
- PASM and ASM for WINTEC, Graduate Diploma of IT In Education (GDITE)
- ICT PD Facilitator
- Director of ICT, State Secondary School

The researcher has also worked in the IT Industry in a variety of roles (training, user support, systems programming and customer sales and support), mainly for banking institutions.

Given the researcher’s background there is potential for preconceived notions to colour the research. The researcher has had some considerable ‘inside’ experience in managing ICT in secondary schools and in advising schools on their ICT. His experience in the IT industry will also colour his
perception of ICT in schools, especially where perceived best practice is concerned, given that he has been involved in the management and deployment of IS systems to industry and customers. However, the purpose of this research is not to define best practice but to describe how schools manage their ICT.

To avoid colouring of the research the thesis supervisor closely examined the interview questions for bias and explored these with the researcher prior to his conducting the interviews. These questions needed to be open ended to allow the interviewees an opportunity to freely express their opinions. (Creswell, 2003) Other questions were posed during the interview to elicit further detail as data was uncovered.

Whilst every attempt has been made by the researcher to be an unbiased observer the researcher has had involvement with the schools in the case study and thus interpretations of qualitative data may be coloured by his experiences and observations outside of this research.

### 4.8 The Schools Selected

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<th>School</th>
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<td>(MOE, 2005a)</td>
<td>(MOE, 2005a)</td>
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<tr>
<td>School One</td>
<td>2139</td>
<td>Upper Band</td>
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<tr>
<td>School Two</td>
<td>1423</td>
<td>Lower Band</td>
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*Table 2: Schools selected and their decile band*

Both schools were contacted prior to the research being conducted and written confirmation of their approval was gained. Each person interviewed also granted written approval for the use of their comments and were given a two week period to retract their interview should they so wish. It was agreed with all participants that the schools and individuals would not be identified.
4.9 Data Processing and analysis

Several authors note the issues of deriving generalisable conclusion from qualitative data. (Bouma, 2000; Gillham, 2000; Yin, 2003) This research is not attempting to explore ‘best practice’ or promote a specific approach to managing ICT in schools as appropriate for a given circumstance. Rather it is a descriptive snapshot in time.

However, to further explore what is uncovered, each interview was analysed for themes as they emerged and these coded to a matrix. This was an iterative process as the themes were not necessarily apparent prior to the analysis. Gillham (2000, pp. 71-73) has an extensive section on the mechanics of performing such an analysis and this process was followed. Categorisation of data initially used the terminology of the participants (in vivo) (Creswell, 2003)

However,

“Most researchers will want to compare their findings with previous research; for this reason, key definitions used in your study should not be idiosyncratic. Rather, each case study and unit of analysis either should be similar to those previously studied by others or should innovate in clear, operationally defined ways.”

(Yin, 2003, p. 26)

Thus, once initial recording and coding had been completed the data was mapped to a matrix of roles and processes that have been defined elsewhere.

As the interviews were reviewed and the data analysed and coded, a number of observations were made and recorded in situ in the data analysis of the schools. This process of emergent observations was also continued as the two schools were compared for similarities and differences. The observations gained inform the conclusions reached from this research and form a basis of extrapolation, being cognizant however, of the limitations of
generisability that occur with case study research. Some of the observations come from emergent themes derived from the coding of the data.

4.9.1 ICT Management Roles

A number of functions need to be carried out to manage ICT in any environment. Analysis of the data provided by the schools suggests these can be broken into four broad categories.

1. Strategic and High Level Management
   Vision, Goals, Policies, Human Resources, Budgets

2. Day to Day Management
   Annual Planning, Research, Budget, Deployment, Project Management

3. Technical (Systems) Management
   Server, network and desktops, User Management, Help Desk

4. Sector / Industry Specific Management
   Sector specific, which in the case of a school, can include SMS, LMS and Attendance recordings

These are not strict boundaries between these areas and considerable blurring occurs between them. In particular, item 4.Sector / Industry Specific Management can be encompassed among the other three but is crucial to the overall alignment of ICT to the school.

The needs of the ICT users must also be considered here as well. For a school, there are three distinct sets of users:

1. The staff, both teaching and non-teaching, full time and part time.
2. Students
3. External users such as Community Education classes.
Figure 1: Structure of Roles

Figure 1 gives a visual impression of the roles in managing ICT in schools. The bars between the levels indicate areas of overlap and interaction. The strength and size of these overlaps will vary from school to school. In a similar fashion, the input from both Users and Education Specific Requirements (including those mandated by the MOE) is shown. Depending upon the structures and personnel in the schools the strength of these inputs will vary.

Overlaid on top of this broad diagram are the actual positions within the school and the roles they are designated, or have assumed authority to perform. These roles may well be disguised by the Job Title they hold. A table of roles was generated from the interview data and the tasks performed by the incumbents mapped to this. The data was also reviewed for how the Users’ requirements are met.

4.9.2 Further Analysis

Yin (2003, p. 50) discusses multiple case study methodologies stating:

“Each individual case study consists of a ‘whole’ study, in which convergent evidence is sought regarding the facts and conclusions for the case; each case’s conclusions are then considered to be the information needing replication by other individual cases”
Thus the first stage is to examine each case individually and build a picture of how the school manages its ICT. From there the data was explored for commonality and differences between schools before being explored for commonality in roles. Initial review of the data involved teasing out the ICT Management structure of each school. A subsequent analysis of the data examined commonality experienced by the schools such as staff skill-sets, retention and other factors that emerge.

Figure 2: Overview of analysis of schools and comparison

It would be very informative to review how ICT is managed within specific decile groups however a much larger sample size would be required to adequately do so, as already noted, a limitation of this research.
The data was then be explored for commonalities in role between the schools and as a sector.

**Figure 3: Overview of commonalities between schools and their ICT Management Roles**

### 4.9.3 Alignment Model

Mackey and Mills (2003) used a four step model adapted from King and Teo, to consider the level of integration of ICT to the core business of the primary schools they examined. (King and Teo 1997, cited in Mackey and Mills, 2003) This model could be applied in the following modified format.

**Stage 1**
A need for ICT is understood but is not immersed into the school culture or planning processes.

**Stage 2**
A need for ICT is understood and the school has or is deploying ICT resources to meet student / teacher demand

Stage 3
A need for ICT is articulated in terms of outcomes (alignment) for the school. The school has deployed resources and actively examines their use, looking for improved outcomes.

Stage 4
The school articulates a clear vision for ICT that is aligned with the school’s vision statement. The deployment of ICT resources is constantly assessed against this vision and attained outcomes.
(Adapted from Mackey and Mills, 2003)

This model will prove useful in positioning schools in terms of their management of ICT. The stages represent steps along a continuum rather than discrete steps and there should be no inference taken that schools assessed in stage 4 have reached a ‘nirvana’ like state where everything is perfect.

Referring to the discussion of Alignment in Section 2.1, a stage 4 school would be characterised by a high level of ICT in organisation and support of the school’s function, strong ICT knowledge vested in the IT Manager and potentially the Principal as well, with constant discussion between the parties regarding how ICT can assist and support the school in its core outcomes.

4.10 Summary

The following process was followed:
1. A research proposal was submitted and ethics approval gained
2. Schools were selected and their approval to research gained
3. Appropriate interview questions were developed
4. Staff were interviewed and these interviews transcribed.

5. Using the original recordings as a basis, supported by the transcriptions, the interviews were analysed for themes and coded to a matrix. Emergent themes were added to this matrix.

6. Data for each school was analysed and a picture of ICT Management in the school created. These were then reviewed for common themes. During this stage a number of observations were noted.

7. The observations were explored against materials gained in a literature review and some conclusions and recommendations were drawn.
5 Data Analysis

In the following chapter the data collected from interviewing staff at the two schools will be reviewed against the research questions. The interviews were transcribed and comments plotted to a matrix of initial emergent themes. Both the transcriptions and the original recordings were used for this process to ensure that any emotional content was captured along with the text. As the data was reviewed and coded certain additional themes became apparent and these will be commented upon. A number of observations were made and these have been noted in the context of the data that generated them. In chapter six the observations made will be examined in the light of the literature review and a number of conclusions and recommendations made.

Each school will be reviewed separately (Sections 5.1 and 5.2) and then themes common to both schools will be examined (section 5.3). Throughout this analysis considerable use is made of direct quotations from the various interviewees.

The description of ICT Management in these schools is a ‘snap shot in time’ in that it explores how ICT was managed in the schools at the time the interviews were conducted. It is highly likely that changes have occurred since that time.

To preserve anonymity the schools are referred to as S1 or School One and S2 or School Two. Persons interviewed are referred to by their position title where it is relevant or as P1, P2 and so forth, where it is not. Because the relationships between levels of management is important to this research P1 is the ‘highest’ authority interviewed, P2 the next highest and so forth. Where those interviewed are at the same ‘level’ they are suffixed with an A,B or C hence S1P5A would be School One, Person 5, one of three interviewed at this level.
5.1 Data Analysis: School One

As data from interviews with school staff was reviewed and transcribed it was placed in a matrix based on the Areas of Interest tabled in Section 4.5.4. As additional themes became apparent they were commented on in the context of this structure or as a separate observation.

5.1.1 Data collection and researcher’s bias

Before embarking on a description of School One it is necessary for the researcher to explain his association with the school and to discuss changes that occurred during the data collection phase.

The researcher had had a three year association with the school in a part time role of ICT Professional Development and thus had easy access to the appropriate staff. However, just as data collection began one of member of the IT Management team resigned. This person was interviewed, however it was on the day they were leaving. At the end of that year a second member of the IT Management team, who had been interviewed some time earlier, left the school as well. The net result was that the researcher was offered the position of Director of ICT for a twelve month contract. The announcement of this was made just after the interviews with the IT Management team had been completed.

However, interviews with other (teaching) staff members were not conducted until after the researcher had assumed his new role. The researcher notes that comments made by School One staff members may be biased as the interview was conducted by a person who was now part of the IT Management team.

The three staff members were selected purely for their willingness to be interviewed and represent a cross section of subject areas; however all three hold positions of responsibility within the school. To ensure the confidentiality
of their information their titles and subject areas will not be mentioned in this research.

5.1.2 School One demographics and structure

School One is an upper decile school. It has approximately 1800 pupils (down from the MOE (2005a) figure) and 180 Staff (120 Teaching and 60 non-teaching), utilising 444 desktop computers and 101 laptops. The infrastructure consists of ten servers, running in the main Novell network operating systems (NOS).

The management structure was described by all participants and the structure portrayed is depicted in Figure 1.

![School 1 - ICT Management Structure](image)

**Figure 4: School One- ICT Management Structure (Formal)**
5.1.2.1 ICT Management - Formal Structure

As the levels of ICT management and interaction are explored it is easy to lose sight of the goals of the school. The school’s vision statement is to “equipping individuals for lifelong learning” (School One, 2008) and in essence its ‘raison d’être’ is to produce graduate students that are capable of learning: student learning is at the core of all that it does.

School One does not have a Board of Trustees (BOT) member with a specific task to oversee ICT within the school. Rather, the BOT deals with ICT under appropriate sub committees such as Finance and Property.

The school Principal takes the overall responsibility for ICT within the school on an institutional level. He sets the overall vision for ICT and the Principal regards themselves as a “prophet” and “model” of ICT use in the school.

Day to day management of budgets, long term planning and pedagogical outcomes, along with student ICT discipline are the responsibility of the Director of ICT. The incumbent is a teacher who still teaches two classes and has previously been a Head of Department (HOD) of a large department within the school. They also have line management authority over the Network Manager.

Day to day management and long term planning of technical aspects of the school’s ICT structure is handled by the Network Manager. This is a purely technical role with no teaching load, and is focused on server and network infrastructure. The incumbent is an IT Professional and has not been a teacher. They have line management duties over the ICT technician.

The ICT Technician is essentially a desktop engineer although they have been given some roles in day to day management of the infrastructure such as
backups and end user management. In the past there have been two technicians but at the time of the interview only one was employed at by the school.

The Deputy Principal (DP) is a member of the Senior Management Team (SMT) which is the day to day ‘governing body’ of the school. The incumbent provides an informal line to this body but has had a significant role in HR management within the ICT Management structure, specifically with the relationship between the Network Manager and Director of ICT, as well as attempting to recruit new and replacement staff.

Staff interact with this structure as users of the system and requesters of support and new technology requests such as hardware, software and access. As users there is also some imposition of how they will perform certain tasks and the perception that they will accept the pedagogical implications of ICT and use it appropriately to support the learning of their students.

Students are essentially end users of the system with little control over what and how they work with ICT. They are directed by staff to perform tasks at certain times whilst the Director of ICT keeps a watchful eye on their activities in ‘loco parentis’. If students require support their normal first port of call is their classroom teacher, followed by the ICT Technician or Director of ICT as necessary. It is important to note here that there is an expectation that students will use ICT out of school either at home or in other public institutions such as libraries.

Whilst informative a description of the formal structure leaves a lot of the story unspoken. Below is a Functional model of ICT Management in the school.
5.1.2.2 ICT Management – Functional Structure

A whole new order of complexity is immediately apparent. Whilst the formal structure is relatively simple, the number of other parties that have an impact on ICT within the school is significant and as can be see only five of the twelve identified individuals or groups have been interviewed in this research. It is beyond the scope of this research to interview and explore all of the functions affecting ICT in this, or any, school however the outputs from such further research could well be very useful to schools in clarifying their roles and reporting lines.

However, this structure gets even more crowded when the implementation of the school’s Student Management System (SMS) is considered. The Ministry of Education has mandated the use of SMS systems to enable interchange of data and for such purposes as Electronic Attendance Registers (eAR) (MOE,
Within School One two people are involved in the management of the SMS; a DP who manages timetables and class allocation, and a full time office employee who manages the SMS system including school reports.

Further still, the Accounts Manager operates a separate accounting system that is run on a ‘stand alone’ network. The amended diagram is below.

Observation 1
ICT in School One is far more complex than it initially appears, with a very significant number of participants who have direct input to ICT, as well as stakeholders (users).

Observation 2
Those formally tasked with managing ICT do not have direct control over some aspects, such as the SMS and accounting package, that impacts on their role.
Observation 3
Those tasked with managing ICT in the school must operate with a high level of consensus from all of the stake holders and interested parties. Every decision must be made with an eye for its impact on other parties.

5.1.3 Staff Member Demographics.

5.1.3.1 School Principal

Mackey and Mills (2003) found a direct correlation between ICT uptake and maturity in primary schools, and the principal’s knowledge of ICT. (Mackey & Mills, 2003) Similar research for secondary schools has not been located however the MOE have acknowledged the issue of ICT understanding and principals with the Laptops for Principals Initiative (MOE, 2008d).

The Principal describes themselves as having low to moderate ICT skills (1 to 3 on a 1 to 5 rating scale) but states that:

“one in terms of how the stuff works, still mystifies and amazes me, (laughs), and in terms of use, well I can and do use the programs that are necessary to me.”
(S1P1, personal communication, November 30, 2007)

It can be directly inferred that the Principal does not have an in-depth understanding of ICT, which is further inferred from their answer to question 9, what is their input to ICT Management in the school. The principal stated that their key role is “I just sign the cheques really”. (S1P1, personal communication, November 30, 2007)

As a user of ICT the Principal stated that the programmes they use regularly are MS Word and MS Excel, and that they are branching out into the use of MS PowerPoint. However, throughout the interview the Principal also mentions
the use of asTTLe achievement data for monitoring student progress and shows an awareness of ICT in the school.

Asked about their knowledge of ICT and its integration to learning and teaching the Principal states that they “would like to think that was about a four” (S1P1, personal communication, November 30, 2007). Discussion through other questions revealed that the Principal has a strong desire to see student learning benefit from using ICT effectively, and that they see ICT as central to twenty first century learning.

“In this day and age it’s necessary for kids to be IT literate so obviously there is a role for schools to promote and develop that, in terms of giving them exposure and a chance to use.” (S1P1, personal communication, November 30, 2007)

“I think the more important thing for me is the potential of ICT to improve teaching and learning and the learning outcomes and particularly, and increasingly so I think, as a tool to engage the natives as it were.”
(S1P1, personal communication, November 30, 2007)

The Principal sees their role as

“as a pusher for, you know, more and more people to using IT more effectively, and sort of a prophet ( ..) of the potential value of it for improving teaching and learning.”
(S1P1, personal communication, November 30, 2007)

Whilst not professing to have an in-depth understanding of how ICT works, nor being a particularly extensive user of ICT, the Principal has both a desire and an understanding of how ICT can be used to promote teaching and learning in the school.

5.1.3.2 SMT Representative

The Senior Management Team (SMT) is the managing body that manages all aspects of the school on a day to day basis, and is composed of the Principal, Associate Principal and the school’s Deputy Principals. The
incumbent in this interview is a Deputy Principal who has been in the school for seven years.

The SMT Representative feels they have a knowledge rating of ICT that ranges from two to three. “I know more than most people. But I know enough to know I am not particularly well versed in the whole thing” (S1P2, personal communication, November 21, 2007). One important factor in this answer is that it shows the impression of any question asking a person “what they know”. The SMT Representative did mention that they had an interest in ICT and had volunteered themselves to be involved with ICT management in the school.

“I’ve spoken out about IT from time to time when there have been issues that I’ve thought needed supporting or developing or whatever” (S1P2, personal communication, November 21, 2007)

The SMT Representative states that they have become a DP with responsibility for ICT, particularly as certain Human Resource issues of management arose in the school. They have also been involved in staff recruitment and contract negotiations for ICT.

In terms of integrating ICT into learning and teaching the SMT Representative see themselves as a four, with a high understanding of ICT use. “I know about it, I know what it is, but practise; I don’t practise” (S1P2, personal communication, November 21, 2007)

### 5.1.3.3 Director of ICT

The Director of ICT has been on staff at the school for twenty years and has held other senior roles, related to teaching. (Head of Department - Business Studies and Head of Department – Social Sciences, the later being one of the larger school departments). They see themselves as:

“a jack of all trades with regards to ICT. So anything that no one else wants to be their patch with regards to ICT is my patch”

(S1P3, personal communication, November 2, 2007)

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4 In this interview the rating scale was reversed with 1 being high and 5 being low. The numbers stated for this person have been realigned with the 1 Low, 5 High scale used in other interviews.
They view themselves as a user ‘who is aware’, but states that “I just do not feel that I’m technical” (S1P3, personal communication, November 2, 2007). They rate their technical knowledge of ICT as being a three. With respect to the integration of ICT to learning and teaching they view themselves as a four and that they “constantly look out for opportunities to use ICT in the curriculum, to enhance the delivery to students.” (S1P3, personal communication, November 2, 2007)

Later in the interview the Director of ICT made a further comment about their role.

“I guess I see my job as, um, stirrer, stirring it along and in a vague direction which, um, yeah, I think that probably, um, I would imagine, you know, that there are people in the school who sort of say ‘So, what’s the direction of ICT?’ And, and, maybe that is my problem but um, you know I think very much that it is about being used as a tool and integrating it into the teaching and learning.”
(S1P3, personal communication, November 2, 2007)

The Director of ICT’s background is that of a teacher who has held middle management roles in the school and then has moved to this role. The Principal identified the incumbent in this role as being crucial.

“Well I think the biggest change, really, would be having (Dir ICT) in that position for the last, whatever it’s been, five years”
“a dedicated sort of Director who is an educator has sort of helped to bring it together in terms of what we need and what we want to do in relation to the teaching and learning.”
(S1P1, personal communication, November 30, 2007)

The principal also commented that previous Network Managers were self taught enthusiasts and that in the past the school had had no mechanisms for educational IT decision making. (S1P1, personal communication, November 30, 2007)

Observation 4
A review of the ICT management structure of the school shows this role as being pivotal. It provides budget control and the vast majority of stakeholders
interact with this role. The Director of ICT was entirely correct when they stated that their role was as a ‘jack of all trades’

5.1.3.4 Network Manager

The Network Manager is an IT Professional with twelve years of experience, and a Novell Systems specialist. They have not been involved in classroom teaching. They have been in this role for nearly four years. They view their role as:

“Network Manager meaning manage the, whatever ICT IT equipment is in there. Make sure they are properly used and to the expected level. And to provide support on everyday base whatever”

“Hardware, software, infrastructure, communication, whatever. Whatever”

(S1P4, personal communication, October 26, 2007)

Given the Network Manager’s background, the question relating to their level of ICT knowledge is somewhat meaningless in the context of the school. They saw themselves as being 4½ to 5 which is anticipated. In explanation for not placing themselves entirely at the top of the scale they stated that:

“Because it’s most of the time I know from top of my head. There are new things which, are you know, always are new and you have to do some research but that’s not a biggie.”

(S1P4, personal communication, October 26, 2007)

A more interesting question to resolve for this incumbent is how they view their knowledge of the integration of ICT to student learning and teaching. When asked how they rated themselves there was a significant pause before the Network Manager stated that they saw themselves as having a knowledge of 3 to 3½ out of 5. They qualified this by saying first:

“Providing I um, have just started to sort of, learning that by joining the school environment because companies have different sort of approach.”

