

# **I.C.T. DECISION-MAKING PROCESSES IN SELF-MANAGING SECONDARY SCHOOLS.**

*Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them. ( Laurence Peter).*

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## ABSTRACT

This study examines decision-making processes involved in the development, integration and management of Information and Communication Technology (ICT) in self-managing secondary schools and influences that affect these processes.

To obtain an holistic view of ICT decision-making processes, a case study is undertaken of three co-educational, state secondary schools within a regional New Zealand city, thereby establishing a multiple case study. The principal, network manager and three staff nominated by the principal as playing an active role in ICT decision-making processes were interviewed using an open-ended interview.

Five frequently cited generic decision-making models, developed by theorists to describe specific features of the decision-making process, are examined to provide a theoretical platform against which the interview data are analysed and interpreted.

The study concludes that ICT decision-making in the case study schools is influenced particularly by technical knowledge and understandings. Such decision-making tends to be ad-hoc, isolated from other important influences particularly in relation to teaching and learning issues, and “bounded” because of limited information, the limitations of existing technology, and the inability of schools to keep abreast of technological changes. Six implications are therefore put forward to inform future ICT decision-making in schools. They are:

1. Schools should develop a strategic plan that is underpinned with technical planning requirements;
2. Technical advice and professional development should be provided for principals;
3. Principals should consult outside the school environment for technical advice to assist with decisions;
4. The role of the ICT committee should be redefined to include planning and development of ICT;
5. Principals should ensure that staff receive professional development; and

6. Schools should consider student access and the best way of integrating ICT into teaching and learning.

The study highlights the need for schools to develop strategic plans that address teaching and learning issues in the development, integration and management of ICT in self-managing secondary schools. Technical decisions should be made in support of these.

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## CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

### 1.1 External Pressures on ICT Decision-making

This study examines decision-making processes involved in the development, integration and management of Information and Communication Technology (ICT)<sup>1</sup> in self-managing secondary schools.

The introduction of computer technology into schools occurred during a turbulent time of change to management structures within secondary schools creating additional pressures for school leaders. In 1989, following the Picot Report,<sup>2</sup> New Zealand followed many of its overseas counterparts when the Ministry of Education devolved, with the exception of curriculum and assessment, all responsibilities to schools. The management of decisions within the school became the responsibility of the school principal, with the ultimate responsibility for all governance decisions resting with the school's Board of Trustees. While the underlying philosophy behind devolution was the belief that schools would perform better if the individuals affected by change had a greater say in the decision-making process (Williams, Harold, Robertson & Southwood, 1997), devolution has had the effect of shifting school principals into areas where they lack expertise and knowledge (Sharpe, 1996). This is evident in decisions relating to ICT development that require new skills and competencies. Since the development of computer policies in the early 1980's, Schiller (1997:136) notes that school leaders have been faced with 'complex decisions'.

Technological change and, in particular, the development of the Internet provides opportunities for schools to communicate more readily with the 'outside world'. Now, in order to stay abreast of changing technologies, schools must shift from their relatively insular state to pursue communication with the 'outside world'. Constant

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<sup>1</sup> The term ICT is taken to include computers and related devices such as Internet and intranet access and CD-ROMS (Computer Disc Read Only Memory). Because of their everyday meanings, the terms ICT and computer technology will be used interchangeably in the study.

<sup>2</sup> In 1988 a task force chaired by Brian Picot was established by the Government to review educational administration.

technological changes continue to put both financial and pedagogical stress on schools.

There is a clear expectation from the community, political leaders and indeed the New Zealand Ministry of Education, that schools will incorporate computer technology into the learning environment so students are equipped to meet the challenges of the global knowledge economy. In fact, the Novell Corporation signalled in their 1994 white paper that the constantly changing technological world would drive educational institutions to adopt and use computers and telecommunications. It was also noted in the white paper:

that this shift will have major implications for and will be strongly affected by parents (in the case of school children), educators, administrators, industry, publishers, media and government (Novell Corporation, 1994:5).

The pressure, 'perhaps unprecedented', for schools is the need to change in response to changes occurring in society (Riffel and Levin, 1997:51).

Potentially a number of factors impact on decision-making as it relates to ICT practices. According to Riffel and Levin, (1997:51) 'technological change in schools and school systems involves many complex, diverse and uncertain organizational processes' and presents a range of difficult management issues for administrators. One of the main differences between computer innovations and other innovations occurring in schools is that decisions require a level of skill and knowledge; they are costly and have a relatively short life span - sometimes less than two years (Trotter, 1997).

The following section examines issues associated with the ICT decision-making processes in self-managing secondary schools. Part of this discussion examines the direction and assistance given to schools from the Ministry of Education, initially through draft documents and more recently through financing Microsoft software and a laptop-leasing scheme<sup>3</sup> for teachers. Because of the choice of Microsoft software by the

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<sup>3</sup> The laptops were pre-configured with the latest version of Microsoft Window ® XP.

Ministry of Education, the effect of Microsoft software policies<sup>4</sup> is also discussed, since this is a critical consideration for computer development and reflects fast moving changes occurring outside education that schools need to consider. The final part of the chapter explains the specific purpose of this study and outlines the content of the following chapters

### **ICT Decision-making Within Secondary Schools**

Mooij and Smeets (2001) proposed five successive phases of ICT implementation within schools that represented different levels of ICT learning processes. These were:

1. the incidental and isolated use of ICT by one or more teachers;
2. increasing school awareness of ICT relevance for the school at all levels;
3. emphasis on ICT coordination and hardware within the school;
4. emphasis on didactic innovation and ICT support; and
5. use of ICT integrated teaching and learning that is independent of time and place.

According to Ward (2003) ICT decisions relating to the development, integration and management in schools can be divided into four separate categories; installation (the provision of a suitable infrastructure and staff training); administrative, (use of computers for routine tasks such as reporting and communication); integration into the curriculum, (use of computers for curriculum delivery by teachers) and innovation, (a change in teaching and learning).

The following discussion is informed, in part, by the suggested conceptual framework proposed by Mooij and Smeets (2001) and Ward (2003).

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<sup>4</sup> Microsoft publishes a timeline for support of their software products. In general terms they will support only the previous two versions of any software.

### **1.1.1 Infrastructure**

The advances that have been made in installation of infrastructures in New Zealand have been well documented. The Information Technology Advisory Group (ITAG) 2000 report showed that there was a ratio of 1:7 computers to students in secondary schools and only 33% of secondary schools had no networking between classrooms, while 26% had more than 80% of their classrooms networked, (Sullivan and Anso, 2000). The Educational Review Office (ERO) report in 2001, noted that 98% of all schools were connected to the Internet. Although it would appear from the literature that schools have established an infrastructure, technical aspects do not remain static and require constant decision-making to keep pace with technological advances.

Schools must ensure that technical decisions will allow students access to computers, at school and access to the school system from home; the development of an intranet within the school to deliver administrative and teaching and learning resources and contact with the world outside the school through the use of the Internet and email. Information should be accessible twenty-four hours a day, either from school or home – referred to by the Ministry of Education (2002:1) as ‘anytime, anywhere’ delivery. Providing. ‘The use of computers and the WWW is considered essential for the further progress of education,’ (Kinelev et al, 2004). The Ministry of Education has provided additional funding to schools to assist in establishing technical infrastructures. In 2002, the Ministry signed a contract with Microsoft to provide software to schools, saving schools a huge amount of money. Technically these features are now options for schools but they require school leaders to be aware of the possibilities and to take these into consideration when making decisions. More recently the Ministry has provided a leasing arrangement for laptops to permanent full-time teachers. These have been set in place to try to assist schools to provide an up-to-date and reliable infrastructure to support teaching and learning.

The cost to schools for computer technology implementation and maintenance and the constant need to be able to upgrade to new technologies, requires a regular source of revenue. In the study carried out by Riffel and Levin (1997:55), they found that school costs had increased significantly because, ‘computer technology has been an

additional expense, not a substitute for other expenditure such as salaries, instructional materials or library books'. Dede, (1997:14) notes that 'high-performance computing and communications systems require high-tech skills to remain operational and moreover they will become obsolete in five years.' However, Riffel and Levin (1997) warn that although there was a 'fear of obsolescence' and that keeping up to date was both expensive and frustrating, obsolescence did not apply just to hardware and software but to what was being done with the technology. They stressed that the leader should have clear goals for computer usage established, since many so-called obsolete computers may well be more than adequate for certain basic functions. Adding to the complexity of the decision-making process, therefore, is that many of the decisions made will have a degree of financial risk associated with them, more so than many of the other decisions made in a school. Trotter (1997:30) found that because of this 'some administrators have been hesitant to commit to technology because they have seen how hard it is to avoid costly mistakes'.

### **1.1.2 Integration of ICT into Teaching and Learning**

It is essential that technology becomes 'integrated into schools to improve teaching and learning experiences and streamline administration' (Hay, 2001:5). Russell and Russell (1997:130) consider that there is little point, 'pasting new technologies onto existing pedagogy, evaluation procedures, teachers' work practices, and community relationships'. Riffel and Levin (1997:60) suggest that schools should embrace the challenge that computer technology provides, since, 'computer technology opens up possibilities for rethinking how students learn in schools, not just changing how they are taught'. At the end of 2001 Mr Trevor Mallard, the New Zealand Minister for Education, introduced the Ministry of Education draft *Information and Communication Technologies (ICT) Strategy for Schools 2002-2004* (Ministry of Education, 2001:4), by saying that his vision for education was:

for all students, irrespective of their backgrounds, to develop the knowledge, understanding and skills and attitudes to participate fully in society, to achieve in a global economy, and to have a strong sense of identity and culture. ICT can help to make this vision a reality.