(S1P4, personal communication, October 26, 2007)

They view their role in the school as

“based on a very clear specified customer needs, whatever is student or teacher, doesn’t matter what level, even administration it does not matter. I would see my input as finding solution for them to deliver what they need.”

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Observation 5

The Principal noted that previous staff in this role had been self taught:

“people that just came out of teaching and were sort of, if you like, self taught computer experts, which I guess was fairly widespread in schools 5 to 7 years ago. And so, as you know, we had a very patchwork sort of set up technically”

(S1P1, personal communication, November 30, 2007)

5.1.3.5 Staff Members

Three staff members, whose selection was based solely in their willingness to be interviewed, were interviewed for this research. So that they are not easily identifiable their specialist areas will not be mentioned and they are referred to as P5A, P5B and P5C. All three staff carry a level of responsibility in the school, with one Director of, and two being a Teacher in Charge of a specific area.

All three teachers mentioned making two or more hours of use of ICT within the school day. However, all three made comments that they make more extensive use of ICT out of hours, normally at home.

Teacher 5A – significant use for marking (electronic) work at home
Teacher 5B – using a word processor from two to six hours per night
Teacher 5C – extensive use of communicative technologies including e-mail and chat, with senior students.

(S1P5A, personal communication, May 30, 2008; S1P5B, personal communication, May 30, 2008; S1P5C, personal communication, May 30, 2008)

When asked about their ICT Skill levels the responses were very subjective and not really useful for comparison between the interviewees. The responses were 2-3, 3-4 and one teacher rating themselves solidly as 4. This later teacher stated that some years back they had completed Computer Science papers at university, which were orientated around the use of mainframe computers. They did note that they were able to adapt what they had learned in these
papers and that they “can help staff frequently with really minor things they ask me for” (S1P5C, personal communication, May 30, 2008). This comment also suggests that the ICT skill levels of other staff that this teacher interacts with are not particularly high.

Two of the teachers listed their understanding of integrating ICT into the curriculum as 4, and as 2 to 3 respectively. The third teacher did not directly answer this question but did spend some significant time discussing the technologies they use to communicate with students. Regarding themselves, stating that “I’ve got a lot of gadgets and that’s very helpful” (S1P5C, personal communication, May 30, 2008) when describing their knowledge of ICT integration.

**Observation 6**

All three teachers commented on the ‘out of hours’ use they make of ICT without any prompting from the researcher. ICT in schools is not strictly ‘in school’ but extends to the locations teachers work in, and the hours that they actually work.

**Observation 7**

In discussion regarding the integration of ICT to the curriculum, the three teachers talked about how they were learning to use ICT in more ways that integrated with their specialist area. Teacher 5A discussed their desired use of the internet to expose their students to broader aspects of their subject. Teacher 5C also commented about how they often find ICT based solutions for existing issues. “I find that I find ways where I think, oh I need to do that, and I can” (S1P5C, personal communication, May 30, 2008)

This suggests that ICT in schools is somewhat unique in that it is the employees who must decide how to implement ICT. The school is tasked with providing the resource, but the individual is tasked with how to effectively utilise this. This may sound simplistic however there is much material published on using ICT in learning and the MOE has the multimillion dollar ICT PD Cluster Programme.
with the aim of improving student outcomes through effective use of ICT. (MOE, 2008b)

5.1.4 School Vision for ICT

School One has a clear mission statement:

“Equipping individuals for lifelong learning” (School One, 2008, p. 1)

The internal document accessed then describes the principles that are used to guide the implementation of this Mission Statement. Whilst only one of the stated principles directly relates to ICT, other statements also have a bearing on the outworking of ICT.

Quality Learning

“Supporting students to achieve their maximum potential through well constructed and delivered learning opportunities”

Equip Students

“Fostering independent learning through the development of key competencies”

“Developing their ability to work cooperatively”

“Fostering adaptability and flexibility”

“Developing the skills required to function effectively in an information and technological age”

Provide a Positive Environment

“Providing structures to maintain emotional, physical and cultural safety and hauora”

(School One, 2008, p. 1)

Hauora is defined as:

“a Maori philosophy of health unique to New Zealand. It comprises taha tinana, taha hinengaro, taha whanau, and taha wairua.”

“The concept of well-being encompasses the physical, mental and emotional, social, and spiritual dimensions of health. This concept is recognised by the World Health Organisation.”

(TKI, 2008)

Whilst this definition is taken from a page discussing Health and Physical Education, the concept has applicability to ICT in the realm of maintaining emotional and mental health, as well as on occasion, physical health, where the use and abuse of ICT, particularly the internet, is concerned. It also
applies to other technologies such as instant messaging, e-mail and cell phone use.

Thus, the principle message regarding ICT use in the school is that of assisting students to develop “skills required to function effectively in an information and technological age” (School One, 2008, p. 1), with other applicable principles embedded in the school’s principles and needing to be ‘teased out’.

Assuming that Vision is normally cascaded down from the top of an organisation the following review looks at the school’s vision for ICT form a top down perspective.

5.1.4.1 Principal

The Principal had a two fold vision for ICT as follows:

“Obviously in this age it is necessary for kids to be IT literate”

“the more important thing for me really is the potential of ICT to improve teaching and learning and the learning outcomes and particularly, and increasingly so I think, as a tool to engage the natives as it were. Because it’s pretty obvious out there that they don’t like and can’t tolerate sitting listening or reading and writing for a whole hour because they’re such hyperkinetic digital twits. The teachers have to somehow try and embody that in their teaching”

(S1P1, personal communication, November 30, 2007)

Thus the Principal’s vision is that all students need to have ICT and that it is of great value for student engagement and improving learning outcomes.

5.1.4.2 SMT Representative

The SMT Representative said that they felt the school’s vision had been changing

“has been that we want all students to be competent to use ICT in a way which effectively supports their learning, and to provide the infrastructure for that for which we are prepared to set aside quite a large amount of resource; there’s never enough. The vision is to get away from teaching ICT as a standalone, and to integrate it so it is relevant to kids learning. Not
for ICT per se but for their acquisition of skills and knowledge in whatever areas they are interested in.”
(S1P2, personal communication, November 21, 2007)

When asked if they could articulate the school’s vision for ICT the SMT Representative gave a significant pause, over eleven seconds, before answering and sounded distinctly under pressure to respond. The vision enumerated by the SMT Representative is substantively the same as that stated by the Principal with an added comment about teaching with ICT in a context rather than teaching ICT or teaching about ICT.

The SMT Representative also mentioned that the school’s vision is to provide ICT infrastructure that is supportive of student learning. This links back to the school’s vision of continual improvement of ICT.

5.1.4.3 Director of ICT

The Director of ICT did not hesitate when asked what the school’s vision for ICT is and answered:

“basically to use IT to enhance the learning experience for students. And I guess now that we’re talking of more personalised learning, that. But, um, because we’re a school, but then I guess, you know, by default we are very dependant on ICT for our admin”
(S1P3, personal communication, November 2, 2007)

Again, the theme espoused is to enhance learning for students, which was related to the area of personalised learning. This links back to the vision as stated by the Principal and the SMT Representative. When asked where this vision came from the director of ICT paused for nearly 10 seconds and considered their answer before saying:

“I guess it comes from the principal. ‘But, I mean, its something I believe in myself anyway, so, I get a bit confused whether it’s my vision or (their) vision.”
(S1P3, personal communication, November 2, 2007)
The Director of ICT is clearly unsure of where this vision for ICT has come from; despite the way it appears to be a commonly shared vision within the school. There is certainly some confusion over a school wide vision for ICT. It is also interesting that the Director of ICT also mentioned the use of ICT for administration at the same time whereas neither the Principal nor SMT Representative made any acknowledgement of ICT for administration.

Later in the interview, the Director of ICT made some interesting comments regarding the ‘vision for ICT” in the school; stating that:

“I guess I see my job as, um, stirrer, stirring it along and in a vague direction which, um, yeah, I think that probably, um, I would imagine, you know, that there are people in the school who sort of say “So, what’s the direction of ICT?” And, and, maybe that is my problem but um, you know I think very much that it is about being used as a tool and integrating it into the teaching and learning.”

(S1P3, personal communication, November 2, 2007)

These comments suggest that a formal vision for ICT, its use and deployment in the school, is not widely publicised and is not articulated to or by staff.

5.1.4.4 Network Manager

(English is not the Network Manager’s first language and thus some of the phrases quoted will require some exploration to gain their full import.)

When asked what is the vision for ICT in the school the Network Manager paused for nearly 14 seconds in consideration before saying:

“I can’t tell really. I mean, I don’t know because the vision in the school I worked is not particularly clear. They expected me to create it virtually.”

“It’s just sort of, you know, not much was coming from school management as such. (Dir IT) used to, as others, what you’ve got, what I can have. So, it’s not a vision as such. It was just like based on questioning, you know, comparing our system to another.”

(S1P4, personal communication, October 26, 2007)

The first portion of this statement shows that the Network Manager was completely unsure of the school’s vision for ICT, which is borne out by the
second statement that there was no vision coming from the senior management.

The comment about creating the vision needs to be seen in the context of further discussion. When asked about how ICT Management worked within the school the Network Manager made the following opening comment:

“Well, um, I think at school the ICT management is not fully aware of what can be done”
(S1P4, personal communication, October 26, 2007)

This and subsequent discussion about ICT capabilities suggests that in the Network Manager’s opinion senior management do not understand the capabilities of ICT in the institution, and hence the Network Manager’s comment about creating a vision for ICT. To them the vision is based around what ICT can do whereas the previous interviewees expressed the vision in terms of student outcomes. This also shed some light on their comment regarding a vision based on comparison to other schools. Again, a view of a vision based on systems and infrastructure and not student outcomes.

“Vision for me is like bigger picture. I couldn’t see the bigger picture. I could just see little actions, but not big…”
(S1P4, personal communication, October 26, 2007)

Clearly the school’s vision for ICT has not reached the Network Manager.

Observation 8
The Network Manager is an IT professional and does not have a teaching background which may in part explain why they view a school vision for ICT quite differently to other managers who are teachers. This raises a question of how the school vision is interpreted from an educational view to a systems one, so that those tasked with managing ICT infrastructure can see the import and impact of what they are doing.

With no specific school vision for ICT it is impossible to re-interpret it for other levels of management who have different backgrounds. Compare this with
School Two where although there is again no stated vision there is less discord as the equivalent incumbent has a background in both teaching and ICT.

**Observation 9**

ICT like any other industry has core business, student learning, which ICT supports. It is fundamental to alignment of ICT in the institution that the IT Professionals understand the business their ICT is supporting.

**5.1.4.5 Staff**

The three staff interviewed showed three markedly different viewpoints on the school’s vision for ICT.

**5.1.4.5.1 Staff Member 1**

This staff member was very concerned at a lack of communication from senior management regarding a school wide vision for ICT. The teacher alluded to this when talking about a lack of infrastructure access in their classroom and further emphasised when they quoted a biblical aphorism.

“It is like a disconnection. We have talk of ICT vision and then it’s not walked out.”

“Where there is no vision, the people perish”

*(SIP5A, personal communication, May 30, 2008)*

The teacher discussed their personal vision for ICT which is based around a rich environment for their students, utilising the internet for current topical research in their specialist subject, as a tool to provide differentiated learning in the classroom. In essence, their view of the school’s vision is an exploration of the ICT infrastructure and its level of deployment within the school. Their classroom does not have network connectivity and the teachers vision centred around the possibilities for their students should they have connectivity. The teacher also noted issues in obtaining ICT based resources (learning CD-ROMs) which will be discussed later, but also formed a part of their vision for how they could use ICT. *(SIP5A, personal communication, May 30, 2008)*

**5.1.4.5.2 Staff Member 2**
This staff member made no mention of a school wide vision for ICT other than
to suggest the reason for this question was to see if their vision for ICT
matched that of the senior management. In contrast to the previous staff
member, this staff member has a standalone computer, data projector and
network access in their classroom. This teacher’s description vision was again
centred around infrastructure and deployment, but in a less personal way,
rather looking at how other teachers could gain better levels of access,
stating that:

*Definitely to have every single room in the school with a desktop computer and a data
projector would be the ideal”*

(S1P5B, personal communication, May 30, 2008)

This staff member was concerned about budget levels within the school and
saw their vision in terms of budget.

“The vision for ICT at (the school) is to try and keep up with, as much as the budget will
allow, up with what’s happening. Because we’re teaching these students who are totally
techno savvy.”

(S1P5B, personal communication, May 30, 2008)

They later repeated their comment on budget restraints limiting a vision for
ICT in the school. The second part of their comment above also relates this
vision to the ICT literacy of the students they are teaching, implying a need to
use teaching tools and pedagogies that the students are familiar with. The
teacher’s enthusiasm for using ICT for both administration and student
learning is borne out by this comment.

“Once everyone’s got access then you’re going to get more people doing their admin, they’re
going to integrate the curriculum in more. If they can get a data projector in their room as
well you’re just onto a winner.”

(S1P5B, personal communication, May 30, 2008)

Thus, this teacher’s vision for ICT also concerns the deployment of
infrastructure, but from a less personal basis to a whole school view.

5.1.4.5.3 Staff Member 3
Again, the third teacher made no reference to a school wide vision for ICT. However, they did make an interesting comment regarding the management of ICT in the school, stating that eventually:

“the school will have confidence that we know where we’re going. Ask any staff member about where we’re going; nobody knows where we’re going. It’s all suggestions all over the place.”

(S1P5C, personal communication, May 30, 2008)

This strongly suggests a lack of communicated goals and vision for ICT.

In discussing their personal vision for ICT in the school the teacher discussed a move from teaching ICT as a subject to a more ubiquitous ICT that is there when needed by both staff and students, suggesting that ICT should be “part of your way of life” (S1P5C, personal communication, May 30, 2008). This comment does relate back to the school’s mission statement if one considers an ability to use ICT as a requirement for a ‘lifelong learner’. It certainly relates back to the school’s principle of providing students ICT skills to enable them to function in society.

5.1.4.6 Comments

There is no explicit statement regarding, or vision for, ICT in the school. All of the staff members interviewed, with the exception of the Principal and SMT Representative, prefixed their discussion of the vision with a comment suggesting that the vision they held for ICT was in fact their own.

The Principal, SMT Representative and Director of ICT were concerned about the impact of ICT on teaching and on student learning in a broad sense, whilst two of the classroom teachers viewed the school’s vision for ICT from the standpoint of infrastructure availability. The third teacher had a similar view but looked further ahead to a point where ICT is ubiquitous. (S1P5C, personal communication, May 30, 2008)

The biggest difference in viewpoint came from the Network Manager, who has not and has not been a teacher. Their point of view seemed to suggest
that they were required to describe what ICT could do so that a vision could be formulated. This does suggest that their view of a vision was in fact closer to being a definite plan rather than broad direction.

5.1.5 Alignment of ICT

The following statements were made by the Principal and SMT Representative, regarding the use of ICT in the school.

“I think the more important thing for me really is the potential of ICT to improve teaching and learning, and the learning outcomes, and particularly and increasingly so I think, as a tool to engage the natives as it were.”

“The teachers have to somehow try and embody that in their teaching”
(S1P1, personal communication, November 30, 2007)

“We want all students to be competent to use ICT in a way which effectively supports their learning and to provide the infrastructure for that for which we are prepared to set aside quite a large amount of resource. There is never enough”
(S1P2, personal communication, November 21, 2007)

These statements explore ICT from the standpoint of the students learning and teachers teaching, suggesting that high alignment of ICT is characterised by extensive use by students to learn with, and by teachers to teach with.

Teaching staff too expressed their concept of alignment of ICT around its use as a teaching tool, but also made comments regarding its use as an administration tool.

“(We are) now doing far more of the admin”
(S1P5B, personal communication, May 30, 2008)

“I don’t know how people taught before without a laptop. Because I can take it home; it’s contact time here and I do a lot of my stuff at home.”
(S1P5C, personal communication, May 30, 2008)
5.1.5.1 Dichotomy

Review of the interviews shows several distinct viewpoints on the use of ICT as shown above. There are two very distinct uses or alignment needs, of ICT in the school.

1. ICT for Administration (SMS systems, attendance, grades, reporting and so forth)
2. ICT for learning and teaching

The later can be further subdivided into its own dichotomy

1. ICT for teachers to teach with
2. ICT for student use

Thus there will be significant differences in how alignment is viewed depending upon the ‘use’ to which ICT is being put. Each one of these will be considered separately here and evaluated against the alignment model in Section 4.9.3.

5.1.5.2 ICT for administration

The school runs an MOE approved Student Management System (SMS) and utilises it for enrolments, timetabling, grades, reporting and attendance. Other systems such as Detentions, STAR Recording and the Learning Management System (LMS), use database extracts from this system. Hence this is a ‘core’ system and its deployment and accessibility will be a significant measure of alignment.

The Principal did not directly make mention of this software whilst the SMT Representative stated that “We do pretty well - we’ve got (SMS) and it does the work for us.” (S1P2, personal communication, November 21, 2007) and the Director of ICT noted that the school has become very dependant on ICT. (S1P3, personal communication, November 2, 2007)

However, the reality for the teachers is not the same. The teachers interviewed made mention of the uses of ICT for school administration but
expressed significant dissatisfaction at the deployment of ICT to perform these tasks. Teachers wanted to be able to perform administrative tasks in their teaching space or from home, with both teachers one and three making mention of this. (S1P5A, personal communication, May 30, 2008; S1P5C, personal communication, May 30, 2008) Teacher two stated that:

“Once everyone’s got access then you’re going to get more people doing their admin, they’re going to integrate the curriculum in more”

(S1P5B, personal communication, May 30, 2008)

Deployment, specifically network infrastructure, is seen as a major issue by staff.

“We have all this ICT but we are actually isolated. I think it’s largely ineffective because I think management lets us down. It’s not effectively managed.”

(S1P5A, personal communication, May 30, 2008)

It should be noted that all three teachers indicated that they utilise ICT extensively when at home (utilising a school subsidised laptop) ranging from two to six hours per evening. (S1P5A, personal communication, May 30, 2008; S1P5A, personal communication, May 30, 2008; S1P5C, personal communication, May 30, 2008) Thus, a measure of ICT being highly aligned to teacher demands (Stage 2 of the alignment model) would be for teachers to have remote access to the SMS for reporting and to the school infrastructure for data. This is not the case. Applying the Alignment Model described in 4.9.3 the school is in Stage 1; understanding the need but not immersing the deployment of ICT into either culture or planning processes, and ICT is not being deployed to meet teacher demand.

The school also uses other software for testing and monitoring student achievement (asTTle) which one teacher noted as being too complex to use.

5.1.5.3 ICT for learning and teaching

The Principal talked about the need for students to be IT literate in today’s society but did not make any other mention of ICT for student learning and
teaching. They did, however, mention that the appointment of the Director of ICT was a pedagogical, rather than an IT, decision. This role is focused on assisting staff to use ICT for learning and teaching, although the ICT Director described their role as being more a ‘jack of all trades’ which encompasses the actual management, both budgetary and decision making, of ICT.

“Anything that no one else wants to be their patch with regard to ICT is my patch.”

(S1P3, personal communication, November 2, 2007)

Teacher 2 did say that they would normally approach the Director of ICT for advice on using ICT in the classroom as they would anticipate that the ICT Technician “would not know how I can use this as a teaching tool” (S1P5B, personal communication, May 30, 2008)

The Network Manager talked in terms of finding solutions for staff members:

“based on a very clear specified customer needs, whatever is student or teacher, doesn’t matter what level, even administration it does not matter. I would see my input as finding solution for them to deliver what they need.”

(S1P4, personal communication, October 26, 2007)

However, during the interview, the Network Manager made no mention of student learning or teaching and as already noted, was unaware of a vision for ICT within the school. This person is an IT Professional and not an educator, and when questioned about their knowledge of ICT integration they stated that:

“Providing I um have just started to sort of, learning that by joining the school environment because companies have different sort of approach.”

(S1P4, personal communication, October 26, 2007)

However, at the ‘whiteboard face’ the point of view is quite different.

“(It is a lack of ICT infrastructure) that kills some of my enthusiasm for teaching because I have such a lot of ideas that are pumping in my head that I can’t work through”

(S1P5A, personal communication, May 30, 2008)

“there is too much down-time in computer labs. I don’t see that as productive learning time”

(S1P5B, personal communication, May 30, 2008)

“(Student access) that’s still not so good”

(S1P5C, personal communication, May 30, 2008)
Significant frustration surfaced when talking to the teachers regarding the use of ICT. A lot of this frustration was tied up a lack of infrastructure, especially for administration, as already noted, but also for learning and teaching tasks. Teacher 1 made three strong comments about ICT actually killing their enthusiasm for teaching rather than enhancing it. They talked of using differentiated Learning in the classroom via CD-ROM software, but were unable to do so. Their most insightful comment was that:

“It’s like the roof of the house is not actually connecting to the basement; and all the activity is going on in the basement”

(S1P5A, personal communication, May 30, 2008)

This indicates a significant gap between the perceived alignment of ICT by senior management and that actually experienced by staff members. To be fair, the SMT Representative did point out that they were aware of limiting factors in hardware and infrastructure, but that this was a question of budget.

(S1P2, personal communication, November 21, 2007).

A further comment made by the SMT Representative was a move to take ICT out of the ICT Class and into the classroom, which aligns with other statements regarding pedagogical use of ICT.

Again applying the Alignment Model described in 4.9.3 the school is between Stages 1 and 2, understanding the need and attempting to deploy ICT resources to meet the demand.

**Observation 10**

Schools face an interesting problem of providing ICT and then expecting the teachers to find ways of using it; rather a ‘field of dreams’ approach. (To paraphrase the line in the Kevin Costner movie Field of Dreams; If you build appropriate ICT structures then teachers will find ways of using it). The teachers interviewed did show a keen interest in using ICT for pedagogy, both teaching and learning. Teacher 3 noted that:
“I find that I find ways where I think, oh I need to do that, and I can.. I’ve got a lot of gadgets and that’s very helpful.”
(S1P5C, personal communication, May 30, 2008)

5.1.5.4 Budget Constraints

A comment from the SMT Representative regarding budgets has already been noted above. The Principal, somewhat facetiously, referred to their role in ICT Management as “I just sign the cheques” (S1P1, personal communication, November 30, 2007) however there is a distinct point of view to be considered behind the statement. Recently during the 2008 Budget discussions, New Zealand’s largest secondary school stated in a newspaper article that ICT now costs them $565,000 per annum. (McKenzie-Minifie, 2008c). Indeed, the 2008 Budget did include $65.3m over four years, for ICT in schools. (Herald, 2008) The costs associated with ICT are a significant factor for the school.

Budgetary provision for ICT is an issue and again suggests the school is between stages 1 and 2 on the alignment model, by grappling with issues of deployment.

5.1.5.5 Impact of ICT Management Roles

As already noted, the school does not have a vision for ICT that is articulated and understood by all. Further, ICT is not embodied in other decisions with the Director of ICT noting some frustration in not being involved in the construction of new buildings. (S1P3, personal communication, November 2, 2007)

The Principal did not see themselves as being particularly knowledgeable in ICT but professed themselves to be a ‘user’ of the programs necessary for their function, and as a modeller of ICT. (S1P1, personal communication, November 30, 2007). In their research of Primary School Principals Mackey and Mills found that:

“The ICT competence of the schools’ principals, coupled with their attitudes toward using ICT, appeared to be an important factor influencing ICT planning and development”
(Mackey & Mills, 2003, p. 84)
However, even the largest Primary School in New Zealand is smaller than this secondary school and thus it should be assumed that a secondary school Principal works far more by delegation that would a Primary Principal. One of the teachers interviewed did comment on the Principal’s lack of use of ICT in staff meetings.

It appears that at the senior management level there is enthusiasm and acknowledgement of ICT but no alignment of ICT to the school’s vision, nor is there a strong impetus for ways in which ICT could benefit the school, its staff and its students.

At a middle management level there is a distinct issue. The Director of ICT is a teacher foremost and has budgetary responsibility for ICT. The Network Manager is an IT Professional with no teaching experience, producing a Pedagogy / Technology dichotomy. Further, there is significant friction between the two parties with the Principal pointing out that:

“I don’t see it (IT Management) as working all that well actually, and that’s not the fault of any person or persons particularly”

“That sort of structure inevitably, potentially, leads to conflict because where are the boundaries”

(S1P1, personal communication, November 30, 2007)

The Principal went on talk about conflict in particular over decisions made by the Director of ICT that the Network Manager felt they owned. The Principal did state that key decisions were made by the Director of ICT with appropriate consultation as required. (S1P1, personal communication, November 30, 2007)

The location of Budgetary decision making has a significant impact. It raises the question that outcomes may have been different, and friction lessened, if direction were set by the Director of IT but technical budget decisions made by the Network Manager.
The interview with the Network manager indicated a disconnect between educational use of ICT (Pedagogy) and their perceptions of ICT (Technical), suggesting that senior management were not aware of how ICT could be used in the school. They stated that:

“Well, I think at school the ICT management is not fully aware of what can be done. So, its still, how we can say; we learning what we could have out of it. I have a feeling like management, school management, ICT management in the school, is less, how we can say, orientated to get as much as possible from ITC of IT equipment than students are”

(S1P4, personal communication, October 26, 2007)

The Network Manager expressed significant concern over ICT alignment with the school, but without an articulated vision for ICT, was unable to say what that alignment should be like. When asked about how the school plans for future ICT requirements they replied:

“deploying network access everywhere so that would be first approach. Based on much more user or student access, providing web access services more and more often. Allow students to (pause) actually to control and sort of have an access to see an exciting progress you know?”

(S1P4, personal communication, October 26, 2007)

The later part of this comment was based around the IT Manager’s experience with Novell training and the ability to review one’s progress through the qualifications via an online portal. This does suggest that the Network Manager was straying into areas of the SMS system. They went on to further discuss the possibility of using the systems to teach students about IT servers and infrastructure, potentially setting up servers for students to work on.

“That’s what I expect with virtualisation but you know it was, you know, dreams, dreams, dreams. But hey, you have to start with dreams”

(S1P4, personal communication, October 26, 2007)

No suggestion that this concept was communicated to the school could be found and certainly the idea of teaching ICT as a subject goes counter to the SMT Representatives comments and is not supported by current MOE policy.
This indicates a significant gap between the Network Manager’s perception of alignment and that of the school.

5.1.4.6 The ICT Committee

The role of the ICT Committee is to:

“oversee the budget carve up and decide on priorities when inevitably the requests outnumber the potential to fund them. Other meetings from time to time are sort of, more generic, sort of, IT in an educational setting, or how it relates, or how it is used or whatever.”

(SIP1, personal communication, November 30, 2007)

This group is appointed on an annual basis by invitation of the Director of ICT. It normally consists of the Director of ICT, the Network Manager, the SMT Representative, the Head of the IT (Teaching) Department, and several other teaching staff with an interest in ICT. The majority are not ICT specialists and there is no guaranteed consistency of the group from year to year.

The Director of ICT stated that they

“feel too that there needs to be a strong committee and I think that’s always the challenge to schools to actually have enough people who are interested enough to keep it going.”

(SIP3, personal communication, November 2, 2007)

Interestingly, none of the teaching staff interviewed made any direct mention of the ICT Committee.

However, the Network Manager expressed some significant discomfort with the committee.

“I do like the ICT group we’ve got and closed meetings. In many big decisions, sorry, they are not qualified to do that. Sorry. They can listen to one or two preferably, competitors, ( ), you know what I mean, just to get two different, very opposite point of views, then they can make decision.”

(SIP4, personal communication, October 26, 2007)

And when talking about planning for future ICT they stated:

“we will go this way or we want this way I supposed to do some sort of investigation or sort of, I don’t know, research. And then the group of people, not necessarily ICT group, based on
who really know that subject decision. It’s not just like used to happen, whatever somebody feels like goes. Shouldn’t be like that.”
(S1P4, personal communication, October 26, 2007)

The Network Manager appears to feel that decisions made by this group lack technical rigour and are more based around discussion and ‘feelings’ than technical content. It suggests that the Network Manager is feeling undervalued and that their input is being reduced.

Although this committee is supposed to be a governing body for ICT in the school it appears that key decisions are made elsewhere, normally by the Director of ICT, and that the lack of technical knowledge in the group is seen by the Network Manager as a significant problem.

5.1.5.7 Comment on Alignment

There does not appear to be strong alignment between ICT and the School’s Vision and Objectives; certainly there is no articulated vision for ICT within the school. Overall the school appears to be at stage one of the alignment model in section 4.9.3:

A need for ICT is understood but is not immersed into the school culture or planning process.

As a final comment on the alignment of ICT within the school teacher one is quoted below.

“There is a huge gap between what the curriculum states, what we have to talk about on in-service days, and what we’re doing at a grassroots level. And those people at the whiteboard face are penalised constantly because there isn’t enough money, there isn’t enough vision, there isn’t enough planning by our senior management for that to be implemented accurately or properly. That’s going to have a huge impact on our students if this is not rectified soon.”
(S1P5A, personal communication, May 30, 2008)
5.1.6 ICT Management Structure

Again reviewing Figure 3 it is clear that there are a significant number of actors in the management of ICT in the school. The formal ‘acknowledged’ structure is shown in Figure 4 page 72, which is in reality, only a subset of the actual actors involved.

Broad drivers for the school (top level of the diagram) are

1. Board of Trustees’ / Principal’s expectations
   How they see ICT adding to the core business of the school and funding.

2. Care Givers’ expectations
   What they anticipate from the school in terms of providing educational opportunities to their children.

3. MOE expectations
   Requirements for ICT in administration and expectations in learning and teaching as well as some funding and support.

Contrasting this structure with that of a company would suggest that:

- CEO function is carried out by the Principal
- CIO function is carried out by the Director of ICT
- CFO function does not have an equivalent

5.1.6.1 The Student Management System (SMS)

The functions of the SMS system are broadly stated as:

- Enrolment
- Reporting (School reports to parents)
- MOE Reporting (School returns)
- Recording results and passing to the MOE
- Timetabling
- Attendance
- Discipline (Detentions and history recording)
Considerable other functionality is possible (MOE, 2007a, p. 5)

This functionality both core and specific to schools with nine packages accredited by the MOE for use whilst data interchange between institutions is via the MOE utilising provided middleware processing. (MOE, 2008f). A distinct difference between schools and industry should be noted here. There is no competitive advantage for a school to be gained by developing their own core software, unlike industry where competitive advantage is sought from such software. Further, schools do not have the resources to develop software in-house and as a rule, do not do so. The main advantage gained from use of an SMS is regulatory, in that its use is now mandated by the MOE, and, potentially, in cost reduction in data processing. Users of this system include office staff, counsellors and nurses, senior managers and all teaching staff.

School one has chosen to compartmentalise different components of the SMS. This has created a sequence of managerial roles (as defined in Section 2) that are more assumed in nature than formally delegated. Referring to Figure 6 on page 75, it is easy to see the complexity that this creates.

The Records Officer is a full time ancillary position charged with management of the software including user access, enrolment, MOE Reporting and recording student grades. There is no direct linkage between the Director of ICT (CIO) and the Records Officer.

A Deputy Principal, and thus a member of the SMT, is in charge of the Timetable component and also manages some aspects of Discipline recording. The incumbent is senior to the Director of ICT and again there is no direct linkage to the Director of ICT.
A school Dean is also in charge of attendance recording. The incumbent is at a similar authority level as the Director of ICT and again, there is no direct linkage between them and the Director of ICT.

The upshot of this structure is that control of the core school system does not reside with the CIO (Director of ICT) however they are charged with supplying infrastructure to run and deploy the software to users. Strong communication between parties is a must to ensure that all requirements are met with a minimum of disruption to staff. There is no evidence of this communication occurring.

5.1.6.2 Financial Systems

There is no equivalent CFO position within the school however the Accounts Manager does come close to filling this role. In essence they perform all financial operations from accounts receivable, accounts payable to financial reporting. Their role does not include the allocation of budgets; rather this is managed by the Principal and the BOT Finance Sub-Committee.

However, of key importance to the school here is that the Accounts Manager operates a small peer-to-peer network for the accounts software. This network is not part of the broader school network and is again, outside the control of the Director of ICT, creating another actor with assumed management authority.

5.1.6.3 Comments

The actual ICT management structure contains a large number of actors which gives rise to potential conflicts, miss communication or no communication. The Director of ICT must juggle a significant number of points of view and interpret these to the Network Manager to ensure the school’s requirements are met. Conversely, the Network Manager must be receptive to the requirements of the school as they are set out by the Director of ICT.
5.1.7 Personnel and Roles

Review of the interviews with School One Staff suggests the following modification to the Diagram in Section 4.9.1.

Figure 7: School One - Roles Overview

5.1.7.1 Drivers

Two major drivers for ICT are shown in Figure 7. These are Education (Industry) specific requirements and those of the users. The users are a diverse group that includes:

- Staff (Administration, Teaching and other staff)
- Students
- Other external users. (actual and potential)

(In the case of School One there are no community education or other programmes that utilise the ICT services.)

Users appear to have strong input to Technical and Day to Day management but a very weak voice in high level and strategic management.

The Director of ICT noted that “by default we are very dependent on ICT for our admin” (S1P3, personal communication, November 2, 2007) due to MOE requirements and also MOE initiatives. This filters through to the teaching staff in the form of
requirements for electronic reporting (Student Reports) and attendance recording. However, the skill level of the various staff members varies considerably. The student users also vary considerably in their ability from essentially disinterested non-users to keen enthusiasts with home networks. However, the key features of the student users are the sheer number of them (1800 plus) and the fact that they are children (chronologically and legally) which means the school can not trust them in the same way that a commercial operation can trust its employees. The result is that considerable resources have to be focused inwards to protect the system from its own users. As there is no 1:1 ratio of appliance to user, any one computer may have multiple different users with significantly different requirements.

A second group of drivers for ICT are pedagogical ones for the use of ICT to support student learning. The MOE has some significant indirect input into these drivers through such schemes as the ICT PD Contracts and the Digital Horizons publication. These drivers have considerable input on day to day management in terms of systems uptime and deployment, but have a lesser impact on Technical Systems Management by, MOE design. The MOE deliberately issues guidelines and not edicts. For example, they accredited and suggest more than six different Learning Management Systems (LMS) allowing schools to make their own decision on which one to deploy. A similar stance was taken regarding SMS systems and about core architectures (Windows Server, Novell Netware or Apple Server). Due to this, the MOE also have a lesser voice in Strategic and High Level management than might be anticipated. However it would be interesting to consider if this is also due to ‘filtering’ by the school’s ICT management structures, such as the ICT Committee.
5.1.7.2 Management Function and Personnel

Regardless of the job title held, certain functions are needed to ensure that ICT is managed and functions to the benefit of the institution. Table 3 below, maps areas of functionality across the ICT management team member who appears to carry out that function. It does not show the level to which the current incumbent fulfils that role.

Observation 11

Different people bring different talents, strengths and weaknesses to a given role. The mapping of function will change as incumbents change. This raises the question of how much the structure has been defined by the institution versus how much it has evolved over time.
<table>
<thead>
<tr>
<th>Function</th>
<th>Ministry of Education</th>
<th>Board of Trustees</th>
<th>Principal</th>
<th>SMT Representative</th>
<th>ICT Committee</th>
<th>Director of ICT</th>
<th>Network Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision and strategic direction</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low to Moderate</td>
<td>High</td>
<td>Moderate to High</td>
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<tr>
<td>ICT goal setting and long term planning</td>
<td></td>
<td></td>
<td>Low</td>
<td>Low</td>
<td>Low to Moderate</td>
<td>High</td>
<td>High</td>
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<tr>
<td>HR management (ICT Senior Staff)</td>
<td></td>
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<td>High</td>
<td>Moderate</td>
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<td>High</td>
</tr>
<tr>
<td>HR management (ICT Subordinates)</td>
<td></td>
<td></td>
<td>Low</td>
<td>Low</td>
<td>Low to Moderate</td>
<td>Low to Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Budget Allocation (Whole School / ICT)</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Budget Expenditure Control</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>Alignment</td>
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<td>Moderate</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Project Management</td>
<td>Solution Research and Selection</td>
<td>Deployment of ICT</td>
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<tr>
<td>Daily Management</td>
<td>Moderate to Low</td>
<td>Moderate to Low</td>
<td>Moderate to High</td>
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<td>Moderate to High</td>
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</tbody>
</table>

Table 3: School One - Function and Staff
Examination of this table suggests little attention is paid to ICT by the senior management of the school, with the obvious exception of HR and Budget functions. Rather than providing strategic direction, the senior management depend on the Director of ICT and the Network Manager to provide direction. This lack of direction was commented upon by the Network Manager who stated that:

“I wish we have a provision driven by financial model more than by; not financial model but strategic model so that whatever we need we got it. Not first approach like how much does it cost? Rather, you know, how much really do we need that and eventually secondly obviously the cost comes”

(S1P4, personal communication, October 26, 2007)

Essentially the Network Manager was saying that they felt that ICT was driven purely by finance (Budget) and that the first reaction was always ‘what will it cost?’ Rather, they were wanting a strategic approach that looked first at the outcomes and benefits for the school. When asked about what they saw as their input to ICT management in the school the Network Manager went on to discuss the development of solutions:

“based on a very clear specified customer needs, whatever is student or teacher, doesn’t matter what level, even administration it does not matter. I would see my input as finding solution for them to deliver what they need.”

(S1P4, personal communication, October 26, 2007)

This appears to be the dilemma of school one: the Network Manager was wanting to supply what the school needs, but the senior management does not appear to define, let alone articulate, what these are. Interestingly, when the table of functions is examined the SMT does not appear anywhere in the table, yet this is the body tasked with management of the school. The SMT Representative saw themselves as the link to this body however their input to ICT Management is mainly in the area of HR and in consultation and support for the Director of ICT. The SMT Representative’s relationship with the Director of ICT is not one of line management. (S1P2, personal communication, November 21, 2007)

5.1.7.3 Interaction between Levels of Management

The content of the interviews suggest that it is unclear where, from an internal perspective, the school’s ‘driving force’ for ICT is coming from. There is no specific
BOT Committee or person tasked with looking after ICT in the school, rather ICT falls into the relevant sub-committee as required (Finance, Property or the whole BOT).
(S1P1, personal communication, November 30, 2007; S1P3, personal communication, November 2, 2007)
The implication of this is perhaps weaker than anticipated high level management. The Network Manager mentioned this by noting that they felt the school did not know what they could achieve through use of ICT.

“ICT management in the school, is less, how we can say, orientated to get as much a s possible from ITC of IT equipment than students are, already, you know”.
(S1P4, personal communication, October 26, 2007)

The Principal takes the role of a “pusher for more and more people using ICT more and more effectively” and “a prophet of the potential” (S1P1, personal communication, November 30, 2007) however one member of the teaching staff in particular did not see this as being the case, seeing a significant gap between their reality and management perception.

“It is like a disconnection. We have talk of ICT vision and then it’s not walked out”

and

“It’s like the roof of the house is not actually connecting to the basement; and all the activity is going on in the basement.”
(S1P5A, personal communication, May 30, 2008)

The Network Manager saw their role as being one of providing solutions based on clearly defined user requirements but then later discussed how they felt the school was unclear as to what could be achieved through ICT. They also discussed issues of policy not being in place (S1P4, personal communication, October 26, 2007), all of which suggests that the gap between strategic management and day to day management is quite significant.

Further, the Principal, SMT Representative, Director of ICT and the Network manager all talked about conflict between the Network Manager and the Director of ICT due to boundary disputes. When asked about how ICT management functions within the school the Principal noted that:

“I don’t see it as working all that well actually and that’s not the fault of any person or persons particularly. Its’ just the nature of it”
“that sort of structure inevitably potentially leads to conflict because where are the boundaries between the Director and the Network Manager or Administrator. We had issues because the Director was making some, if you like, technical decisions which the (Network) Manager thought were more (their) sphere. But on the other hand, some of the technical decisions were really made in a sort of educational context the Network Manager wasn’t necessarily equipped to do. So there’s a bit of a sort of dilemma there.”
(S1P1, personal communication, November 30, 2007)

This is a rather telling discourse from the Principal as it shows that they appreciate the two sided nature of ICT, being decisions that are essentially technical in nature but that also have a very large impact on the school and its function. To paraphrase, ICT technical decisions have such an impact on the ability of students to learn, staff to teach, the school to function, school finances and the school to interface with its client community, that they often need to be made at an institutional level that is cognisant both the institution’s need and the impact of the decision on ICT functioning. This does not appear to be happening.

Whereas, regarding decision making the Network Manager noted a lack of policy regarding ICT in the school (S1P4, personal communication, October 26, 2007) and also discussed ICT decision making within the school, first with the ICT Committee

“I do like the ICT group we’ve got and closed meetings. In many big decisions, sorry, they are not qualified to do that. Sorry. They can listen to one or two preferably, competitors, ( ), you know what I mean, just to get two different, very opposite point of views, then they can make decision.”
(S1P4, personal communication, October 26, 2007)

And then with the Director of ICT

“But based, without (Dir ICT), based on calling the school how the wireless internet is working. Sorry, that’s not...”
(S1P4, personal communication, October 26, 2007)

Essentially the Network Manager was saying that they felt ICT decisions were being made by a group not qualified to do so and that any options they were to consider should be filtered by the Network Manager first. They also felt that decisions were being made by the Director of ICT comparing the school to other local schools. Obviously the Network Manager feels that ICT based decisions were not being made in a suitable manner.
A further interesting comment was made by the Director of ICT, when talking about projects in the school. They commented that they often come into projects, such as new building and renovation of existing buildings, quite late so that their input from an ICT perspective is one of the last elements to be added, and again, is budget constrained. (SIP3, personal communication, November 2, 2007) This again suggests a lack of focus on ICT by senior management.