Findings from research in the area of integration into the curriculum have been disappointing (Becker and Ravitz, 2001; Lai, Pratt and Trewern, 2001). Shakeshaft (1999:4) comments that 'just because ICT is present does not mean students are using it'. The EMILE European Project (Simpson and Payne, 2002), found that within secondary schools, teachers predominantly saw the use of ICT as the domain of computer teachers. Integration of ICT into other teaching areas was not sort nor planned. However, in a case study of ICT adoption carried out at a Finnish lower secondary school in 2004, it was noted that almost all the teachers involved had acquired the necessary technical ICT skills, and the majority of teachers used ICT with their students, (Llomaki et.al, 2004). In two other case studies carried out in Sweden, findings indicated, that although the teachers' knowledge and ability regarding ICT had been improved, it was less obvious how ICT had been integrated into the core of the educational practices. The data showed that the technique and technicians, that is, the technical aspects of ICT, controlled the possible pedagogical outcomes. 'It should be the pedagogic staff that learn and say how they want it work and then ask the technicians if they can solve it' (Selander, 2003:9). Hay (2001:6) also suggests that one of the reasons for a lack of integration is the majority of ICT leadership in schools is fundamentally pushing a technical approach, rather than an information-based integrated approach. Riffel and Levin (1997:62) note that one of the problems preventing ICT integration is that technology has been seen as an answer rather than a reason to ask questions about the purposes of schools and the nature of teaching and learning.

Watson (2001) indicated, that in the UK, although national policies and investment have been made in ICT, technology is still an imposed and novel 'outsider' in the pedagogy of schools. A number of barriers to the integration of ICT have been reported from studies that have been carried out. Smerdon, Cronen, Lanahan, Anderson, Iannotti and Angeles (2000) noted that the two most significant barriers are access to computers and release time for teachers to learn how to use them. Morse, (1991) noted that a major factor inhibiting use of computers in the classroom was the insufficient amount of computer hardware and software that was linked to budgetary constraints. He went on to say that moving computers into classrooms for student use was time-consuming and therefore inhibited use, while moving students to a 'computer lab' meant that teachers had to compete for time to use them. Murray and

Campbell (2000), also identified a number of barriers. These included, lack of professional development leading to decreased teacher skill levels; workload and curriculum pressures; time and lack of equipment. The Education Review Office report of June 2000 also identified a lack of leadership from Boards of Trustees and principals as a barrier to successful use of ICT in schools; a lack of teachers' skill and confidence; lack of technical expertise and the inability to obtain servicing and support. Venezky and Davis (2002:40) noted that the OECD study had concluded that 'both infrastructure and teacher competencies are required for successful implementation of ICT into schools'. Carnoy (2004:9) observes that 'even if teachers are familiar with ICT, additional technical support is needed to make ICT a tool for curricular change and changes in the teaching and learning process'.

The role of ICT in teaching and learning should be viewed positively, since according to Atkin (1997:10) information technology should, 'relieve teachers of the burden of being the information source and redefine their role as 'learning technologists'. For many teachers the changes they will be required to make will be potentially threatening and will necessitate careful leadership and good systems. ICT professional development plays a vital role in enabling teachers to feel sufficiently confident about ICT so that they will then use it within their teaching programme. Simpson and Payne (2002) found in the survey of Scottish schools completed for the EMILE project, that the information teachers sought and valued tended to be of a technical or practical nature. However, Beynon, warns that purely skill-based courses do not serve teachers' best interests.

too many still start with the technology rather than the education and force educational concerns too readily into the computer format rather than identifying the education goals and ensuring the technology is appropriate (or adapted) to serve these (1993:228).

Research has shown that the best learning outcomes seem to result when the computer is used as a tool in combination with a learner-centred philosophy and collaborative and cooperative teaching strategies (Lai and McMillan, 1992).

Stratford (2000) makes it clear that successful integration relies on well-maintained, reliable technology that teachers can use effectively. He suggests that these features are more likely to be found within a school that is able to link staff development with

institutional development. Hay (2001:5) also lists as one of the reasons why ICT integration has had mixed success, 'schools have not articulated their own information vision on which to base ICT planning, management and integration'.

### **1.1.3 Leadership of ICT**

Research indicates that the principal holds the key to ICT implementation and integration into schools (Cooley and Reitz, 1997). Technology leadership, according to Hope, Kelly and Guyden (2000: 366), 'entails both understanding technologies and how they can be applied to accomplishing tasks'. The recently released draft *Information and Communication Technologies Strategy for Schools, 2002-2004* (2001), considers, as one of the key insights, the need for high quality leadership. This view is reinforced by Wilmore (2000:6) who notes that the leader or principal should act as a facilitator for technology planning, since integration and implementation of ICT into schools will only be successful if the principal actively 'supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change' (2000:6). Slowinski (2000:1) also acknowledges that effective leadership in the area of technology is needed from forward-thinking leaders.

Although there are many issues facing leaders that result from the self-management of schools, ICT presents additional problems. Decisions, according to Schiller (1997: 136):

regarding purchase of hardware and software, staff training, parental involvement, student and staff access to information technologies, and the increasingly important role of information technology (IT) in the teaching and learning process have all challenged school leaders.