5.1.7.4 The ICT Committee

No formal interview was conducted with other members of the ICT Committee although the SMT Representative and the Network Manager are members and the Director of ICT the chair.

“I feel too that there needs to be a strong committee and I think that’s always the challenge to schools to actually have enough people who are interested enough to keep it going. Umm However, as a school I think there is always that issue that um, because the school’s main job is education, um, and unfortunately, you know, we are becoming more and more dependent on the IT. Ah, and so managing IT in a school is very different to managing IT in a corporate for example” (SIP3, personal communication, November 2, 2007)

The composition of the committee is changed on an annual basis and is dependent on volunteers which the Director of ICT notes is an issue, with the staff focused on education, which suggests that ICT is seen as an addition to this focus. This is in contrast to the MOE’s stated goals in the Digital Horizons document, which looks at the ICT infused curriculum. Perhaps the changing nature of this body reduces its ability to function as this would certainly reduce the long term view of its members.

Observation 12

ICT in schools is a scarce resource. Its deployment is often not as complete as would be anticipated. A justified need may not equate to funding.

Observation 13

Schools are not financed specifically for ICT and thus must take funds from Operations Budgets.
5.1.8 Strategic Planning

Figure 8: School One – Strategic Planning

Figure 8 gives an overview of strategic planning in School One.

Senior Management are tasked with providing direction and approving a strategic plan for ICT. The Principal comments that they see ICT as functioning like a car; “Don’t understand a car – same with ICT. If it don’t go, take it to an expert.” (S1P1, personal communication, November 30, 2007) Thus they rely on their ICT management team to provide strategic planning that is in line with the school’s vision and vision for ICT. Essentially the principal’s role is confirmation.

The ICT staff (Network Manager and subordinate(s)) require a clear strategic plan to work to that matches the school’s vision. Obviously they have input to this plan. Users also require input to the plan so that it provides the tools they require. Users also include the students.

Thus, in the middle, the ICT Management team are tasked with developing a strategic plan that matches the school’s vision and provides users with their requirements.
5.1.8.1 Senior Management

The Principal talked in terms of continual improvement in teaching and learning and achievement outcomes for students based on a school vision of “Equipping individuals for lifelong learning” (School One, 2008, p. 1). However he made no mention of how this is to be outworked in a coherent plan. Rather, they appeared to be concerned about the ICT landscape stating that “The way it changes means it will all be quite different probably.” (S1P1, personal communication, November 30, 2007). Strategic planning seemed to be confined to an annual budget only. With The BOT having no representative specifically tasked with ICT and the SMT team not forthcoming it leaves the senior management providing only an annual budget as a planning tool for ICT. It is assumed that senior management anticipate a strategic plan form the Director of ICT with both the Principal and SMT Representative saying they saw their role as a ‘sounding board’ for the Director of ICT. (S1P1, personal communication, November 30, 2007; S1P2, personal communication, November 21, 2007).
5.1.8.2 ICT Staff

This is essentially the Network Manager as the ICT Technician was not interviewed. The Network Manager gave a strong impression of waiting for a strategic plan to implement. They mentioned several ideas they had of their own but expressed frustration at the level of strategic planning. Their comments on possibilities were based on technology (extension of the network and so forth) without being necessarily pedagogically based and they saw an annual budget plan as the only form of strategic planning and found it limiting. (S1P4, personal communication, October 26, 2007)

This raises the question of why the Network Manager does not present their own strategic plan. As already been noted, there is some friction between the Director of ICT and the Network Manager, making this difficult (S1P1, personal communication, November 30, 2007; S1P2, personal communication, November 21, 2007; S1P3, personal communication, November 2, 2007; S1P4, personal communication, October 26, 2007). Thus the Network Manager is left wanting more strategic guidance.
Nowhere in the interviews has any mention been made of a student voice yet they are the largest group of users in the school. Discussions with the staff suggests that they feel ill-informed of ICT plans and that a lack of access to ICT is an issue for them, reinforcing the Network Managers point about further extending the network.

“As any staff member about where we’re going; nobody knows where we’re going. It’s all suggestions all over the place.”

“As for the management stuff, staff really aren’t aware what’s happening there.”

(S1P5C, personal communication, May 30, 2008)

“As once everyone’s got access then you’re going to get more people doing their admin, they’re going to integrate the curriculum in more. If they can get a data projector in their room as well you’re just onto a winner.”

(S1P5B, personal communication, May 30, 2008)

As has already noted, the most telling comments came from Teacher 1 who said:

“There is a huge gap between what the curriculum states, what we have to talk about on in-service days, and what we’re doing at a grassroots level. And those people at the whiteboard face are penalised constantly because there isn’t enough money, there isn’t enough vision, there isn’t enough planning by our senior management for that to be implemented accurately or properly. That’s going to have a huge impact on our students if this is not rectified soon.”

(S1P5A, personal communication, May 29, 2008)
Thus it seems that users have no knowledge of where ICT is going in the school, feel their requirements are not being met and have only a limited voice to express these requirements.

5.1.8.4 ICT Management

![Diagram](image)

**Figure 12: School One - Strategic Planning - ICT Management**

In this group are the SMT Representative (although they could also be considered as part of the Senior Management Group), the Director of ICT and the ICT Committee. This is the group of people who appear to be tasked with creating a strategic plan for ICT.

When interviewed the SMT Representative said that the planning of ICT requirements was through the steering group, meaning the ICT Committee. However, the group meets on an ad-hoc basis and then normally to discuss the dispersement of the budget as set by the Principal. As already noted the Network Manager felt the committee was not qualified to make these decisions. *(S1P4, personal communication, October 26, 2007)*

The Director of ICT stated that their approach to ICT planning was to constantly look to other schools and industry; in effect to “keep an eye on the horizon” *(S1P3, personal communication, October 26, 2007)*.
The Director of ICT noted:

“I guess I see my job as, um, stirrer, stirring it along and in a vague direction which, um, yeah, I think that probably, um, I would imagine, you know, that there are people in the school who sort of say “So, what’s the direction of ICT?” And, and, maybe that is my problem but um, you know I think very much that it is about being used as a tool and integrating it into the teaching and learning.”

(S1P3, personal communication, November 2, 2007)

With regard to ICT Planning they stated:

“the need to actually, um, perhaps stand back and not just reinvent the wheel but perhaps bite the bullet every so often and say right, if we want to be there we need to leap.”

“in terms of a school, when do you, ah, leap because otherwise you might get left behind”

(S1P3, personal communication, November 2, 2007)

5.1.8.5 Conclusion

There is no apparent formal process for ICT strategic planning in School One nor is there has any significant requirement for such planning been noted. The school’s approach to planning appears to be the cause of friction between the Network manager and the Director of ICT and also it would appear that the staff feel their voice is not being heard, whilst there is no mechanism for the students to have their requirements heard.

The Director of ICT was invited to review this chapter and commented that whilst the research may not have uncovered a specific ICT Strategic plan there was in fact one in place. Rather than swamp the staff with yet another plan the Director of ICT deliberately kept it ‘low key’ whilst working to move the school forward.

(S1P3, personal communication, January 29, 2009)

ICT does not appear to be enmeshed in the way School One operates, but rather appears to be seen as an addition to other functioning. This can occur where ICT is seen more as a teachable subject rather than as an enabler for teaching and learning, and as an enabler for school administration.
Observation 14

Schools are complex and a lot of people and people groupings are involved in their management. This raises the question of what level of understanding they all need to have for ICT to be fully enmeshed in the school psyche?

5.1.9 Summary of analysis of school one

Management of ICT in school one is more complex than it first appears, with many different actors involved; some who have designated authority whilst others have assumed authority. The level of ICT knowledge among staff is quite variable with previous research of Mackey and Mills (2003) pointing to greater integration of ICT in primary schools where the principal is more conversant with ICT. It is reasonable to assume that this is also the case in large secondary schools.

Each staff member interviewed had a different view of the school’s vision for ICT and there was no apparent cohesiveness. However in reviewing this research the Director of ICT stated that the vision was deliberately not widely publicised due to the number of other ‘visions’ the school was working on. *(SIP3, personal communication, January 29, 2009)* Significant differences in ‘vision’ were noted in discussion with the Network Manager.

The school seems to be at stage 1 in terms of the alignment model in 4.9.3: A need for ICT is understood but is not immersed into the school culture or planning processes. Certainly there was some concern noted from the teachers interviewed regarding the alignment of ICT with their and their student’s needs. There did not appear to be a voice for either the student users or the wider parent community to give input to the deployment and use of ICT. For administration use there are also alignment difficulties, the chief one being limitations on the reach of the school’s network infrastructure.

The Principal recognised difficulties in the structure of the management roles and discussed ‘boundary disputes’ between the Director of ICT and the Network
Manager. This was also acknowledged by the SMT Representative who had taken on a specific HR role to try and reduce the conflict.

There were no long term plans for ICT visible, with planning for ICT generally being carried out on an annual, budgetary basis with input to this from the observing of, and comparison to, other schools. The Network manager appeared sceptical of this approach. Part of the planning and monitoring team was the ICT Committee which is reconstituted on an annual basis.
5.2 Data Analysis: School Two

5.2.1 Data collection and researcher’s bias

The researcher also has a prior relationship with school two as part of ICT PD Professional Development cluster (in conjunction with school one) for three years. The interviews were conducted three months after the contract was concluded.

The Principal of the school was contacted and they arranged for the appropriate interviews and times. The three members of the teaching staff were selected by the Principal.

5.2.2 School demographics and structure

School Two is a lower decile band school. When the interviews were conducted there were 1,521 enrolled students, 104 teaching staff and approximately 50 non-teaching staff. The school operates 300 desktop computers and 100 laptops connected to ten servers running Windows Server operating system.

The management structure was described by all participants and the structure portrayed is depicted in Figure 13.
5.2.2.1 ICT Management – Formal Structure

The BOT does not have a specific person tasked with overseeing ICT in the school and presumably handles ICT through the appropriate committees.

The Principal takes an overview of ICT, in particular, where the budget is concerned. This is developed in conjunction with the Director of ICT and the Accounts Officer. In the past the director of ICT has reported directly to the Principal and this still occurs. The Principal see their own function as being one of supporting developments in ICT within the school that support the school’s core vision for students learning and teaching, stating that;

“If I wasn’t supportive of ICT as a key tool for improving teaching and learning and improving motivation to learn, then there would be a major issue”
(S2P1, personal communication, April 1, 2008)

The SMT Representative has reassumed the role of oversight of ICT at the start of 2008 as 2007 saw some significant changes in the school’s senior staff. They see...
their role as a facilitator for the ICT Director and a gatekeeper from other staff; “if people are querying things to send them to me and I’ll make the final decision on things.” (S2P2, personal communication, April 1, 2008)

The Director of ICT reports to the SMT Representative and is viewed as the central point of all things ICT in the school. “At this stage all those roads lead to ( ) as the ICT Manager / Director” (S2P2, personal communication, April 1, 2008). The Principal made it quite clear that they view this role, and its incumbent, as crucial to all aspects of ICT in the school. (S2P1, personal communication, April 1, 2008). The role includes long term and short term planning, budget preparation, technical oversight and support and pedagogical support. There is a single direct report in the form of the ICT Technician however HR appraisals for both the Technician and Director of ICT are handled by the SMT Representative. (S2P2, personal communication, April 1, 2008)

5.2.2.2 ICT Management – Functional Structure

School 2 – ICT Management Structure
(Shading indicates the positions interviewed)

Figure 14: School Two - ICT Management Structure (Functional)

However, as with school One, there are significantly more actors than at first apparent. These have been represented in Figure 14, although not exhaustively.
One omission (for clarity) is the curriculum planning group and another is the external users (Adult Education and Community Education).

External actors are the Ministry of Education and also the parent / care giver community of the school which were discussed in 5.1.2. There also some community education and adult learning groups that use the school’s ICT facilities.

Internally the ICT Committee is seen as very important to the process of ICT Management in the school, especially as a voice for staff. All those interviewed made mention of the ICT Committee and its changing emphasis for 2008, which will be discussed in more detail later in this section.

Both the Principal and Director of ICT noted that they directly communicate with each other regarding ICT matters, perhaps due to historical management structure. *(S2P1, personal communication, April 1, 200; S2P3, personal communication, April 1, 2008).* This puts an additional ‘informal’ reporting line between the Principal and the Director of ICT. At the time of the interview the SMT Representative role was only recently established with a view toward HR (appraisals for the ICT staff) and as a ‘higher’ point of contact for teaching staff. *(S2P1, personal communication, April 1, 200; S2P2, personal communication, April 1, 2008)*

There are two different roles in this structure than those depicted for School One. The first is the property manager role. This role encompasses all aspects of property in the school, including the fixed copper cabling for data and voice. The network switches and such are the responsibility of the Director of ICT whose responsibility is to the port in the wall and then from the point that port re-emerges and connects to the device. *(S2P3, personal communication, April 1, 2008)*.

The second point of difference is the Resource Coordinator position. The school centralises the storage of all portable resources (Digital cameras, video cameras, data projectors and so forth) and the incumbent is responsible for the issue and return of these resources to both staff and students. They also manage the booking
of the various computer laboratories. \(S2P4A, \text{personal communication, April 1, 2008}\) The incumbent is also responsible for carrying out photocopying.

The Accounts Officer assists in the development of the ICT Budget and presumably also in monitoring expenditure although the Director of ICT did mention that they have gone directly to the Principal to source additional funding where they exceeded the budget amount. \(S2P3, \text{personal communication, April 1, 2008}\)

The DP SMS is tasked with maintaining the school SMS system and managing staff access to the data.

As can be seen, the majority of the interactions tend to meet at the Director of ICT. The lines in the diagram indicate only identified lines of communication and not the actual level of communication.

5.2.3 Staff member demographics

5.2.3.1 School Principal

The Principal felt that their knowledge of ICT was about a 3 but did query what this was being indexed against. \(S2P1, \text{personal communication, April 1, 2008}\). Again this is a valid question as there are so many facets to ICT. They felt that their knowledge of integrating ICT into the curriculum was at a 4 level.

Throughout the interview the Principal made continuous references to teaching and learning, as noted in 5.2.1, and this is obviously where they see the value of ICT. They also view ICT as a preparation for their students’ future and talked about aligning ICT with the students’ lives both now and in the future:

“And being aware, particularly I think, in terms of ICT, about not only aligning with kid’s lives and future lives but also about them being more motivated to learn. Because IT is huge in that area.”

“I see ICT as continuing to impact particularly in terms of better ways of teaching and learning, not necessarily better outcomes, we know that. But better ways of teaching and learning.”

\(S2P1, \text{personal communication, April 1, 2008}\)
The Principal does not see themselves as the ‘expert’ in ICT but relies on other experts, in particular the Director of ICT.

“The role of the Principal is crucial. You can absolutely be a barrier (laughs) and so it’s about remaining open and not going with ideas that you’ve got in the area in which you are not the expert or an expert. But just always keeping your eye on the ball in terms of what is it that’s going to make a difference for our kids.”
(S2P1, personal communication, April 1, 2008)

The Principal is very supportive of ICT in the school but always within the constraints of what the school can actually afford to do.

“We’ve worked really hard to try and make good use of the bucks in terms of student use and I think we do pretty well there. Again, just being really conscious, as we said before, of not putting lots of money into too many things that we can’t sustain”
(S2P1, personal communication, April 1, 2008)

5.2.3.2 SMT Representative

The SMT Representative noted that their skill levels with ICT had improved significantly due to their role in coordinating the now completed ICT PD contract, and are now approaching a 3 level. In terms of ICT Integration they felt they were working towards a 5 and approaching the understanding of some of the members of the ICT Committee. (S2P2, personal communication, April 1, 2008)

The SMT Representative sees their role as one of supporting the ICT Director and being a more senior interface with the teaching staff

“All staff problems with not getting jobs done they come to me.”
(S2P2, personal communication, April 1, 2008)

It should be noted that due to the relatively short time the incumbent has been in this role they have not been called upon very much.

“I see my position as supporting (The Director of ICT) with anything he needs support in. Again he’s self sufficient, number of times he’s been to see me; twice. And not big things.”
(S2P2, personal communication, April 1, 2008)
The SMT Representative also has HR responsibility for the two ICT support staff and performs performance appraisals for both the Director of ICT and his direct report, the ICT Technician (S2P2, personal communication, April 1, 2008)

5.2.3.3 Director of ICT

This role is seen as the key position by the Principal and SMT Representative. The incumbent sees themselves as “responsible for anything and everything to do with how the school implements ICT” (S2P3, personal communication, April 1, 2008). This is a large brief however the Director of ICT qualifies it by noting that there are some blurred areas of management, a key on being the fixed copper cables for data and telephony, which the Property Manager is responsible for. However, the termination and network componentry associated with the cabling is part of the Director’s role. Photocopiers and telephony also fall outside their scope. (S2P3, personal communication, April 1, 2008)

The incumbent has been in the role for approximately seven months and sees their ICT skill level as a four and their knowledge of integrating ICT into the curriculum as a four, pointing out that there is always room for improvement. (S2P3, personal communication, April 1, 2008) The Director of ICT is a former teacher who has also worked in the ICT industry, and has been given some teaching responsibilities within the school, including a form class and as the Gifted and Talented (Students) coordinator. (S2P1, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008)

5.2.3.4 Teaching Staff

The three staff members were selected by the Principal. One staff member was an experienced teacher but new to the school, one was in their second year of teaching and the third an experienced teacher who had been at the school for six years. The subject areas covered were Science, English and Business Studies. All off the three teachers were focused on the use of ICT for teaching and learning.
Teacher 4A – 50% of the day spent using ICT, more if administration work is also considered, using a variety of applications. They saw their ICT skill level as a 3 with knowledge of integrating ICT into the curriculum a 4. (S2P4A, personal communication, April 1, 2008)

Teacher 4B – 10-15% of their day using ICT in the classroom but was keen to see that increase to 50-70%. They felt that a lack of ICT infrastructure, particularly a data projector, was a major barrier to further use of ICT. They felt their ICT knowledge was between a 2 and a 3 but that a recent ICT conference had given them more ideas for the integration of ICT into teaching and learning, which they rated as a 3. (S2P4B, personal communication, April 1, 2008)

Teacher 4C had spent some time teaching in the United Kingdom, in a school where every classroom had an Interactive White Board (IWB). Their comment on this was that the teachers lacked the training to fully utilise these. They rated their knowledge of ICT at a 3 to 3 1/2 . they did not give a rating for their knowledge of integrating ICT into the curriculum but did again comment on a lack of ICT resources, particularly a data projector, stating that when they were able to book one they used it 100% of the time they had it. (S2P4C, personal communication, April 1, 2008)

5.2.4 School Vision for ICT

School Two appears to have a two point vision for ICT; an overall guiding vision and a more short term and strategic view, the latter being principally brought about by circumstances.

When asked about the school’s vision for ICT the Principal stated:

“For me that’s really simple. It’s about improving teaching and learning; almost full stop. Because hanging off that one statement sits everything really. The only thing you could give a rider to this is that clearly what we are aware of is that our students arrive in tertiary education or whatever it is they are going to, with skills that align and knowledge that aligns. So that must be a part of that improving teaching and learning picture as well.”
The Principal further stated that this vision is included in the school’s documented policies. The same vision was stated by the SMT Representative, who re-worded it slightly and also put it in the context of the new curriculum.

“The vision I have for ICT obviously is that it becomes a teaching and a learning too; especially for student learning, to enhance the student learning within each curriculum area. Especially with the key competencies that are coming out with the new curriculum.”

“So it’s having the access, I would imagine, to all the things that are available to students to enhance their learning. Because you know it’s innovation, it’s initiative, it’s enquiry learning.”

The SMT Representative made the vision a little more concrete by adding aspects of access to different forms of ICT that would or could enhance student learning.

This vision was also repeated by the staff interviewed.

“I see the vision though, for the whole school, is to integrate ICT into the learning; whether that’s student led or teacher led”

Not surprisingly the teachers interviewed were also keen on access to ICT for teaching as well as for student learning.

Thus it would seem that school two has a strong reason for ICT and this is communicated through the levels of the school. The actual outworking of the vision is very much the task of the Director of ICT with the Principal stating that:

“the vision we build together and then the management of that vision is largely (the Director of ICT) at the centre of what’s going on”

When asked if they could state the school’s vision for ICT the Director of ICT paused for a moment and then said “yes I could”. They then went on at length to describe their outworking of the school’s vision for ICT. They view their long term vision for ICT as:

“Long term our vision would be to bring ourselves up to a level which would be comparative to some of the other schools. We don’t necessarily want to be leaders but we don’t at the same time, want to leave our kids to miss out on opportunities that are associated with ICT”
This long term view was tempered with a very immediate view of ICT in the school:

“we are in state at the moment where our vision is that we are able to survive in the currently changing environment, based on... some poor decisions that have been made. And just some lack of forward planning with regard to ICT”
(S2P3, personal communication, April 1, 2008)

This was also echoed by the staff interviewed who spoke of significant issues with ICT resources and their availability. The SMT Representative also echoed this in talking about current ICT infrastructure issues. (S2P2, personal communication, April 1, 2008)

The Director of ICT is very focused on fixing the current issues so that better use can be made by both teachers and students. This is compounded by budget issues with significant funds being required to bring the school’s infrastructure to a point of alignment with its vision.

“So the vision at the moment is survival mode growing so we’re trying to improve our infrastructure. Once we’ve got the infrastructure under control we improve what we’ve got available on the desktops. Once we’ve got that under control we can do more with the stuff that we have available.”
(S2P3, personal communication, April 1, 2008)

Problems with the school network infrastructure in particular, as well as desktop equipment, were echoed by the staff and the SMT Representative. One staff member expressed the issues faced when the technology fails saying:

“When you do start to use technology and then technology isn’t available – whoo!”
“But if that’s what you’re planning on using and for what ever reason your computer’s down, your laptop’s down, your projector’s down etc life will become a little more challenging”
(S2P4B, personal communication, April 1, 2008)

Thus it appears that School Two has a vision to use ICT for teaching and learning, which all parties know and agree upon, and is centred around its outworking by the Director of ICT. The Director however, has a more immediate vision for resolving legacy issues with infrastructure, the need for which is echoed by the staff.

**Observation 15**

Professional development in ICT, centred around how to apply it for student learning and teaching, and a solid infrastructure to support the application of ICT
are highly necessary for staff to be able to succeed or indeed, try to succeed in using ICT to support student learning. PD without the infrastructure is pointless.

**Observation 16**

Educators frequently use the phrase ‘teaching and learning’ which in an ICT context, can obscure what is being spoken of. Teaching is distinct from learning; a teacher teaches and does so in a way that maximises the potential for students to learn. From an ICT perspective, there is technology that specifically enhances teaching (such as data access in a classroom, teacher computers, data projectors for display purposes, interactive white boards and so on) and technology, or more often the application of technology in a specific way, that is aimed at enhancing learning (collaborative tasks using ICT as an enabler through Wikis, Blogs and podcasts, student access computers, access to the internet for research, specific computer software for learning, digital still and video cameras and so forth).

Thus, from an ICT perspective, Teaching and Learning actually represent two distinct sets of users with different requirements for ICT. Technology for teaching is not necessarily the same as the technology for student learning.

**5.2.5 ICT Management Structure**

Referring back to figure 2 it is again obvious that there are a large number of actors involved in managing aspects of ICT in School Two; significantly more so than the formal ICT Management structure. Two of those interviewed mentioned the historical nature of the structure and deployment of roles. (S2P1, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008)

Broad drivers for the school (top level of the diagram) are similar to those for School One.

1. Board of Trustees / Principal’s expectations
   How they see ICT adding to the core business of the school and funding.
2. Care Giver’s expectations
   What they anticipate from the school in terms of providing educational opportunities to their children.
3. MOE expectations

Requirements for ICT in administration and expectations in learning and teaching as well as some funding and support.

Contrasting this structure with that of a company would also suggest a similar outcome to School One:

CEO function is carried out by the Principal
CIO function is carried out by the Director of ICT
CFO function does not have an equivalent although the Principal’s role is crucial

One key difference is that the CIO function (Director of ICT) is not a direct report of the CEO but reports to the SMT Representative. However, both the Principal and Director of ICT talked of a direct ‘informal’ reporting line whilst the SMT Representative commented that the Director of ICT does not come to them often. They suggested that their role was to ‘interface’ between the Director of ICT and the school staff, and for HR Appraisals. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008)

5.2.5.1 The role of Director of ICT (CIO)

Both the Principal and SMT Representative made strong mention of the crucial nature of the Director of ICT’s role.

“At this stage all those roads lead to (…) as the ICT Manager / Director”
“in that regard the person in the role (..); that person is absolutely critical as to how this all works and how well it does get into teaching and learning, rather than just being purely a technical adjunct.”
(S2P1, personal communication, April 1, 2008)

Thus the Director of ICT is the focus for all ICT in the school and their role encompasses more than just the technical aspects of ICT but also the application of ICT to teaching and learning. This makes the range of skills held by this person critical to the school.
School Two recognised this issue of skills, especially where technical skills and continuity are required.

“That’s why we moved to (...) outsourcing some of the management of it which we’ve still got in a slightly different format and not having all the expertise within the school because we know it’s not sustainable.”

(S2P1, personal communication, April 1, 2008)

The Principal had noted issues of skill and knowledge retention as the incumbent in the role of Director of ICT had changed a number of times in recent history, each time resulting in a change of skills and knowledge, especially institutional knowledge, available to the school. The school has deliberately outsourced some ICT functionality to a third party, with the view that the contract will remain in place as internal staff change.

5.2.5.2 The ICT Committee

The role of this committee is seen as significant to the school. The Principal noted that it had been “redirected this year in terms of its focus being on teaching and learning” (S2P1, personal communication, April 1, 2008). The role of the ICT Committee is multifaceted. The committee

1. Provides direction for ICT in the school in terms of teaching and learning
2. Provides input to budget decisions
3. Allows for feedback to the ICT Director from departments and individuals
4. Provides a source of ‘super users’ as an additional resource for ICT support

However, the key to its functionality was provided by the Principal who stated that the key function of the committee was to provide ‘industry’ input; i.e. teaching and learning, for the ICT Director.

“It has been very, very clearly stated … this is about professional learning…. That’s how it must be otherwise you’ve got this one person with this ridiculous amount of almost autonomy which is not the way things can work”

(S2P1, personal communication, April 1, 2008)

This suggests that the school is aware of issues that can arise where the Director of ICT (CIO) is not focused on the institution’s core business. This can often happen where staff constantly go direct to the ICT Director without the ICT Director being aware of the ‘bigger school picture’. It was suggested by one staff member that
this did happen in the past to the detriment of ICT in the school. (S2P4A, personal communication, April 1, 2008) It is apparent that the Director of ICT has hands on management of the committee, setting agendas and meeting frequency which currently is fortnightly. (S2P2, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008)

With the ICT Committee being so important to the management of the school it is vital that appropriate people are on the committee. The SMT Representative commented that the members were familiar with, and keen to use ICT in their classrooms (S2P2, personal communication, April 1, 2008) whilst both the Director of ICT and the Staff members commented on the potential for the members to have a ‘super user’ role. (S2P3, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008). The Principal noted some past issues related to having appropriate people involved with the committee.

“Getting the right people on the ICT committee is crucial. And it hasn’t always worked well here. Has at times been a group of people who might occasionally meet and complain.”
(S2P1, personal communication, April 1, 2008)

This was also echoed by the Director of ICT.

There was no apparent criticism of the current ICT Committee by the teaching staff interviewed. They saw it as both an operational and strategic component of ICT management in the school, with one teacher directly stating that using the Committee effectively was vital for further development of ICT in the school. (S2P4A, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008)

5.2.5.3 The ICT Technical Team

Currently the ICT Technical (support) Team consists of the Director of ICT, who also has ‘hands on’ involvement, and a single ICT Technician. Both report to the SMT Representative for HR appraisal purposes however for all other matters the ICT Technician reports to the Director of ICT.
Both the SMT Representative and teaching staff interviewed were of the opinion that the team was not big enough to cope with the workload, with the SMT Representative suggesting that an additional technician was required. The teaching staff talked of ‘super users’ in each department that can handle minor issues as they arise, taking some of the weight off the ICT Technical Team. It was suggested that these super users could come from members of the ICT Committee. (S2P2, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008)

5.2.6 ICT personnel and roles

Review of the interviews with School Two Staff suggests the following modification to the Diagram in Section 4.9.1.

5.2.6.1 Drivers

These appear to be very similar to those discussed for School One in Section 5.1.7.1, viz:

Education (Industry) specific requirements and those of the users, including
- Staff (Administration, Teaching and other staff)
- Students
- Other external users (Community Education, Adult Learning)
External drivers, specifically the MOE, seem to be identical to school one. With regard to school SMS systems the Principal did discuss the MOE’s policy of not mandating specific software but recommending a range of products.

“I’m really conscious of in a small country like New Zealand, with the strategy that the Ministry’s got, and I don’t know if it’s right or wrong, they’re the experts in this, where we haven’t got a huge amount of centralised resource into one SMS I don’t know that it can happen any better”
(S2P2, personal communication, April 1, 2008)

The teaching staff made reference to MOE pushing digital strategies without attendant funding.

“The government wants us to incorporate things in and we should because times are changing and we need to keep up our classes for our kids. But the government, at the same time as telling us we need to be doing certain things, isn’t even meeting us halfway on it”
(S2P4B, personal communication, April 1, 2008)

One might consider that the parent body may be making additional demands for ICT given that the school zone is of a lower socio-economic standing, decile, than that of school one. However, this is not borne out by the interviews, with the Director of ICT talking at length about the local community and levels of access to ICT.

“We’ve got to be a little bit careful in that we need to understand our community a little bit better. I did a quick survey of my class and there was about 3 kids in that class who didn’t have access to computers at home, and there was about one of those that didn’t have broadband at home. And we still have a kind of vision that we have to buy lots and lots of units so that we can put lots and lots of units of computers into the school and then the way that we can teach them is buy getting a class and dragging that class into a computer room and saying go onto the internet and do things
(S2P3, personal communication, April 1, 2008)

The Director of ICT went on to discuss pedagogical shifts using ICT as an enabler rather than teaching about ICT so that students are more ‘employable’. Similar comments were made by the teaching staff interviewed (S2P4A, personal communication, April 1, 2008) Thus, the interviewees suggest there is no real difference in levels of access to ICT in the homes of their school or those of an upper decile school.
Thus key external drivers appear to be MOE requirements for administration and learning and similar parental expectation to those in School One.

Due to infrastructural issues there appears to be a significant blurring between strategic and day to day planning, with the Director of ICT noting that “the vision at the moment is survival mode growing so we’re trying to improve our infrastructure.” (S2P3, personal communication, April 1, 2008)

The teaching staff appear to have a good voice in the day to day and strategic management of ICT in the school. This is through the ICT Committee with the Principal commenting on how their perception was that staff are being heard and also as there were no negative comments from the teaching staff interviewed. (S2P1, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008; S2P4C, personal communication, April 1, 2008). There was no evidence of either student users or their caregivers having a voice in the deployment and use of ICT.

5.2.6.2 Management Function and Personnel

Again Table 4 maps areas of functionality across the ICT management team member who appears to carry out that function. It does not show the level to which the current incumbent fulfils that role.
<table>
<thead>
<tr>
<th>Function</th>
<th>Ministry of Education</th>
<th>Board of Trustees</th>
<th>Principal</th>
<th>SMT Representative</th>
<th>ICT Committee</th>
<th>Director of ICT</th>
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</thead>
<tbody>
<tr>
<td>Vision and strategic direction</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
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<td>HR management (ICT Subordinates)</td>
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<tr>
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Table 4: School Two - Function and Staff
The Principal is very aware of the changing nature of roles as people change, stating that “It depends so much on the people in the jobs” (S2P1, personal communication, April 1, 2008). With this in mind it is appropriate to comment on the role of Director of ICT as the current incumbent was highly thought of by all members of the school interviewed, from the Principal to the teaching staff. It was very apparent that the incumbent’s mix of ICT Knowledge and background as a practising teacher was much appreciated.

“We’ve remained with the structure of having the one person there but we’ve gone from having a non-teacher to a teacher to someone who’s almost half way between really because (they have) has taught so (They do) understand but (they have) got the level of technical expertise that (their) predecessor didn’t have. So at the moment we’ve got probably almost an ideal situation which is not necessarily sustainable and that’s the challenge in a school isn’t it.”
(S2P1, personal communication, April 1, 2008)

This was echoed by the teaching staff who discussed previous incumbents, clearly identifying the perceived strengths and weakness of the incumbents, and stating that since the current Director of ICT has been in the role life has been easier. (S2P4B, personal communication, April 1, 2008)

Review of the School two interviews strongly suggests that the apparent ‘success’ of this person is not only due to their background but also to their interpersonal abilities. Certainly there was no apparent criticism from staff of their approachability or knowledge, and the Principal noted that:

“people do think they’re being better heard. Due in large part to (The Director of ICT) being very proactive about being out there, being seen, making it clear that (their) role is about teaching and learning.”
(S2P1, personal communication, April 1, 2008)
5.2.6.3 Retention of ICT staff

School two realises there are issues around attracting and then retaining ICT staff and the Principal has worked with the Director of ICT to enhance their enjoyment of the role. There is the anticipated issue of offering salaries that are competitive with industry.

“We can’t meet industry rates in terms of pay. We are remunerating certainly our IT manager as well as we believe we can. And that hasn’t changed much in terms of the level of where it sits against teacher salaries for about 10 years here. So we’ve always remunerated that position relatively well compared to other schools. But that’s a huge resource that’s going in there and when with the technician as well. So I think you can do a lot within the school in terms of providing support that’s not financial and things that we all enjoy and I guess the collegial aspects of it and all that. But the dollars remain the major issue for us.”
(S2P1, personal communication, April 1, 2008)

Thus, at the same time as offering what they believe is the best salary they can, school two also recognises that other factors can be important in retaining staff. They have noted that the Director of ICT, having been a teacher, still enjoys working with students and they have given them additional responsibilities in this area, over and above the ICT role. (S2P1, personal communication, April 1, 2008)

This was echoed by the Director of ICT when discussing the retention of the ICT Technician. In this regard they noted that anyone working in ICT in schools must be willing to do so for less pay than they could earn outside of the school. However, they feel that the rewards of working in a school outweigh this.

“You’re going to have people who are prepared to work for slightly less money than they’d get out in the real world. But for that they see the value of what they get in a school. It’s a fun place to work it’s got better holidays, schools and teacher in then are generally although they can be a bit annoying they’re often really cool people to work with. You work in a much larger organisation than you probably would  and have a lot more work to do”
(S2P3, personal communication, April 1, 2008)
The second part of their statement also suggests that working in ICT in a school is a very good way to get a broader background in ICT that perhaps one would in industry.

However, balanced against this is a comment made by one of the teachers interviewed, regarding the Director of ICT’s school commitments. They noted that the Director of ICT is also a Form Class teacher, and that the form class meets first thing in the morning. This means that if things are not working first thing in the day then the Director of ICT will not be available to resolve the issues. *(S2P4C, personal communication, April 1, 2008)* (There is an underlying assumption that things are more likely not to be functioning at the start of the day than later on.) Thus the teacher considers the Director of ICT’s role as a Form Teacher to be an impediment to their role of Director of ICT.

**Observation 17**

The Principal of School Two has made it quite clear that they have had the following incumbents in the role of Director of ICT.

1. An IT specialist with minimal exposure to education prior to obtaining the role
2. A teacher with limited exposure to ICT
3. A teacher who also has a significant background in ICT, especially in an education context.

Of the three, the third is by far the most preferred incumbent from both a management and teaching staff perspective. Yet, these people are hard to find and difficult to retain.
5.2.7 Alignment of ICT

With reference to the discussion on Alignment in Chapter Two the school’s use and deployment of ICT was reviewed in the light of its stated goals for ICT. Again the following breakdown was used:

1. ICT for administration
2. ICT for Teaching and Learning
   a. ICT for Teaching
   b. ICT for Learning

5.2.7.1 School Two’s alignment objectives

The school utilises an ‘off the shelf’ SMS package that was purchased a number of years ago and is a significant tool for school and student administration, timetabling and reporting. Other administrative tasks are performed utilising ICT, along with secretarial support.

Both the Principal and the SMT Representative talked of their vision to use ICT to improve teaching and learning, and also talked of ICT to motivate students to learn. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008) The principal also talked of a ‘rider’ to this vision in ensuring students have sufficient ICT skills to move to employment or further education.

“what we are aware of is that when our students arrive in tertiary education or whatever it is they are going to, with skills that align and knowledge that aligns. So that must be a part of that improving teaching and learning picture as well.”
(S2P1, personal communication, April 1, 2008)

However the SMT Representative and the Director of ICT talked about ICT infrastructural issues that significantly limit the use of ICT. The SMT Representative noted that “Networks and problems still outweigh everything at the moment, including student learning” (S2P2, personal communication, April 1, 2008). Available funding for ICT was also seen as a significant barrier to achieving better...
alignment with the Principal stating that: “We’ve worked really hard to try and make good use of the bucks in terms of student use and I think we do pretty well there.” (S2P1, personal communication, April 1, 2008). This was also echoed by the Director of ICT. (S2P3, personal communication, April 1, 2008)

None of the school staff interviewed mentioned any form of formal review of ICT alignment in the school.

5.2.7.2 ICT for administration: SMS

The school utilises an SMS that was initially purchased a number of years ago and when asked regarding its use the Principal stated simply that “It’s critical – we couldn’t do it without ICT” (S2P1, personal communication, April 1, 2008). They mentioned the processes undertaken to select the SMS but did say that they would be unsure of the outcome were they to revisit the decision. (The original selection was made prior to the MOE publishing their list of accredited SMS systems however the system selected by School two is one of those accredited). They went on to state that the school was committed to the system due to the large investment it had committed to the system: “to change from there we couldn’t afford it in the near future, either human resource wise or financially” (S2P1, personal communication, April 1, 2008).

According to the SMT Representative the school was investigating further modules that were available to assist the school in the area of Reporting and Assessment. They also spoke highly of the way the system was supported and managed by the Director of ICT and the DP SMS (an additional actor noted in Figure 14, page 120).

The teachers interviewed stated that they felt the functionality they required (absence recording, location of students, reporting) from the school’s SMS was available. One teacher did remark that they would like to have remote access to the system along with their stored and shared data. (S2P4A,
Thus ICT for administration, especially the SMS, appears to be well aligned with school requirements and vision. However, issues with infrastructure do perhaps limit this.

5.2.7.3 ICT for teaching and learning, and for motivation.

Improving teaching and learning, and increasing student engagement (enthusiasm) are stated core vision for ICT in School Two. As noted in Observation 16, the term Teaching and Learning actually denotes two different groups of users with different requirements for ICT.

5.2.7.3.1 ICT for learning: Students

This research did not interview any students or parents of the students regarding their views on ICT in School Two. However, the Director of ICT talked at length about their perceptions of the school’s community and the access that students may have to ICT outside of the school itself. The Director of ICT discussed a simple survey they had taken of their class which suggested that more than 90% of students have access to a computer and broadband internet through their home.

“There is a transition I think that’s going on within the community and a lot of people are still saying oh we have to provide lots of opportunities so that they can get on the computers because they don’t have computers at home”

“To improve the real sense of the teaching and learning with ICT, to really do that, we actually really need to understand the community a little bit better, we need to have staff that understand the community a little bit better, and are a bit more committed, to perhaps a different view of what ICT integration actually means.”

“Things like providing a lab for an entire class to go to; yes it’s kinda cool but no, maybe we’re spending the money in the wrong way.”

(S2P3, personal communication, April 1, 2008)
The Director of ICT also discussed changes of the deployment model from computer labs to projectors and access in teaching spaces and associated pedagogy and attitude changes it would require among the teaching staff. (S2P3, personal communication, April 1, 2008).

As already discussed in chapter 5, we need to be cognizant of the fact that the majority of users are children aged 13 to 18 and this significantly impacts on the way in which ICT is deployed. The teachers interviewed discussed at length issues that had occurred where students stole passwords and accessed the system as another student. Password systems were changed and new passwords re-issued to all staff and students which were complex and all users found them difficult to remember, resulting in students not being able to login or simply writing them down. This led one of the teachers interviewed to comment about access to ICT in the school for students:

“The problem with the access is twofold. Lack of resources inability of students to access because they haven’t got their password”

(S2P4A, personal communication, April 1, 2008)

Thus, for School Two, a significant problem of access for students is due to the nature of the users themselves.

As also noted by Teacher A, the teachers see the school as having a lack of resources, both for student access and for teaching. When asked if they felt there was sufficient access to ICT for students the answer was a simple “No”, which they further expanded by commenting that “During the day the labs are really set up for the ICT classes.” (S2P4A, personal communication, April 1, 2008) This suggests that teachers find it difficult to get classes into a computer laboratory, which was borne out by the other teachers interviewed. (S2P4B, personal communication, April 1, 2008; S2P4C, personal communication, April 1, 2008). However, as noted above, the Director of ICT is suggesting that computer laboratories may not be the best use of ICT funding and that alternative deployment modes should be considered. (S2P3, personal
In summary, the teachers do not feel that there is a strong alignment of ICT for student learning and this is not helped by infrastructure issues. Considering the comments made by both the Director of ICT and the teachers, it is suggested that ICT for learning actually encompasses far more ICT than that supplied by the school; rather it also includes such facilities as those available in the student’s (user’s) home, public libraries, internet cafés and so forth. It was noted by the teachers that the school’s current intranet is not available to students from outside of the campus. (*S2P4C, personal communication, April 1, 2008*)

**Observation 17**

Schools are unlike commercial enterprises in that they expect their users (students) to work with ICT based tasks outside of the institution utilising the users own resources. This raises a second issue of the transfer of data between the user and the school (USB, CD-ROM, E-mail) and how this is monitored, and also about how remote access for the user to the school is provided and controlled. This must also be tempered with the realisation that the majority of these users are children (aged 13 to 18) and thus less likely to be aware of dangers and pitfalls in transferring data through removable media and the complexities of remote access. It certainly suggests that some research into this area of data transfer directly related to schools would be very useful for school ICT Managers.