It was noted in a paper produced in 2002 by the Ministry of Education entitled *Technology Standards for School Administrators* (Ministry of Education, 2002) that 'administrators play a pivotal role in determining how well technology is used in our schools'. Trotter (1997) also discussed the strong link between the administrator's ability to make informed technology decisions and his or her personal use of technology. Although speaking of changes required in higher education, Barone (2001:47) commented that the changes required 'cannot occur in a leadership

vacuum'. This point is reinforced by Sheingold and Hadley (1990) and Schiff and Solmon (1999) who found that for ICT to be used effectively within United States schools, there was a need for a well-designed technology plan driven by strong leadership. While it is important that leaders are familiar with the direction of the latest technologies, Trotter (1997) advises leaders to use outside specialists for technical opinions. Unfortunately according to Riffel and Levin (1997:62):

schools' understandings are shaped by relatively narrow sources of information. Much depends on what individuals happen to hear, see or read, and most of the attention is given to what other schools or school systems are doing.

Leaders who source their information in this way run the risk of isolating their schools from technological changes in the 'outside world'. Although Fullan (1991) recognised the school principal as a key change agent in the school, the idea of shared leadership at the school level has been suggested as a better model for the implementation of innovations, (Hopkins et.al. cited in Lai and Pratt, 2004). Exploring this idea, Lai and Pratt conducted a study in 2002 to evaluate the role of ICT coordinators in 21 secondary schools in one region of New Zealand. The study supported the view that a full-time ICT coordinator is essential if ICT is to be successfully integrated into the curriculum. However, most importantly, the work of the ICT coordinator has to be focused on providing curriculum support to teachers. Technical support should be supplied by a technician. The outcome of this study was reinforced by a similar study conducted by Lucock and Underwood (1981) who cautioned schools to ensure that the ICT coordinator did not end up doing everything related to ICT. Because the coordinator is primarily a teacher it should therefore, be his or her main responsibility to guide ICT teaching and learning in the school. This view was supported by Reilly (1999, cited in Lai and Pratt, 2004; 463), 'that the ICT coordinator should be the curriculum leader but not the electronic janitor'.

It is important for leaders to establish clear goals for ICT development, management and integration (Gebhart, 2003). In a 1997 Education Review Office Report it was noted that among the many conditions that make ICT more effective in schools is careful and systematic planning that has identified the educational needs of students, ensuring that the technology purchased is appropriate to meet those needs. The speed of technological change and the additional knowledge and skill level required to

understand what is happening makes this a difficult decision-making area for a school leader. However, to meet student needs, ICT development, management and integration, the literature indicates (Hay, 2001, Riffel and Levin, 1997; Ringle and Updegrave, 1998) the need for the school to incorporate planning into the school's overall strategic plan. It also necessitates an annual financial commitment. The leader must, therefore, remain part of the planning and decision-making processes and not delegate this responsibility totally to another member or group of staff. 'The pace of change is too great and the consequences of the decisions too significant to simply delegate to others' (Duderstadt, cited in Ward and Hawkins, 2003:39). This view is shared by Ward and Hawkins (2003) who stress the importance of ensuring that IT issues are not entrusted exclusively to IT professionals, either computer companies outside the organization or a delegated technical person on the staff. Although referring to colleges and universities, it was noted by Duderstadt (cited in Ward and Hawkins, 2003:39) noted that the strategic issues relating to digital technology decisions require both understanding and attention from leaders: He classifies technology issues as key strategic issues and put them into the same category as other strategic issues such as curriculum and finances. To avoid fragmented technical decisions being made unrelated to teaching and learning, a strategic plan is required. Ringle and Updegrave (1998) challenge conventional strategic planning which involves a task force or committee that gathers information:

conducts interminable discussions about what the institution needs, and ultimately drafts a huge document that meets with overwhelming approval from the three people that actually have the time to read it (1998:18).

As an alternative, they suggest that there are two distinct aspects of strategic planning related to technology. Instead of the traditional strategic plan that incorporates both technical and teaching and learning aspects, these should be separated into two processes, that of 'socio-economic' and 'pragmatic or technical' (Ringle and Updegrave, 1998:18). The objectives for both parts of the planning are quite different. While socio-economic goals, which are essentially strategic, need to be stable and comprehensive, technical or operational planning needs to be 'agile and responsive to rapid changes in technology and users' needs' (Ringle and Updegrave, 1998:19). Without a strategic planning process for technology it may be difficult to identify the connection between technology initiatives and 'the institutional goals they are

designed to support' (Ringle and Updegrave, 1998:20). Because of the pace of technology, it is difficult to produce technical plans that look ahead and determine which forms of hardware, software and support will be required to meet the future needs and goals of the school. Ringle and Updegrave (1998) found that many chief academic officers thought that technology planning failed because technology moved too rapidly and that there would never be enough resources to meet everyone's demands. This will certainly be the case if leaders fail to appreciate the dual nature of technology planning (strategic and technical), and keep both processes separate. The main reason why technology strategic planning fails is not because of the speed of technological developments but because the technical plan has become 'orphaned' by being prepared independently of the overall institutional strategic plan (Ringle and Updegrave, 1998:20). The technical plan must be linked to teaching and learning and to the institution's overall plan. Experience based on what some writers refer to as 'first generation thinking' has demonstrated that unless simultaneous developments occur in pedagogy, curriculum, assessment and school organization, the time and effort expended on instructional technology produces few improvements in educational outcomes (Dede, 1997:14). Riedl et al. (1998:311) note that there must be a vision of how technology can be developed so this gives direction for the decisions about purchases, deployment, support and the use.