One teacher interviewed suggested that the school should:

“*Educate the parents and say that we want the kids to go on the internet tonight and research this. It’s up to you whether you manage them on Bebo because parents only give their kids ‘x’ amount of time so when the kids get on there at home they go into Bebo and chat rooms and do all that, rather than doing what they should be doing on there*”

(*S2P4A, personal communication, April 1, 2008*)
5.2.7.3.2 ICT for teaching: teachers

As already noted above, the teachers interviewed spoke of a lack of ICT resources whilst the Director of ICT and the SMT representative spoke of infrastructural issues hindering the use of ICT. The SMT representative also discussed how staff were using ICT for administration and teaching, noting that all staff have TELA provided laptops which are in regular use; that it has become “matter of fact to them” (S2P2, personal communication, April 1, 2008)

The teachers interviewed were very concerned about a lack of resources such as computer spaces, both laboratories and Pods, and data projectors. One teacher commented that:

“I think the school wants that (the use of ICT for teaching and learning) but again I think it’s a resource issue”
(S2P4A, personal communication, April 1, 2008)

The issue of resourcing featured strongly in the interviews with the teachers, along with issues relating to current ICT infrastructure and especially its reliability, which was seen as a very significant issue.

“When you do start to use technology and then technology isn’t available – whoa!”
“But if that’s what you’re planning on using and for what ever reason your computer’s down, your laptop’s down, your projector’s down etc life will become a little more challenging.”
(S2P4B, personal communication, April 1, 2008)

The school is entirely aware of these problems and working toward their resolution. (S2P2, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008)

It was noted that the deployment and use of Interactive White Boards (IWBs) was mentioned by all but one of the interviewees. Both the Principal and SMT Representative commented that there was insufficient demand to justify the expenditure on further IWB’s beyond the single unit currently installed in a Mathematics classroom. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008) whilst one of the teaching staff
interviewed commented on their time teaching in the United Kingdom where many classrooms have IWBs installed. They felt that a big issue was a lack of Professional Development for staff and did not seem concerned about their lack of availability in School Two.

“My last school had (an IWB) in every room and teachers didn’t know how to use them.”
“So it will have to come with ongoing professional, like training for it”

(S2P4C, personal communication, April 1, 2008)

Thus it would appear that ICT is not strongly aligned with the school for ICT for Learning but that the school is aware of gap and actively working to close this by concentrating on infrastructure.

**Observation 18**

Discussion with the teachers interviewed suggested a view that Professional Development in the school was an issue because once the time and funding is given to a teacher there is nothing stopping them from leaving the school taking the skills and knowledge with them. (S2P4B, personal communication, April 1, 2008) All schools have turnover, just like any commercial enterprise, but perhaps schools are slightly better off in this regard in that whilst an individual school may lose skills and knowledge, if the teacher moves to another school then the skills and knowledge is still retained in what is essentially a non-competitive industry, that of education in New Zealand. The MOE still retains that teacher’s skills and knowledge even where the individual school does not. This then suggests that perhaps Professional Development could be seen as a centralised resource rather than as a school resource.

**5.2.7.4 The impact of funding**

Not surprisingly, the biggest perceived barrier to achieving better alignment from ICT was seen as funding; both external from the MOE and internally through budget processes.

“Again, just being really conscious, as we said before, of not putting lots of money into too many things that we can’t sustain”
None of the School two interviewees appeared concerned that the school was unaware of alignment factors or that it was not endeavouring to move to a position of greater alignment of ICT to objectives.

5.2.7.5 Comment on Alignment

The school has an articulated and documented vision for ICT and is endeavouring to meet that vision by deployment of ICT as well as available funds will allow. Reviewing the alignment model in 4.9.3 the school appears to be at stage 2.

A need for ICT is understood and the school has or is deploying ICT resources to meet student / teacher demand
5.2.8 Strategic planning for ICT

Review of the interviews conducted with staff at School Two suggests the following structure for ICT strategic planning.

The main focus of planning appears to be centred on the Director of ICT with the role of the SMT Representative being somewhat unclear. By way of summary the process could be described as a risk adverse, agile comparison that is dollar limited.

5.2.8.1 ICT Strategic plans and agility

The school does not have a formal ICT Strategic plan. The SMT representative stated simply that they do not have a one, two or three year plan (S2P2, personal communication, April 1, 2008) whilst the Principal commented that ICT was:

“One of the main areas where you can’t plan too far. We did a five year plan one year. (laughs) What a joke.”

(S2P1, personal communication, April 1, 2008)
The ICT Director talked about an overall goal (of resolving infrastructure issues) and essentially, an agile approach to its progression.

“It’s not a formal fixed kind of plan but we’ve got a plan that we’re revising all the time, of exactly where we ant to be over the next three years. We have certain things that we need to achieve over the next three years and we look at each of them on a case by case basis and we project manage them to bring them into play when the time is right”
(S2P3, personal communication, April 1, 2008)

Thus it appears that the focus of ICT planning is centred around a three year resolution of current issues to provide a platform for future developments.

With regard to these developments the SMT Representative commented that:

“You have this vision of what a high tech school should have in it. And it’s not about the hardware to have in it.”
(S2P2, personal communication, April 1, 2008)

The Principal also alluded to a level of agility when discussing budget processes, talking about a keeping some funding aside for ‘timely things’. They commented that:

“You got your plan but things are coming in all the time and you may have to veer your course.”
(S2P1, personal communication, April 1, 2008)

Hence the use of the term Agile in describing the school’s ICT planning.

5.2.8.2 Risk aversion

The Director of ICT was very clear about how they felt concerning risk, based upon experiences both within School Two and those that they had seen outside of the school. As well as infrastructural challenges the school also experienced a significant and protracted period of ICT unavailability that was commented upon by the teachers interviewed, and which continued for the best part of a term. (S2P4A, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008)
In this environment the Director of ICT is unwilling to risk further problems and commented that:

“We’re a little bit risk adverse in the way that we go forward because I think there have been a lot of things done in the past where they just haven’t come off”

(S2P3, personal communication, April 1, 2008)

They also commented on system failures they had observed in other schools, stating that for both risk and financial reasons they are quite happy to wait for second or even third generation technologies that are proven in schools and generally of lower cost than first generation solutions. They felt that it was unnecessary for School Two to be at the forefront of ICT technology.

“We want to be like that for most things not just because of the economics of it but also because you know, we don’t need to be at the cutting edge. But we just need to make sure we do enough with the money we have available”

(S2P3, personal communication, April 1, 2008)

Thus, the term ‘risk aversion’ is used in describing School Two’s ICT planning.

5.2.8.3 Comparison

The word ‘comparison’ was used in describing ICT Planning in School Two as both the Principal and the SMT Representative talked of reviewing how the school was using ICT and comparing it against other schools. When asked about ICT strategic planning the Principal stated:

“I think it’s about continually looking at what is happening out there; continually saying what can we do better, and when ideas come along from whoever, whether its staff, students or who ever, actually someone investigating them without immediately saying I don’t think so. And going the extra mile because maybe it is something that will make a difference”

(S2P1, personal communication, April 1, 2008)

This was echoed by the SMT Representative

“I think it’s just keeping abreast of it; just making sure that you keep up to speed and make sure that you don’t not have something that may not be relevant for the school”

(S2P2, personal communication, April 1, 2008)

Although no formal process was evident it is a constant (agile) review of school ICT looking to see what could be improved.
The SMT Representative’s role in the ICT planning process is unclear, potentially in part because they had not been in role for very long at the time of the interview. (Hence the line between the Principal and the Director of ICT on the diagram passes straight through this position). They seem to be happy to leave the planning of ICT to the Director of ICT.

“I take it a lot onboard what (the Director of ICT) and the ICT Committee come up with. How do you plan for ICT? Look, the good thing about (the Director of ICT they) keep up to speed with all the major developments that are going on in hardware and also the curriculum side as well”
(S2P2, personal communication, April 1, 2008)

The Director of ICT is keen to ensure than any technology deployed in the school will work in the school’s environment, preferring to see it successfully implemented in another school first and to avoid any initial pitfalls they may have found. Regarding new technologies they said that:

“we want to see them in practise. We want to see somebody else make mistakes”
(S2P3, personal communication, April 1, 2008)

5.2.8.4 Impact of funding and budgets

As has already been noted several times the school sees a lack of funding and budgets as a barrier to further enhancement of ICT and ICT planning is also constrained by needing to fit within budgets. The Principal was keenly aware of ICT’s ability to absorb funding, stating that the planning and budgetary process had to be:

“Just a pragmatic process because IT can just be a black hole.”
(S2P1, personal communication, April 1, 2008)

The SMT Representative noted that:

“It comes down to the money thing. Need to try and get some funding done and some smart technical stuff to ensure it keeps running.”
(S2P2, personal communication, April 1, 2008)
The Director of ICT also had the same view although they were also concerned about potential for wasting funds in the school and wanted to ensure that they obtained the best possible resources with the available funding.

“We want to get the most bang for the dollars we have available. We want to advocate for spending the money on the right things. We want to be the people that say hey don’t waste your money on this rubbish. ‘Cos (in) schools there’s just ridiculous amounts of wastage. We want to make sure that we get the most out of the dollars that are available so that we give the best opportunities for staff and kids.”

(S2P3, personal communication, April 1, 2008)

Thus all ICT planning is tempered by the amount of funding available and is ‘budget limited’.

5.2.8.5 The Process

As already noted, the majority of ICT planning appear to be the role of the Director of ICT who provides a sequence of short term, agile projects for sign-off by the Principal with the final approval coming from the BOT. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008) This suggest that a large amount of responsibility for knowing what is available and also what the school and its users need or want, rests upon their shoulders. The SMT Representative noted that:

“Because it’s (the Director of ICT’s) passion (they) keep up to speed. (They) also includes the staff in that and it’s something that we do talk about and with the SMT as well”

(S2P2, personal communication, April 1, 2008)

The ICT Committee also has a significant voice in the process, providing requests from the teaching staff and providing a direction for ICT. It is the Director of ICT’s responsibility to draw up ICT budgets based on these requests and then have these approved by the Principal and BOT. (S2P1, personal communication, April 1, 2008). The Director of ICT described the
process as “Departments come along and say this is what we really want to do and we kind of put it into the big picture” (S2P3, personal communication, April 1, 2008).

There was no apparent voice for the student users or the caregiver community.

5.2.8.6 Conclusion

There does not seem to be a formal process for review and planning. However, the school has deliberately shied away from long term plans preferring an approach that could be termed as ‘agile’, focusing on short term projects with a long term goal of resolving current issues. Staff appear to feel that their voice is heard in this process however there is no mechanism for other parties to have their voice heard.

5.2.9 Outsourcing

Outsourcing was not mentioned by School One but is a factor in the management of ICT for School Two. As mentioned in 6.5.1, the rationale is to ensure continuity of skills and knowledge should members of the ICT Team (the Director of ICT or the ITC Technician) move to new employment.

The Principal did mention that there were some issues with the vendor they chose to outsource with, resulting with, in essence, a change in vendor to a former employee of that vendor. (S2P1, personal communication, April 1, 2008) Due to a lack of data it is not possible to explore outsourcing of ICT support further and a full exploration is outside the scope of this research. However, further research on the use of outsourcing vendors by schools of all levels and size would be of significant benefit to schools, vendors and potentially the MOE.
5.2.10 Summary of analysis of School Two

School two is a lower decile band school which, like School One, also has a lot more actors in the functional management of ICT than the formal structure. The level of knowledge and knowledge of integrating ICT into the curriculum was variable among the staff, with the Director of ICT being highly knowledgeable of ICT and also having been a classroom teacher. Significant emphasis was placed on this role and the school has had incumbents with a variety of different backgrounds filling the position over time.

The school’s vision for ICT, although worded differently, seemed to be known by all staff interviewed. The vision is centred upon teaching and learning but tempered with a more short term goal of resolving infrastructure issues within the school; a view that seem to be more strongly melded with the school’s vision by the teaching staff interviewed.

Strategic and day to day planning seem to be somewhat blurred due to current issues, however the Director of ICT keeps an eye toward the future whilst rebuilding the structure. They are also cognisant of their wider parental community and its impact on how ICT is used in the school.

Referring to the Maturity Model in 4.9.3, the school appears to be at a level two: A need for ICT is understood and the school has or is deploying ICT resources to meet student / teacher demand. For this school the emphasis is probably on ‘is deploying’ rather than ‘has’. Interviewed staff seemed happy that their voice was heard and that within limitations of infrastructure ICT was meeting their needs.

Strategic planning was viewed on a short-term basis rather than long-term, with an agile approach to planning. Again, the ICT Committee was viewed as the source of recommendations (through the teachers’ voice) but there was no observed mechanism for students and caregivers to voice their
requirements. Planning was informed by the Director of ICT ‘keeping up to speed’ and by observation of practice in other schools. The Director of ICT was ‘risk adverse’ in their approach to ICT and new technologies.
5.3 Commonalities between School One and School Two

In this section the two case studies are compared and similarities and dissimilarities between the two schools are discussed.

5.3.1 Management Structures

Both schools have a structure of three or four people directly tasked with managing aspects of ICT, that when examined further, showed a raft of other ICT related functions being carried out by other staff. Both schools used the same name for their key position, the Director of ICT, with school one having the additional level of Network Manager.

In School One the Director of ICT reported directly to the Principal (CIO to CEO) and in School Two, although the Director of ICT’s reporting line was to the SMT Representative, there was a strong, acknowledged informal reporting line to the Principal.

Both schools have a person from the SMT in the structure although in School one’s case, this person is not in the direct reporting line whilst in school two, the person is to an extent being bypassed.

Neither school had a BOT member whose specific role was the oversight of ICT. Rather this was left to the CEO (Principal) and again one must refer back to the research of Mackey and Mills (2003) describing the impact of the school’s principal on ICT alignment in schools. Repeating this research for small, medium and large secondary schools would be extremely interesting.

Both schools utilise an ICT Committee to give teachers a voice in ICT deployment and development in the school, and as noted by the principal of School Two, to ensure the Director of ICT is not left to act in a vacuum. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008) However, the two schools differed in the ‘brief’ the ICT
Committee was given with School One’s having a budget and deployment mandate and School Two’s a pedagogical, integration role. (S1P1, personal communication, November 30, 2007; S2P1, personal communication, April 1, 2008) The composition for both groups appears to be across the spectrum of the teachers.

**Observation 19**

Both schools have a very similar structure for core ICT roles. They have a key CIO role (in these cases, the Director of ICT) that report either to, or one position below, the CEO (Principal). The management structure also includes a link to the SMT which is the day to day management of the school. On paper this structure appears to provide strong informational lines so that ICT can be aligned to the schools needs. An interesting question would be how many large secondary schools, and how many smaller or primary schools, have a similar structure in place.

**5.3.1.1 The Director of ICT**

Both schools viewed this role a crucial to ICT in the school. In School One this was to provide oversight for the Network Manager who was a technical person with no teaching background. In School Two it was simply stated that “At this stage all those roads lead to (the ICT Director).” (S2P1, personal communication, April 1, 2008) The person in this role is crucial, with School One indicating that since they had appointed a Director of ICT with an educational focus there had been improvements in the use of ICT for teaching and learning. (S1P1, personal communication, November 30, 2007) School Two commented that they had had a person with an IT background and no education background, then a person who was a teacher with no IT background and now have a person who is a teacher and also has an IT background. The latter person was clearly seen as the best combination of skills and experience. This was also echoed by the School two staff who were interviewed. (S2P1, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008; S2P4B, personal communication, April 1, 2008)
Both schools viewed the role of Director as being foremost a managerial role. At School One a Network manager was employed to segregate the technical and managerial functions whereas in School Two the functions were met by the Director of ICT with the HR Management component being devolved to the SMT Representative and the technical aspect of their role was supported by an outsourcing agreement. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008) Neither school viewed the Director of ICT as a ‘super technician’.

5.3.1.2 Technical Support

Both schools recognised the need for quality ICT technical support to adequately manage their ICT systems. School One noted that previously it had employed self-taught teachers in the role of technical management, a practice that was widespread. They noted that outcome was a ‘patchwork technical setup’ (S1P1, personal communication, November 30, 2007) and addressed the problem by employing an IT Professional in the Network Manager.

School Two took the option of employing a Director of ICT who has significant ICT background and has supplemented those with technical outsourcing as noted above.

Observation 20

The days of well meaning, self-taught people managing ICT in large schools are probably over, given the rise in complexity of ICT in these institutions. However, smaller schools may have difficulty in supporting a dedicated technical specialist and thus the rise of the Education Specialist outsourcing vendors such as Edtech and NewEra IT. It would also be interesting to study the impact these and similar companies are having on ICT in New Zealand schools.
5.3.2 Personnel and Roles

The mapping of roles to position in sections 5.1.6.2 and 5.2.6.2 have been merged to a single map in Table 5, where (1) designates School One and (2) designates School Two.

Both schools appear to map the same function across the same position with only the level to which the position carries out that role being variable. If the Director of ICT and Network Manager positions for School One are merged together they very nearly duplicate the roles mapped to the Director of ICT for School Two.

The most significant difference appears in the areas of:

1. Alignment Monitoring
2. Daily Management
3. Solution Research and Selection
4. Deployment of ICT

For School Two these areas see more involvement by the SMT representative and Principal, as well as by the ICT Committee. However, senior management at School One are less involved in the management of ICT than those at School Two.

The ICT Committee also has a broader brief and functions in the areas of daily management and solution research than does the ICT Committee in School One. There are two factors that suggest why this is so. Firstly, the Director of ICT at School Two noted that they had moved to a fortnightly meeting basis and both the Principal and SMT Representative described the role of the Committee as being more to promote teaching and learning. (S2P1, personal communication, April 1, 2008; S2P2, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008) The teaching staff interviewed also made reference to the ICT Committee as a potential source of ‘super users’, suggesting that the committee has good visibility within the
The ICT Committee at school one has an ad-hoc meeting schedule and its role was viewed as proscribing the deployment of ICT and allocation of ICT capital budget. (S1P1, personal communication, November 30, 2007) It is also noted that the Network Manager did not feel comfortable with the ICT committee having their role extended.

“In many big decisions, sorry, they are not qualified to do that. Sorry. They can listen to one or two preferably, competitors, ( ), you know what I mean, just to get two different, very opposite point of views, then they can make decision”

(S1P4, personal communication, October 26, 2007)
**Indicates School One and (2) indicates School Two**

<table>
<thead>
<tr>
<th>Function</th>
<th>Ministry of Education</th>
<th>Board of Trustees</th>
<th>Principal</th>
<th>SMT Representative</th>
<th>ICT Committee</th>
<th>Director of ICT</th>
<th>Network Manager</th>
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<tr>
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<td>(1) Low, (2) Moderate</td>
<td>(1) Low, (2) Moderate</td>
<td>(1) Low-Mod, (2) High</td>
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<tr>
<td>Daily Management</td>
<td>(2) Low</td>
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<tr>
<td>Project Management</td>
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<td>(1) Mod - Low</td>
<td>(1) Moderate</td>
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<tr>
<td>Solution Research and Selection</td>
<td></td>
<td>(2) Low</td>
<td>(1) Mod - Low</td>
<td>(1) Mod - High</td>
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<tr>
<td>Deployment of ICT</td>
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<td>(2) Moderate</td>
<td>(1) High</td>
<td>(1) Mod - High</td>
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Table 5: Combined Schools One and Two - Function and Staff
5.3.3 School Vision for ICT

Both schools viewed their vision for ICT in terms of teaching and learning, viewing ICT as a tool to engage, motivate and support students in their learning. This is consistent with the MOE strategy document “e-Learning Action Plan” (MOE, 2006b) and also overseas research, in particular SETDA research, which urges the American education system to use technology to support innovation in teaching and learning.

“To keep pace with a changing world, schools need to offer more rigorous, relevant and engaging opportunities for students to learn—and to apply their knowledge and skills in meaningful ways. Used comprehensively, technology supports new, research-based approaches and promising practices in teaching and learning.”

(SETDA, 2007, p. 3)

Neither school appeared to have a strong translation of this vision into a set of action plans although School Two in particular was concerned about creating a strong infrastructure as an enabler for the integration of ICT to teaching and learning. Both schools appeared to be more focused on ICT for teaching through the teacher’s voice in the ICT Committee. The staff interviewed at School Two all described a similar vision for ICT whilst at School One the staff gave different visions with the Director of ICT stating they were uncertain if the vision they had described was their own or the Principal’s.