Unless school leaders have a clear focus about the reasons for ICT within their schools there is a real danger, according to Atkin (1997), that it becomes technology driven rather than value driven. This point is observed in the case study schools in Sweden where Selander (2003) reports that more regard is placed on technical aspects of ICT and less on the development of new ICT practices. It was difficult in the case study schools to see any clearly formalised pedagogical ICT practices that would change teaching. Instead, any initiatives that did take place were the result of individual teachers, since there appeared to be a lack of a clear professional strategy towards the use of ICT in teaching. Atkin (1997:17) stresses the importance of having a clear reason for doing whatever we are doing in practice – a view reinforced by Slowinski (2000:4), who advises the need for a school vision so that a 'longitudinal technology plan is driven by the school vision rather than by the technology itself.' Making changes to integrate technology into the school so that it is not just an 'add on' to existing curriculum or administrative practices, requires a rethinking of existing

school procedures. Without careful planning and a robust decision-making process school systems can fall prey to enthusiasts and changes could be introduced without adequate consideration of how teaching, learning and administration practices need to change.

Because of the additional funding required to meet IT development, an integrated plan that provides technical support for teaching and learning needs is important. Cartwright (2003:42) says that an overall institutional plan should drive the information technology (IT) plan and budget decisions. Budget decisions, should follow strategic planning not the other way around. It has been suggested by Ross and Weill (cited in Cartwright, 2003:42), that the most commonly used strategy 'is to parcel out some IT resources to all constituents, satisfying everyone a little and no one completely'. Planning in this manner is not strategic. It puts the people responsible for allocating the resources into the 'political position of being responsible for outcomes while often not being completely in charge of the decision-making process' (Cartwright, 2003:42).

As with organizations outside education, the impact of change on technology decision-making in secondary schools is evident. There is little time to enable schools to gather information required to make a decision, nor time to reflect on the effect of the decisions once made. Often other issues arrive on the scene before there has been time to deal adequately with the previous one. Unlike other decisions made within a school that can be reviewed and changed if required, changes in technology occurring outside education dictate the speed and currency of the decision-making process within the school. ICT decision-making requires faster decision-making procedures than other issues within the school such as property development, staffing needs and teaching programmes. Additionally ICT decisions may also need to be revisited and changed more quickly than decisions relating to other school issues. This adds to the pressure on secondary school leaders who already find themselves faced with juggling other decision-making portfolios, such as curriculum and assessment. In discussions with secondary school teachers, Simpson and Payne (2002:4) found that information, both, technical and pedagogical, reached teachers in a 'fairly haphazard and serendipitous way'. At any one time, the information known to any individual was

often 'patchy, uncoordinated and lacking in coherence in relation to any communal teacher strategies or appreciation of technological potential'.

If appropriate decisions are to be made, leaders must be able to obtain advice and accurate information. However, leaders seeking advice for decisions relating to ICT development may find themselves confronted by those with a personal interest in preserving their status as 'computer experts'. The confusion created by those who appear to have knowledge is often achieved by creating an aura of mystique that is difficult to challenge. Trotter (1997:1) observed, that although information is available it is difficult to determine which way to proceed because of the jargon. McClure (2000:108) warns that leaders must not tolerate 'the arrogance of the 'tekkie' elitism that has often been the modus operandi of many'. He considers it is essential to 'learn what you need to know about information technology so that you can ask good questions and assess the answers you get' (2000:108). There is an enormous gap, according to Soules and Adams (1998:3) between those who know and those who do not. Hodson (1992) raises concerns about the expertise myth, which he considers has been reinforced by the poor quality of early hardware and software that repeatedly crashed and the continual change that has left leaders feeling they are out of date. School administrator awareness, understanding and use of information technology are essential, according to Smith (1999:11), if effective use of computers within the school is to be established. A school administrator needs to be familiar with ICT and know what to look for in the classroom if effective supervision, evaluation or support for a classroom teacher is to be made (Fleit 2000). This view is supported by Hope, Kelley and Guyden (2000:369) who claim that, 'technology leadership entails both understanding technologies and how they can be applied to accomplishing the tasks'. They go on to note that school leaders should use technology themselves, developing an awareness of how technology can be used and modelling the practice to the school staff. Fleit (2000:105) recommends that leaders should keep abreast of technological changes by 'reading voraciously and listening intently'. Stegall (1998) also considers it important for principals to use computers, to seek assistance and advice from experts, form a technology committee, visit other schools, brainstorm ideas and hire and train technology 'savvy' teachers. Successful ICT development within the school, that takes into account advances occurring outside education and incorporates these changes into meaningful teaching and learning programmes, will

require skilful management of the decision-making process by the school leader. For some school principals this may pose a difficulty and become an obstacle that hinders suitable decisions being made. The Ministry of Education has acknowledged the vital part that schools play in educating students to meet the demands of a technological world by releasing over the last four years, two draft Information and Communication Technology statements providing ICT goals and guidance to schools. Presumably these have provided school principals with helpful information to assist the decision-making process with regard to ICT implementation, development and management.