(S1P3, personal communication, November 2, 2007)

5.3.4 ICT Alignment

Both schools have complex ICT systems with a large number of users using a scarce ICT resource that has limited funding available. Within this structure ICT must align in three areas:

1) ICT for administration
2) ICT for teaching
3) ICT for (student) learning
5.3.4.1 ICT alignment - administration

Both schools use an MOE accredited SMS application as the core of their administration, with other systems running from this. The SMS systems are ‘off the shelf’ solutions developed and supported by third parties which in turn means that customisation to school specific requirements is problematic at best. School two did comment that should they have to remake the decision as to which SMS they would not necessarily choose the same SMS but acknowledged that the cost of such a change would be very significant in time, training and dollars. (S2P1, personal communication, April 1, 2008) For both schools access to the SMS by all staff is a significant factor in alignment and both schools have a person appointed to manage the SMS system, with this being a full time role in school one.

5.3.4.2 ICT alignment – teaching

Teachers interviewed in both schools indicated that they were big users of ICT, usually outside of teaching hours. Their use of ICT was for administration, preparation and marking but with increasing pressure to use more ICT for teaching. One teacher at School one commented on a lack of remote access for staff, indicating that the ability to perform SMS based administration from home would be a distinct advantage. (S1P5C, personal communication, May 30, 2008) Teaching staff at both schools perform a lot of their work outside of school hours, offsite from the school campus and thus ICT alignment for teaching must also extend to out of hours access.

At School One a teacher interviewed stated that they felt that if the school had “every single room in the school with a desktop computer and a data projector would be the ideal” (S1P5B, personal communication, May 30, 2008) whilst a teacher at School Two lamented their lack of access to data projectors. (S2P4B, personal communication, April 1, 2008) Teachers at both schools are looking at permanently fixed data projectors as the next big step in alignment of ICT. Other specific technologies such as interactive white boards were also seen...
as desirable but less affordable and thus ultimately, not a reality. (S2P2, personal communication, April 1, 2008)

5.3.4.3 ICT alignment – (student) learning

Neither school had a mechanism for students or their parents voices to be heard in terms of ICT and neither school’s ICT Committee contained student representatives. Both the Director of ICT and the teachers interviewed at School Two were aware of local community expectations but only in an unstructured and ad hoc way, with Director describing a quick survey they had taken with their class to gauge the level of ICT available to students outside of the school. (S2P3, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008)

Reviewing the interviews there does not appear to be significant awareness of differences between ICT for teaching and ICT for learning.

5.3.4.4 Other alignment factors

Both schools viewed their infrastructure as a current barrier to alignment with School Two actively working to resolve current issues. School One was hampered by the areas of the school not yet connected to the network.

Both schools cited budgets as another barrier to alignment which in turn makes ICT a scarce resource. When asked if money would fix their ICT infrastructure issues the SMT Representative at School Two simply said “Yes.” (S2P2, personal communication, April 1, 2008)

Observation 21

Not surprisingly, as with industry, connectivity of ICT resources is paramount to alignment. In a school environment it is difficult for teachers to move to another location to obtain access to ICT resources which are often only required for a portion of the lesson. A lack of access to ICT in teaching spaces reduces the opportunities available from serendipity and what
teachers describe as ‘the teaching moment’; when circumstances provide an opportunity for learning to occur.

5.3.5 Strategic planning for ICT

Both schools carried out strategic planning by being ‘aware’ of what was available and examining other schools. Although not formally delegated to do so the Director of ICT in both schools was the key person in this area.

School One has a ‘big leap’ approach in that they felt that large steps separated by time were required. (S1P3, personal communication, November 2, 2007) Whereas School Two had a more agile approach to planning with smaller projects continuously being initiated as resources allowed.

“we’ve got a plan that we’re revising all the time, of exactly where we want to be over the next three years”
(S2P3, personal communication, April 1, 2008)

When they reviewed section 5.1 the Director of ICT for School One was at pains to assure the researcher that the school did have a strategic plan for ICT but that it was not published so as not to compound the impact of other strategies in the school. (S1P3, personal communication, January 29, 2009)

Neither school had a formal written strategic plan with both principals citing the rapid change of pace in ICT as a reason for not constructing one. (S1P1, personal communication, November 30, 2007; S2P1, personal communication, April 1, 2008)

School One’s Network Manager was unhappy with this approach stating that ICT planning should be based on their performing appropriate research and then staff who understand the material make a final decision. They felt that planning was based on a whim.

“we will go this way or we want this way I supposed to do some sort of investigation or sort of, I don’t know, research. And then the group of people, not necessarily ICT group, based on who really know that subject decision. It’s not just like used to happen, whatever somebody feels like goes. Shouldn’t be like that. That’s my personal “
Overall for both schools, ICT planning was short term and constrained by budgets. The ICT Committee was used to capture the voice of the teaching staff and then these plans were forwarded to the Principal and BOT for approval, with this being an annual process. As already noted, neither school had a mechanism for student and caregivers requirements to be heard.

5.3.6 Conclusion

Despite their differing locations and communities both schools had very similar structures for managing their ICT with the roles mapped over a similar range of incumbents. The schools recognised the need for professional management of their ICT resources and both viewed ICT as a way of promoting teaching and learning. The Director of ICT role was seen as crucial and the incumbent needed to understand the environment in which they were working.

Neither school had a formal planning process for ICT nor any methodology for measuring alignment within the school. The availability of budget was the key factor in ICT planning for both schools.
6 Conclusions

The main research question is ‘How do two large New Zealand secondary schools manage their ICT?’ This has been answered in section 5 where the interviews from each school were analysed and a picture of ICT management in the schools developed.

In this section some conclusions will be drawn based on the twenty observations made in Chapter 5. These will be examined through the lens of the three headings in 4.3.1, the research questions. These questions are:

1. What management roles do schools have in place for ICT?
   What ICT management roles do the school have and what staff are involved in supporting them? What is the impact of the incumbents, their skill sets and attitudes, on these roles?

2. How do schools plan their ICT to meet future requirements?
   How the schools determine what ICT will enhance their future vision?
   How do they determine and provide infrastructure (hardware, software and human) required to support this vision?

3. How the schools define alignment criteria and how do they evaluate their success in aligning ICT to vision and objectives?
   How do schools determine the return on this investment for their ICT and how do they determine alignment between ICT and the school’s core business? How do schools ensure that the needs of all users are met?

In section 4.9 it was noted that it is not appropriate to draw generalisations from such a small dataset as this research. Whilst it would be of benefit to ICT in schools to make some strong recommendations and define some best practice scenarios it is not possible to do so from this limited review. Rather
the twenty observations made during the analysis of the material will be examined to pose questions for consideration by educators and hopefully to spur further research in this area.

Not all of the observations made will fit neatly into one area of questioning, particularly as alignment, vision and strategic planning tend to go hand in hand.

6.1 ICT Management Roles

As already noted in 5.3, both schools had a very similar management structure for ICT. For both schools the Director of ICT was a key position and the capabilities of this person crucial to ICT in the school. BECTA note that “there is a necessary concern for those schools which do not have the base levels of leadership and teaching on which to build.” (BECTA, 2003a, p. 2). Schools need good quality ICT leadership; the bigger the school, the more complex and crucial this role becomes. Further, BECTA also noted that:

“Teachers in schools with higher quality ICT support are more likely to use technology in their teaching and in a wider variety of ways, than teachers receiving lower quality support” (Ronnkvist et al., 2000, cited in BECTA, 2007b)

6.1.1 Management structures: CEO and CIO

From Observation 19, the Director of ICT is essentially a CIO function in the school and the Principal a CEO. Between these role the major functions of ICT management are carried out although in both case studies the SMT Representative also had a role in ICT Management. It would be interesting to know how many other large secondary schools had a similar structure and at what point this structure becomes burdensome and a simplified structure invoked. A comparative review of the role of a CIO in a corporate company versus that undertaken in a school would be quite informative and could well inform the selection of appropriate incumbents by schools.
However, simply stated, is the ICT management structure found in the two schools examined the most appropriate management structure for ICT in schools? How dependent is it on finding appropriate skill sets to fill the various roles and how does it vary with different incumbents? It was noted that School Two and School One to a lesser extent, had management structures that were historical. A regular review of these structures and re-alignment with available skill sets may promote more efficiency. However, the MOE has a deliberate ‘hands off’ policy allowing flexibility by the schools to accommodate their specific values and needs.

“Schools are, in the first instance, best placed to make resource allocation decisions in regard to their ICT needs”

“Integrating ICT with teaching and learning to support effective teaching and the personalisation of learning is best achieved at the level of the individual school, as it requires the customisation of ICT based on the needs of the school, teachers and students”

(MOE, 2007b, p. 15)

6.1.2 The Director of ICT (the CIO)

Observation 4 commented on the pivotal role played by this person, with the Director of ICT for School One calling themselves a ‘jack of all trades’. (S1P3, personal communication, November 2, 2007) In the same school the Principal noted that in the past they had had self taught computer experts, often teachers who had acquired ICT skills which led to a less than robust ICT infrastructure. (S1P1, personal communication, November 30, 2007) (Observation 5). Thus we see a move toward the hiring of IT professional to manage the complex ICT environment in large secondary schools, in this case with a teacher appointed as Director of ICT as their line manager.

In Observation 17 the range of different people filling the Director of ICT role in School Two was discussed, with an IT Professional who had not been a teacher, a teacher who had not been an ICT professional, and an incumbent who had experience in both IT and teaching. The latter was felt to
be the best combination. (S2P1, personal communication, April 1, 2008) This is also supported by BECTA research into ICT support which noted that:

“ICT Technicians would benefit from a funded training programme specific to their role. This could include basic pedagogical skills.”

(BECTA, 2007b, p. 2)

Whilst this research of two New Zealand schools does not purport to describe the ideal qualities of a Director of ICT it is noted that quality candidates are needed to fill this position in large secondary schools. It is suggested that research on the skills matrix of current successful Directors of ICT would be useful in informing schools on candidate selection. Further, ways of promoting this role as a career path would help secure these people in place.

Currently schools employing a Director of ICT must do so from their own resources by sacrificing a teaching position or spending operations funding on salaries. The need for this position has been recognised by the MOE:

“The advisory group argued that this leadership role should be provided as a staffing entitlement.”

(MOE, 2007b, p. 24)

6.1.3 People and the ICT roles they fulfil

Review of the functional management structures in sections 5.1 and 5.2 suggests that ICT management in schools, like any other ICT management role, is about people. Whether it is subordinates, peers or superiors, ICT management is about communication, understanding and working with other people. It is interesting to note that conflict was seen as a problem in School One and that human resource management was one of the roles taken on by the SMT Representative. (S1P1, personal communication, November 30, 2007; S1P2, personal communication, November 21, 2007)

6.1.3.1 The number of actors

Review of the ICT management structures for Schools One and Two shows a far more complex arrangement of actors than initial discussions reveal;
almost an ‘iceberg effect’ where much of the structure lies hidden. When interviewed neither of the Principals or other representatives directly mentioned the additional actors as part of the management of ICT but rather these were teased out by discussion during the interview. Hence, whilst these schools may think they have a relatively simple ICT management structure they in fact do not. (Observation 1)

The outcome of this is that those directly managing ICT (in this case the Directors of ICT and Network Managers) may not have direct control of specific elements of ICT. (Observation 2) For example, fixed copper cabling in School Two is managed by the Property Manager and the Director of ICT is responsible only for what goes into the wall port and what emerges from the wall port. (S2P3, personal communication, April 1, 2008) The Director of ICT is responsible for the switching equipment and presumably the communications racks and cable terminations suggesting that contractors need to communicate directly with two actors to complete any work. (It should be noted that the MOE has published guidelines for the implementation of school networks which includes standards for outlets and cabling. Presumably the Property Manager is aware of and applies these and thus does not act in a vacuum.)

Thus, to manage ICT in a large secondary school such as the two examined, a Director of ICT must constantly gain a consensus from a range of other actors and must constantly review the impact of decisions on other potentially affected parties. (Observation 3) Conversely, these other actors may make decisions and not realise or communicate the impact of these upon ICT in the school as the incumbents in these other roles will have a variable range of ICT skills and knowledge. (Observation 14). This was also noted by the Director of ICT for School One who felt they were left out of large projects such as renovation and building until quite late in the process, to the detriment of provisioning ICT for these developments. (S1P3, personal communication, January 29, 2009)
It is suggested that a key attribute of a successful Director of ICT will be communication and interpersonal skills to negotiate successfully among the disparate actors. They must be aware of all the actors involved in the management structure and the roles that they perform.

6.1.4.2 Staff changes

Observation 11 noted that as staff change the mixture of skills and abilities will also change as in any organisation. This does pose the question of whether or not the management structures evolve to suit the incumbents or if the structure attempts to mould new incumbents to itself. Elements of both approaches were visible at School Two where an outsourcing vendor was used to support the Director of ICT as their ICT skills changed with new incumbents (S2P1, personal communication, April 1, 2008) and where, as already noted, the Director of ICT has no control over the copper cabling in walls due to historical management structures. (S2P3, personal communication, April 1, 2008)

It is suggested that schools need to be fully aware of all the actors in the management of their ICT and that this picture should be formally documented and updated as staff change. This would allow better understanding of process and the impacts of any change in the school, enable better communication between parties and greatly assist new incumbents in ‘getting up to speed’ in the environment,

6.1.4.3 Skill sets

Among the large number of actors in ICT management there will be disparate skill sets and ICT knowledge. Observation 14 posed the question of what level of ICT knowledge is required to embed ICT into the school psyche and provide for strong alignment? Perhaps a better question is what level of ICT knowledge is needed to support these different actors and how do schools ensure that it is available?
This comes back to the key ICT management role again, which in both schools reviewed was the Director of ICT. The various actors need to be aware that their decisions may impact on ICT in the school and they need to have confidence that they can approach the Director of ICT and be heard. Conversely, the Director of ICT needs to be able to approach the appropriate actor(s) as they see possibilities and problems. It was noted by the Network Manager of School One, after a protracted pause to consider, that

“I think at school the ICT management is not fully aware of what can be done. So er, its still, um, how we can say; we learning what we could have out of it. I have a feeling like management, school management, ICT management in the school, is less, how we can say, orientated to get as much as possible from ITC\textsuperscript{5} of IT equipment than students are already”

(S1P4, personal communication, October 26, 2007)

The Network manager was suggesting that the management of the school was not aware of how ICT could be deployed and utilised to the benefit of the school and that more could be achieved with the ICT in place.

Discussion on alignment in section 2.1.2 looked at the role of the CEO and CIO in providing ICT solutions for the enterprise. This suggests that a specific function of the Director of ICT is to communicate upwards what can be achieved through deployment of ICT whilst the Principal and SMT need to communicate to the Director of ICT what is required of ICT. Knowledge of ICT and knowledge of how the school functions and desires to function is vital and must be readily communicated by all parties. The Director of ICT must also be aware of current best practice in other schools. It is suggested that if the MOE goes ahead with the suggestion to create and fund an ICT Leadership role (MOE, 2007b, p. 24) then specific forums and professional development must be established to allow the up skilling of, and information sharing between these leaders.

\textsuperscript{5} This is a direct quotation from the incumbent. It is assumed they meant ICT
6.1.4.4 Outsourcing

The Principal of School One mentioned times earlier in the school’s history where ICT support was provided by teachers who were self-taught and that it caused significant issues. (S1P1, personal communication, November 30, 2007) This research is concerned with large New Zealand secondary schools which have complex ICT infrastructure. This may not be the case for smaller schools as ”Most schools’ technical support is provided by a teacher with no additional time allocated for the task”(BECTA, 2007b, p. 2) The Principal of School Two was concerned about knowledge leaving the school as ICT management staff moved on and had located an outsourcing vendor to obtain some continuity. (S2P1, personal communication, April 1, 2008)

As noted in Observation 20, outsourcing was not a big feature of this research however it is an area that would bear some significant study as to its benefits and pitfalls for New Zealand schools. (After the Network manager left School One the school moved to an outsourcing arrangement). BECTA (2006, p. 5) note that

“no single method of providing technical support (e.g. through in-house assistance or external provision) was clearly more cost-effective than others in every situation.”

How this will be impacted by MOE funding would bear scrutiny. ICT Leaders (Managers) need to know how to operate in an outsourced environment, how to get the best from it and how to negotiate contracts with the vendor(s).

6.1.5 ICT professional development for teachers

Both BECTA (2007b) and the MOE (2007b) comment on the need for professional development for teachers to support their use of ICT, with BECTA suggesting that ICT Technicians in schools receive professional development that includes basic pedagogical skills. Teachers in School Two were concerned that teachers may receive professional development and then leave the school. (S2P4A, personal communication, April 1, 2008; S2P4B,
personal communication, April 1, 2008) This is would also the case with ICT technicians and managers. Whilst this view can be understood perhaps it is better to stand back and look from a profession perspective rather than from that of a school. Perhaps the view could be that professional development is for the profession rather than the school. This would put more onus on the MOE to provide professional development which is already seen in their ICT PD Cluster initiative. (MOE, 2007b) (Observations 14 and 17)

6.2 ICT strategic planning

Neither school in this research had a formal ICT plan although School Two had an end goal in mind, the improvement of its infrastructure (S2P, personal communication, April 1, 2008) and the ICT Director of School One did state that they were working to a plan that was not published. (S1P3, personal communication, January 29, 2009). The MOE (2007b, p. 21) note that:

“The Education Review Office has noted that among the conditions that make ICT effective is careful and systematic planning that identifies the educational needs of students and ensures that the ICT purchased is appropriate to their needs. Strategic planning is necessary to support the successful integration of ICT in schools as it identifies the connection between technical initiatives and the educational goals of the school and the government. The plan provides a ‘road map’ that links the development of ICT with the demand for ICT across the curriculum taking into account the needs of teachers (e.g. professional development) as well as the needs of students.”

It is clear that the MOE see ICT strategic planning as a key enabler to the effective use of ICT in schools. However, they also issue a caution stating that:

“school leadership has an important role in ensuring that a clear educational rationale exists for ICT initiatives and interventions, otherwise there is a danger that it will become technically driven rather than educationally driven.”

(MOE, 2007b, p. 21)

Thus it is clear that ICT strategic planning in schools is vital and that all participants in managing ICT in the school must be involved in the process, marrying ICT plans to the goals and vision of the school, and to the needs of the students. Again, the need for a student voice in planning is apparent.
6.2.1 The impact of ICT funding on strategic planning

Observations 12 and 13 noted the impact of funding on ICT in schools; specifically that even a fully justified need for ICT may not result in the funding required to implement it. The MOE state that:

“It is recommended that the strategic plan is linked to the schools financial management plan and underpinned by a technical plan.”

(MOE, 2007b)

This document explores in detail ICT funding for schools and has a number of suggestions about how ICT funding can be dispersed for better alignment of the ICT with its users. The outcomes of this review are still not clear but presumably it has had some impact on the Government’s Budget announcements in 2008 (Herald, 2008). However, ICT management in schools is still the art of deploying a scarce resource for best effect.

Both schools exhibited signs of strategic planning by budget; the dollars available for ICT were in fact the limiting factor for all developments. As has already been noted, the MOE are reviewing the funding of ICT through the schools’ operations grants. (MOE, 2007b). Yet the same research noted that:

“Strategic planning can improve the integration of ICT with teaching and learning and encourage a more sustainable approach to the management of ICT”

(MOE, 2007b, p. 15)

This the fifth principle of the six principles published in the document.

School ICT is about a scarce resource that is run on essentially a shoe string. It was noted by CoSN that schools tend to make more extensive use of older computers, beyond warranty, than cooperate organisations tend to do. (CoSN cited in Moskowitz, 2001)

Put bluntly, schools need to plan more strategically to obtain the best use (alignment) of the limited ICT resources they have.
6.2.2 ICT vision

Given differing ICT skills and knowledge, and also differing knowledge of teaching and learning amongst staff involved in ICT management, it is important that all players be kept focused on how ICT is to benefit the school. This is where the school’s vision for ICT is a tool to support and promote alignment with the school’s vision and to inform strategic ICT planning.

School One had no clearly articulated vision and when asked what the school’s vision for ICT was the Network manager commented that:

“I don’t know because the vision in the school I worked is not particularly clear. They expected me to create it virtually”

(S1P4, personal communication, October 26, 2007)

This appeared to lead to significant gaps in expectations between the Network Manager and the school which were expressed as frustration by the Network Manager.

The MOE (2007b, p. 22) notes that

“The Education Review Office has noted that among the conditions that make ICT effective is careful and systematic planning that identifies the educational needs of students and ensures that the ICT purchased is appropriate to their needs.”

Further, BECTA (2007b, p. 2) note that

“ICT technicians would benefit from a funded training programme specific to their role. This could include basic pedagogical skills.”