In summary, the foregoing discussion has focused on decision-making processes within secondary schools as they relate to the integration, development and management of ICT in schools. While it was acknowledged that schools make decisions on a daily basis, the complexity of ICT decisions resulting from rapid technological advancement requires knowledge, skills and finance. In addition, the literature indicates that technical planning should be built into a school's overall strategic plan which incorporates teaching and learning. This requires the leader to be aware of the possibilities and future development of technology and how the school might integrate these into teaching and learning. Although school leaders have assumed the overall management of their schools as a result of devolution from central control, the Ministry of Education has provided draft documents as guidelines for ICT development. In addition, the Ministry has recognized the financial commitment schools have been required to make in technology and has assisted by providing schools with software. It has also been recognized that to be able to integrate ICT into teaching and learning, in addition to a sound technical infrastructure, teachers must be comfortable with the use of technology. While this requires the school to develop a professional development (PD) programme to train staff, the Ministry has acknowledged, through the leasing of laptops for full time teachers, the need for teachers to become competent with the use of computers.

#### 1.1.4 Assistance Provided to Secondary Schools

This section examines and discusses the assistance given to secondary schools by the Ministry of Education through the release of draft strategic documents, the provision of software and a laptop-leasing scheme.

In 1998, the submission to the New Zealand Government by the Minister for Information Technology's IT Advisory Group (Ministry of Education, 1998) noted that the education sector was lagging behind others in its use of computers and the Internet. In the same year, the Ministry of Education released the first of two draft documents, *'Interactive Education: An Information and Communication Technologies Strategy for Schools'*. This strategy set out a number of aims for schools. It was envisaged that by the year 2002 all schools in New Zealand would be demonstrating that they are:

- i. improving learning outcomes for students by using ICT to support the aims and objectives of the New Zealand curriculum and by providing ICT professional development to teachers and principals,
- ii. using ICT to improve the efficiency and effectiveness of educational administration,
- iii. developing partnerships with their communities to enhance access to learning through ICT (Interactive Education: An Information and Communication Technologies Strategy for School. 1998:5).

The two main focus areas of the strategy are:

infrastructure – increasing schools' access to ICT to enhance education; and building school capability by providing opportunities for school managers and teachers to increase their ability to use ICT through access to professional development (1998:6).

Cabinet approved \$16 million over the three-year period for the strategy which was designed to improve secondary schools' capability to use information and communication technologies in teaching and learning, and administration. In order to

support these aims, the government and schools developed a range of ICT-related programmes and the government funded a number of initiatives. These included:

- i. Te Kete Ipurangi (TKI) - the Ministry of Education's bilingual education portal providing access to curriculum advice and support, information about professional development, administration and financial support for schools' internal management and links to other Ministry of Education sites and the websites of other government agencies;
- ii. NetDay – a national voluntary project to provide practical assistance for schools wanting to set up local area networks (LANS);
- iii. ICT professional development school clusters for selected schools; and
- iv. Principals First – a one-day workshop to develop leadership skills for planning the school's implementation of ICT.

The 1999 Government budget provided additional funding to secondary schools to maximize the implementation of the National ICT Strategy. This included a one-off grant and additional funding for the school operational grant and was available to all state and integrated schools, providing they met the criteria set by the Ministry of Education (MOE) for their school ICT plan. This required schools to supply an ICT strategic plan to the Ministry. The strategic plan needed to demonstrate planning for the use of ICT across the curriculum and professional development. There also needed to be a clear indication of the ICT infrastructure requirements which included an audit of the current infrastructure, including Y2K compliance, provision for teachers and students to access the internet before 2000, an identified time frame for the extension or development of ICT infrastructure and provision for ongoing support and maintenance of the ICT infrastructure.

The Education Review Office (ERO) report released in June 2000, based on reviews of 285 schools completed between October 1999 and April 2000, reported that although most secondary schools had an approved ICT plan that met the Ministry of Education criteria, there had been improvements in the numbers of computers in schools with increased access to the internet and the introduction of professional development programmes, the 'overall implementation of ICT in schools was still in its early stages' (Ministry of Education, 2000:21). Most schools possessed some ICT equipment but there were a number of infrastructure issues that had not been

addressed, namely the networking of schools. Professional development had received considerable effort, but the link between teaching and learning and the skill level and confidence shown by teachers to use ICT was still lacking. The ERO report indicated that many schools were unable to demonstrate a shift from 'how do we get ICT in place' to 'how do we use ICT successfully with outcomes for our students'. The report concluded that despite the increase in availability of ICT resources, many schools considered that they had to 'reinvent the wheel' in incorporating ICT resources into teaching and learning, indicating a need for more national guidance. The report noted that:

unlike other countries with a more centralized school system, the New Zealand curriculum is silent in terms of how its objectives are to be translated into programmes within schools. The extent to which the curriculum should be more prescriptive of ICT may need to be considered (2001: 19).

The second draft strategy – *Information and Communication Technologies (ICT) Strategy for Schools, 2002-2004*, was released in July, 2002 after allowing a small amount of time for feedback. A number of criteria, considered of importance in guiding future development, were identified. The amendments were included in the strategy document - *Digital Horizons – A Strategy for Schools, 2002-2004*. It was considered there was a need for:

- i. informed high-quality leadership where principals are committed to computer technology changes and openly support collaboration between teachers;
- ii. embedded improvements in day-to-day practices, although it was recognized that this would take time to achieve;
- iii. a focus on teaching development to incorporate computer technology into critical and creative thinking or improved pedagogy rather than the acquisition of skills. Successful schools will need to go beyond the technology and draw on their knowledge of how people learn, higher-order thinking, team work and self-evaluation;
- iv. ready access to computer technology for teachers; and
- v. collegial support for teachers so that ideas can be shared.

The documents also stressed the need to focus on long-term rather than short-term goals and to ensure that classroom practices were seamlessly linked to the curriculum. The document recognized the critical role played by the school leader in ensuring that initiatives would happen and stressed that the development of ICT leadership skills was important because it is seen as essential that leaders and facilitators have a sound understanding of ICT and how it can be used in teaching and learning.

While identifying these points from research carried out in schools, the document continued the focus of the 1998 strategy and set out to:

enhance student knowledge, understandings, skills and attitudes through effective learning and teaching; efficient management and administration processes; and the development of an appropriate ICT infrastructure (2001: 9).

The emphasis of the strategies proposed in *Digital Horizons – a strategy for schools, 2002-2004* was for schools to extend teaching and learning skills through the use of ICT and to shift the focus away from technical skills. The document considered that the ‘e-learning environment’ would be characterized by:

- i. student centred learning;
- ii. active exploratory and inquiry-based learning;
- iii. collaborative work;
- iv. information exchange; and
- v. critical thinking and informed decision-making.

Williams (2001) reported that principals were frustrated with this strategic document and considered that the document needed further development and clear funding before schools could embrace it. Robson, President of the Secondary Principals’ Association was also reported in the same article as saying that he considered the new strategy ‘pathetic’ particularly since there was no financial commitment from the Government to underpin the goals of the new strategy. Certainly the Education Review Office (2001) had identified that the finance required to provide a reliable infrastructure (hardware and software) was one of the main barriers to successful use of ICT.

In April 2000 an 'e-government' programme was launched. The vision was that:

by 2004, the Internet will be the dominant means of enabling ready access to government information, services and processes (New Zealand e-government Programme – Strategy 26 April 2002: 1, cited in the Ministry of Education Computer Census Report, 2001).

To establish how prepared schools were to receive communication with the Ministry of Education via the Internet a census of hardware and software specifications currently in use for administrative purposes was completed. It was seen as essential for schools to be able to communicate electronically with the Ministry of Education since the Ministry, in meeting the government's expectations, was required to move towards using the Internet for communication.

At the beginning of 2002 the New Zealand Government signed an agreement with Microsoft to provide all New Zealand state and integrated schools with the latest Microsoft software. This was an important move since Microsoft is one of the main initiators of technology change. The agreement between Microsoft and the New Zealand Government meant that schools would receive Microsoft software valued at NZ\$10 million over a period of two years, enabling schools to integrate technology into classroom instruction and school administration and helping to 'provide students, educators, administrators and parents with anytime, anyplace access to learning' (Ministry of Education, 2002:1). Microsoft commented that they considered it was important for Governments and organizations such as Microsoft to work together to provide schools with the necessary modern learning infrastructure (2002:1). Because of the rapid advances in hardware and software, Microsoft communicates clearly it is unable to provide support for its software much beyond a period of five years. In fact in October, 2002, Microsoft announced a standardization of the Support Lifecycle Policy, indicating the point at which software would pass through different stages of support. The support would move through stages from being fully backed, to the 'extended phase' where assistance would be provided only if requested and at a cost, to the 'non-supported phase', where no help would be provided, until the final stage called the 'End of Life'. It is essential that the decision-maker is aware of the restrictions placed on software as a result of the Microsoft Life Cycle. To ignore the Microsoft Life Cycle outlined in the Windows Desktop Service Road Map (2003), could mean that schools would not be able to move forward with new teaching and

learning initiatives, to communicate with others or to utilize the latest hardware technology. The move, therefore, by the Government is a vital step to ensure schools do not become isolated with old technology.