Hence the issue is twofold. On the one hand, those tasked with managing ICT in the school must understand the aims of the school and how ICT is used to support pedagogy and learning. On the other hand, the school must also clearly articulate the required outcomes from ICT and ensure that these are clearly communicated. (Observation 8). With no clear vision for ICT it is difficult to assess the ICT’s alignment to the school which, given that ICT is a cost, is vital to ensure the school understands why it needs to commit the sums of money required for ICT.
6.2.3 Infrastructure

In observation 21 it was noted that it was difficult for teachers to change their teaching space to gain access to ICT. However, both schools exhibited issues of a lack of ICT teaching resources (network outlets, computers, data projectors, speakers) and the problems this caused teachers. The MOE (2007b, p. 2) note the need for sound infrastructure to support teaching and learning

“The network infrastructure is the key to a school’s ability to deliver a highly effective ICT resource and is essential for the development of effective ICT systems across the sector”

The deployment of network access in large schools is a key issue due to their size and complexity. The placement of scarce teaching (ICT) resources for maximum benefit is also crucial. ICT Management in schools must be cognizant of these issues and endeavour to provide the ‘maximum bang for the limited buck available.’

“Since ICT can be very costly, with substantial ongoing implications, schools need to make well informed judgements about its expected impact and cost effectiveness when viewed against other possible interventions”

(MOE, 2007b, p. 15)

6.2.4 Users and computers

Schools have a large number of ICT users and with large secondary schools there can be well over 1,300 users. (In the case of School One it is just under 2,000 and School Two around 1,650. (extrapolated from S1P1, personal communication, November 30, 2007; S2P1, personal communication, April 1, 2008) However, the great majority of these users are young adults and thus considerable resources must be spent to secure the school’s systems from internal attack. Further, the main body of users, the students, is on a rolling cycle such that a large number enter and exit each year, with a complete change in the user base in essentially five years. ICT Managers in schools must be aware of the complexity of their body of users and must be constantly monitoring the alignment of their ICT to them.
New Zealand has a near 1 to 4 ratio of computers to students, although this figure includes computers deployed solely for administration use. (MOE, 2007b, p. 6) However, the range of applications that students may need or wish to use is large, from multimedia to word processing, presentations to databases, Geographic Information System (GIS), image editing, mind mapping software and browsers to name a few that springs to mind. This does not include the plethora of specialist software that is used in schools. Thus, any given computer will have a number of different users and tasks in any given day, and must be able to cope with all demands. Network infrastructures must be able to cope with large groups of users logging off and then logging on in a very short time span as class periods end and a new one begins, which is intensive on network traffic and server resources.

Large School networks are complex, the demands are unusual and broad, and there are a lot of different users in a day. ICT mangers of these schools must be aware of the complexity of their systems and users and must be able to provide robust infrastructure supports them.

6.3 Alignment of ICT

Just how do schools decide if they are getting appropriate value for their expenditure on ICT? What defines ICT alignment for a school and for its users?

6.3.1 Justification of ICT expenditure

In a business organisation the deployment of ICT would be expected to have a tangible return. This could be direct income, a competitive advantage, reduced costs or greater efficiency. Justification of such deployment is in terms of Return on Investment (ROI) which simply put is ‘how much money will be gained by deploying this ICT?’ Schools do not have a Return on Investment from their ICT. There can be no financial justification for ICT in schools as schools essentially do not generate income; their income streams are the MOE, school fees and some Foreign Fee Paying (FFP) students. ICT is
more or less irrelevant to these income streams making financially justified strategic planning for ICT impossible. At the time of writing the New Zealand Government, through the MOE, is putting in place additional funding for ICT in school to upgrade network infrastructure, a strategic priority, but the nature of this funding has not yet been communicated. (Herald, 2008)

Thus, ICT needs to be justified in terms of core business, or alignment, for a school. Core business for schools is student learning and closely associated with this is teaching, hence the phrase teaching and learning. (Maddux et al., 2001) However, Loveless points out evidence that suggests ICT in classrooms has not created associated improvements in student learning. Yet Loveless (2003) also states that teachers must use the best resources and provide the best experiences and environments to support their students learning. Thus, justification of ICT in terms of greater student learning is on shaky ground at best. Justification of ICT through better teaching, which may lead to better learning, seems to be the best approach.

Justification of ICT for administration seems appropriate given the MOE’s mandating and accrediting of SMS systems. (MOE, 2006a, 2007b, 2008c, 2008e) Certainly there is strong alignment between ICT deployment and school administration. The question is raised however, at what cost? Large secondary schools will already have paper based systems to cope with students and attendance. Deployment of electronic systems is expensive with large scale wireless networks and terminal servers, or fixed copper networks to all teaching spaces. The costs to design, implement and maintain these systems are high and they replace low cost systems. There may be improvements in efficiency of these processes but can they be quantified to a point that validates the change?

However, the MOE strongly encourages the use of ICT in teaching and learning to bring about improved outcomes for learners and states that
ensuring all students have the opportunity to become “confident and capable users of ICT” is a key to the educational outcomes sought by the government. (MOE, 2007b, p. 1) Thus a key justification for ICT in schools is the school’s alignment with MOE mandates.

Hence, ICT for schools is a cost, and a large one with $150m of school operational funding being spent on ICT in the year 2004/2005. (MOE, 2007b, p. 7) It does not bring any ROI in financial terms nor does it necessarily bring any improvement in core outcomes, but may provide an improvement in administration efficiency. However, the MOE actively promotes the use of ICT for student learning, teachers want ICT as a tool so that they can teach better and the parent community expects their students to use ICT. The best justification for ICT in school is MOE requirements, teacher and community expectations and alignment with the school’s vision.

The final word here goes to the MOE who state that:

“Since ICT can be very costly, with substantial ongoing implications, schools need to make well informed judgements about its expected impact and cost effectiveness when viewed against other possible interventions.”

(MOE, 2007b, p. 15)

6.3.2 Users

All staff managing ICT in the school must understand the environment they are in and how ICT is used by all of the various users of that system.

(Observation 9)

Alignment of ICT is about the institution deploying ICT in such a fashion that it supports the vision and goals of the institution, and that it enables those within the institution to perform the tasks they need to perform to achieve these goals. Within schools there are two major uses of ICT:

1. ICT For school Administration
2. ICT for Teaching and Learning
Much of the literature such as BECTA and the MOE uses the phrase teaching and learning.

However, as noted in Observation 16, the phrase ‘Teaching and Learning’ can obscure how ICT is used in the school, especially from a standpoint of the users. Thus, it is suggested that ICT use in school be split as follow:

1. ICT For school Administration
   School administration staff, senior management, teachers

2. ICT for Teaching
   Senior management, teachers

3. ICT for Learning
   Students

6.3.3 ICT for administration –non-teaching staff and teachers

The core applications used for school administration are the SMS programs that have been accredited and now required to be used by the MOE. (MOE, 2006a, 2007a, 2007c, 2008c) Both schools were long time users of SMS systems although they used different accredited systems, which are off the shelf packages. In a commercial environment it could be tempting to develop a customised solution that fully met the needs of the organisation and gave increased efficiency and/or a competitive advantage. Schools however, do not follow this path as they lack the funding and other resources for major custom development of software. Should they do so, no tangible dollar advantage would be gained unless they were then able to on sell the software. It was noted in passing by one teacher that the school had developed software which was on sold to another school but that the process was fraught and did not provide real returns. (S2P4A, personal communication, April 1, 2008) As the staff member who developed the system has since moved on it begs the question of how the school that purchased the system is getting on without any support. Simply put, schools do not undertake large software developments.
However, there are increasing demands on schools to use ICT for more administration tasks. The MOE noted that:

“The ministry is increasingly using ICT to improve business processes and the flow of information between schools and the centre. For example, in secondary schools the processes associated with NCEA are all managed online. Other examples include the online Student Management System (SMS), the School Student Enrolment Register (ENROL) and the online Payroll Project for Schools that is currently being developed. The advisory group noted that the costs associated with these initiatives are placing pressure on school’s operational funding.”

(MOE, 2007b, p. 9)

The pressure on a school’s operational funding will be in the form of connectivity (internet), infrastructure (network, computer, data storage) staff and professional development.

Schools are also facing increased secure data storage requirements yet as already noted, the majority of their users are students from whom they must protect their own systems. Given that BECTA research found that most school’s ICT support came from teachers who did not have any time allocation to do so (BECTA, 2007b, p. 2) it raises serious questions about the ongoing security of school data in terms of backup cycles and unauthorised access. Discussion of ongoing data security for school was not explicit in the MOE document however it was suggested that the MOE could provide some outsourced services including “broad band based remotely located Storage Area Networks (SANs)” (MOE, 2007b, p. 22) Again, given that this research is focused on large secondary schools it is more likely that they will have onsite staff and storage systems already. However, this does again suggest that the staff must have a good grounding in data and systems security. MOE suggestions for professional development for this must also cover this area. (MOE, 2007b, p. 24)

6.3.4 ICT for teaching - teachers

As explored in Observation 16, it is suggested that ICT for teaching implies a distinct subset of all system users. In both schools one and two the number of
staff users, including non-teaching staff, was less than 10% of the total system
users. Yet the needs of this group are extremely diverse, ranging from
administration systems (placing the teachers back in the administration users
category) to portable computing, large display devices, specialist software;
especially whatever is required to present and teach their subject material. It
should be borne in mind that the subjects taught in secondary schools are
diverse, from foreign languages to automotive technology, maths and
science to food and textile technologies, physical education, music and IT
itself, just to name some of the teaching areas. This is the complexity, what
are its implications for ICT management?

6.3.4.1 How teachers use ICT and its implication for ICT
management

Observations 7, 10 and in part Observation 17, note that teachers are
presented with ICT then asked to find ways of using it in their teaching. The E-
Learning Action Plan, 2006 to 2010, notes that

“e-Learning can provide accessible, relevant, and high quality learning opportunities so that
every student is better able to achieve their full potential.”

(MOE, 2006b, p. 6)

However, due to the range of teaching subjects and teaching technologies,
teachers are left to find out their own way of using ICT in a classroom setting.
Again quoting a teacher at School One, “I find that I find ways where I think, oh I need
to do that, and I can.” (S1P5C, personal communication, May 30, 2008). Whereas
at the same school another teacher commented that they were unable to
access the technology they wanted and that it was limiting their teaching.
(S1P5A, personal communication, May 29, 2008) Teachers at School Two also
lamented the lack of appropriate infrastructure, in particular data projectors
and network connectivity. (S2P4A, personal communication, April 1, 2008;
S2P4B, personal communication, April 1, 2008; S2P4C, personal
communication, April 1, 2008) The school was aware of both these concerns
and was working to try and resolve them. (S2P1, personal communication,
BECTA research has noted that a solid and reliable infrastructure, ICT resources and quality technical support are all required to support enhanced teaching and learning. (BECTA, 2003a, 2003b, 2007b) Thus it is the responsibility of ICT management to:

1. provide a solid infrastructure. (Network, servers, devices)
2. provide an appropriate range of teaching tools
3. support the teachers in the their development and use of these tools

Thus, the ICT Management of the school must have ICT knowledge and the ability to apply it to a complex scenario. The MOE note that “large schools may suffer from diseconomies of scale due to the complexity of networking required” (MOE, 2007b) and it is the complexity of the network infrastructure that is the issue for schools. This level of complexity requires a good ICT Management. Without good management it is likely the infrastructure will not support the teachers in their teaching and this also includes a knowledge of how the ICT is applied from a pedagogical standpoint so that teachers can be adequately supported in developing their use of these products. (MOE, 2007b)

Also noted in Observation 6 was the teachers’ use of ICT outside of the school for school purposes. Teachers at School one noted a lack of access to data off campus and its limitation on how they work. (S1P5B, personal communication, May 30, 2008; S1P5C, personal communication, May 30, 2008) The MOE(2007b) found that 70% of schools provide remote access for staff with some giving remote access to students and or parents. Such access adds another level of complexity to schools and the management of their ICT yet it appears to be a significant factor in alignment of ICT with the needs of the teachers.
6.3.4.2 The teacher’s voice

Both schools in this research utilise an ICT Committee to give teachers a voice for their requirements. School Two also noted that this was also to ensure that the Director of ICT had a level of school oversight as well. (S2P1, personal communication, April 1, 2008) The ICT Committee can allow for a strong teacher voice in the deployment and use of ICT but as noted by School Two, this does depend on the composition of the committee and the brief it is presented with. (S2P1, personal communication, April 1, 2008; S2P3, personal communication, April 1, 2008)

Both schools selected members of the ICT Committee on an annual basis however School One’s focus for the group was deployment through budget processes (S1P1, personal communication, November 30, 2007) whereas School Two were at pains to ensure that the members were focused on teaching and learning with the staff looking to this group to provide power users to assist in departments. (S2P1, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008)

Just how effective ICT Committees are and what is an appropriate composition, size and duration of appointment would certainly be worthy of further study. This research could also suggest specific foci for these groups that would contribute to ICT management in the school.

6.3.5 ICT for learning – students

For both of the schools represented in this research over 90% of their users were students of the school aged between 13 and 18 years. As noted in observation 16, the ICT required for this group of users, i.e. for learning, is distinctly different to the ICT required for teaching although obviously there are distinct overlaps such as computer laboratories, interactive whiteboards and Learning Management Systems (LMS). The question posed by this
research is how do schools ensure that their ICT is aligned with the needs of this group?

Observation 17 noted that teachers do call upon this group of users to use ICT outside of the school environment. A teacher at School One noted how they communicate with students via online discussion boards (S1P5C, personal communication, May 30, 2008) whilst at School two a teacher interviewed discussed educating parents regarding their children’s out of hours requirements for, and use of ICT. (S2P4A, personal communication, April 1, 2008) Thus a key characteristic of this group is a requirement to use ICT outside of the school environment. However, as also noted in Observation 17, this also leads to the need for students to pass information to and from the school environment however, given the age of these users, they may not be aware or concerned of risks associated with data transfer via e-mail, USB drive, CD-ROM or other media. Hence ICT Management in schools must provide secure methodologies for data transfer of data, as well as compatibility with various software that students may have access to at home. (Open Office, Office for Mac, Office 2007, MS Works and so forth)

6.3.5.1 The student’s voice

Further to the alignment of ICT to the needs of student users is the question of the student’s voice in planning and deploying ICT. It should also be noted that the student’s care giver’s voice should also be considered along with that of the student. Neither school had a mechanism for students to give input to the deployment and use of ICT. School Two did mention an ad-hoc survey conducted of one class regarding their access to ICT. (S2P3, personal communication, April 1, 2008; S2P4A, personal communication, April 1, 2008) However the MOE (2007b, p. 12) noted that it sought to gain “more informed decision making with the education sector by learners, teachers, parents communities, public businesses, researchers policy makers and administrators” Clearly school ICT Managers need to consider more carefully how they gain more input from the learners and parents.
Questions that would be appropriate to gain input from learners and parents would be in the deployment of ICT equipment, for instance such as ICT based homework centres, ‘drop in’ laboratories, lease or loan computers, laptops for students and remote access. Further consultation could also be gained on the software used in the school and its compatibility with home software, as well as methodologies for transferring data to the school. One teacher in School Two suggested ‘educating parents’ on their expectations of the student’s use of ICT out of school. (S2P4A, personal communication, April 1, 2008)

One possibility for gaining this voice would be to have student and parent representatives on the ICT Committee however the mechanics of this would need careful consideration.
Appendix A: Interview Questions

Principal

Aim
To elicit how the Principal sees ICT being managed in the school and how closely ICT is aligned to the school’s vision, the school’s vision for ICT and needs of the staff and students.

Questions
1. Demographic questions
   a. What decile level is your school?
   b. How many students do you have?
   c. How many teaching staff do you have? Non teaching?
   d. Who is involved in managing ICT in your school?
   e. How would you rate your knowledge of ICT? (1 to 5 ranking)
   f. How would you rate your knowledge of integrating ICT to curriculum? (1 to 5 ranking)
2. What is the vision for ICT for your school?
3. How do you see ICT Mgt working in the school?
4. What reporting lines are in place?
5. Where are key ICT decisions made within this structure?
6. Has your ICT management structure changed with changing personnel?
   How?
7. Have you met any issues in attracting and retaining ICT staff?
8. How effective do you think ICT has been in the following areas of the school?
   Mgt of the school, SMS, student learning, student access?
9. What do you see as your input to ICT Management?
10. How do your current practices align with your vision in the school?
11. How do you see new ICT developments impacting on the school?
12. How do you plan for future ICT requirements?
## Analysis

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<td>Future planning, SISP</td>
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Senior Management Team (SMT) Member in charge of ICT

There may not be an SMT member associated with ICT in the school. This would need to be ascertained ‘upfront’, hence interviewing the Principal first.

Aim

Personal experience has shown the need for appropriate levels of decision making in a school. These questions are similar to those presented to the Principal with a view of exploring any differences of view or reinforcing the Principal’s view.

Questions

1. Demographic questions
   a. What is your job title?
   b. What is your role in the school?
   c. How long have you been in this role? In the school?
   d. To whom do you report?
   e. What direct reports do you have?
   f. How would you rate your knowledge of ICT? (1 to 5 ranking)
   g. How would you rate your knowledge of integrating ICT to curriculum? (1 to 5 ranking)

2. What is the vision for ICT in the school?

3. How do you see ICT Mgt working in the school?

4. What reporting lines are in place?

5. What ICT decisions would you make? Which would you delegate? Which would you refer to the Principal or BOT?

6. Has your ICT management structure changed with changing personnel? How?

7. Have you met any issues in attracting and retaining ICT staff?

8. How effective do you think ICT has been in the following areas of the school?
   Mgt of the school, SMS, student learning, student access?
9. What do you see as your input to ICT Management?
10. How do your current practices align with the vision for ICT in the school?
11. How do you see new ICT developments impacting on the school?
12. How do you plan for future ICT requirements?

**Analysis**

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Director of ICT / IT Manager / Network Manager

There may be a distinction between Director Of and IT Manager in the school. The SMT member may in fact be the Director of IT or it may be a separate position. This role may have significant curriculum influence or none. The incumbent may be an education specialist, an IT specialist or both. There may be several people involve in these roles.

Aim

Personal experience has shown the need for appropriate levels of decision making in a school. These questions are similar to those presented to the Principal and SMT member with a view of exploring any differences of view or reinforcing their views.

Questions

1. Demographic questions
   a. What is your job title?
   b. What is your role in the school?
   c. How long have you been in this role? In the school?
   d. To whom do you report?
   e. What direct reports do you have?
   f. How would you rate your knowledge of ICT? (1 to 5 ranking)
   g. How would you rate your knowledge of integrating ICT to curriculum? (1 to 5 ranking)
   h. Approximately how many desktops, laptops, servers are in the school?

2. What is the vision for ICT in the school?

3. How do you see ICT Mgt working in the school?

4. What are the reporting lines for ICT?

5. What ICT decisions would you make? Which would you delegate? Which would you refer higher?

6. (If direct reports) Have you met any issues in attracting and retaining ICT staff?
7. How effective do you think ICT has been in the following areas of the school?
   Mgt of the school, SMS, student learning, student access?
8. What do you see as your input to ICT Management?
9. How do your current practices align with the vision for ICT in the school?
10. How do you see new ICT developments impacting on the school?
11. How do you plan for future ICT requirements?

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<td>7 Future planning, SISP</td>
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Staff Member

Interviews with two or three staff members. These would be very brief and could be conducted as a group to save time. These staff members should be chosen as randomly as possible.

Aim

To elicit how the users see ICT as working within the school and to review the dissemination of vision and structure.

Questions

1. Demographic questions
   a. Are you a member of the teaching or non teaching staff?
   b. What proportion of your day is spent working with ICT?
   c. How long have you been in this role? In the school?
   d. How would you rate your knowledge of ICT? (1 to 5 ranking)
   e. How would you rate your knowledge of integrating ICT to curriculum? (1 to 5 ranking)

2. What is the vision for ICT in the school?

3. How do you see ICT Mgt working in the school?

4. What are the reporting lines for ICT?

5. How effective do you think ICT has been in the following areas of the school?
   Mgt of the school, SMS , student learning, student access?

6. How do you see new ICT developments impacting on the school?

7. How do you plan / request future ICT requirements?
## Analysis

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BOT Member

Some schools will have a BOT member with a keen interest in ICT whilst others will not. This interview will be either with this key person or if there is not one, a representative of the BOT.

Aim

To elicit how the BOT see ICT management in the school and how they see its alignment with the school’s vision.

Questions

1. Demographic questions
   a. Is there anyone on the BOT specifically involved in ICT in the school?
   b. How would you rate your knowledge of ICT? (1 to 5 ranking)
   c. How would you rate your knowledge of integrating ICT to curriculum? (1 to 5 ranking)
2. What is the BOT’s vision for ICT for your school?
3. How do you see ICT Mgt working in the school?
4. Where are key ICT decisions made within this structure?
5. Has your ICT management structure changed with changing personnel? How?
6. Have you met any issues in attracting and retaining ICT staff?
7. How effective do you think ICT has been in the following areas of the school?
   Mgt of the school, SMS, student learning, student access?
8. What do you see as your input to ICT Management?
9. How do your current practices align with your vision in the school?
10. How do you see new ICT developments impacting on the school?
11. How do you plan for future ICT requirements?
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## Review of Questions

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This review shows that all areas are adequately covered by the questions.
References