At the end of 2002, the Ministry of Education announced that the Government had set-aside about \$25 million over a five-year period to enable permanent, full-time teachers to lease an approved brand of laptop. At the end of the three-year lease, the choice for teachers was to either enter a new leasing deal or purchase the laptop at about 10% of the original value. The Ministry saw the introduction of laptops into secondary schools as an important step in improving computer literacy within schools, thereby enabling New Zealand to ‘participate in the knowledge economy’ (Ministry of Education, 2002:1). In addition to this, the Ministry considered that there were a number of direct benefits to schools and teachers who participated in the scheme, namely:

- i. improved and simplified record keeping (grades, attendance registers etc);
- ii. improved ability to access resources around NCEA (New Zealand Certificate of Educational Achievement), such as exemplar web sites;
- iii. improved communication with other teaching staff;
- iv. increased ability to conduct research on the web for teaching resource material;
- v. less need to carry around hardcopy resource material; and
- vi. increased use of laptops as a presentation aid to improve effectiveness in class.

The MOE provided information on a web site outlining a number of considerations schools would need to take into account before making the decision to take up the offer of laptops for their teachers. They warned that a number of questions should be answered with regard to infrastructure, since the influx of a large number of computers all running the latest software might put considerable pressures on the existing network. There was also a very clear message about the need for schools to carefully consider how they would provide laptop professional development.

Having discussed the importance for schools of developing clear strategic and technical goals for ICT development, integration and management so as to take advantage of technological changes, the following section outlines the specific purpose of the study as a prelude to the other chapters which follow.

## **1.2 Purpose of the Study.**

The study recognizes that there are many influences outside the school that impinge on the decision-making process, although research (Atkin, 1997; Riedl, Smith, Ware, Wark & Yount, 1998; Slowinski, 2000) indicates that an essential aspect for ICT development within a school is that the school has a decision-making process that is commensurate with the school's ICT goals.

The processes established for ICT decision-making within the secondary school are critical to the successful development, integration and management of ICT. Although the literature draws attention to the difficulties associated with the development, integration and management of ICT in schools, there is little research evidence examining decision-making processes established by schools to address the issues.

The data gathered by Webb and Harney (cited in Turkington, 2000) indicate the need to address the concerns of principals as leaders at a time when schools are under great pressure to be seen to be doing something significant with computers and Information Technology. The literature also notes that while principals have an important leadership role in the school, implementation of innovations, as seen with ICT developments, is possibly better served by a shared leadership for curriculum and professional development, and technicians for technical development. The role of the ICT coordinator is therefore important in the curriculum and professional development aspects of ICT integration, while technicians should be employed to complete technical work.

Discussion in this chapter has highlighted the need for a clear school strategic plan supported by a separate technical plan that necessitates some understanding of ICT. In

addition to this, decisions will often require money to complete the outcome and may have only a relatively short life compared to other decisions made within the school. The financial commitment linked to the ICT decision-making process adds a degree of risk to the decisions.

The purpose of the study is to examine decision-making processes in secondary schools, as choices are made about ICT development, management and integration. The study is based on decision-making models which provide a rationale and frame of reference for examination of what occurs in the everyday school setting (Bush, 1989).

There are two foci for the study:

- i. the first examines the decision-making processes that contribute to the development, integration and management of ICT within secondary schools,
- ii. the second focus examines the influences that affect the processes of ICT decision-making.

The study is relevant as self-managing schools in New Zealand have been challenged by the school community and the Ministry of Education to become technologically literate and to produce an environment that can meet the demands of the 'outside world'. The results of this study will provide insight into decision-making strategies and procedures as well as highlighting potential problems and situations that might be avoided.

### **1.3 Summary.**

This chapter has noted a number of issues created by the move away from centralized to decentralized, self-managing schools, combined with the challenges that need to be met with the very rapid advancement occurring in computer technology. In the face of an 'outside technologically focused world,' schools can no longer remain isolated. Reducing this isolation brings with it high risks, costs and an ever-increasing need for accurate information and advice to enable the technical development of a robust and

secure ICT platform that supports the integration of computer technology in teaching and learning. To meet these challenges necessitates sound decision-making processes within the school. Associated with all ICT decisions is an element of risk, the need to make decisions relatively quickly and the realization that decisions, once made, will have to be revisited and adjusted regularly. This places the decision-making structures within the school under pressure, since within educational institutions, time and finances are limited resources.

The literature and discussion in this chapter has also highlighted the need for a school strategic plan that includes teaching and learning underpinned and supported by a technical plan. The pace of technological change makes it difficult for a leader to remain abreast of these advances and yet the literature also indicates that it is important for school leaders to increase their knowledge and skill so they do not abdicate the decision-making process to someone else. Ross and Weill (2002) found in research into IT management practices in business that one of the most important determining factors in the success of companies was 'that the senior managers take a leadership role in a handful of key IT decisions' (2002:83). By contrast they also found 'when senior managers abdicate responsibility for those decisions to IT executives, disaster often ensues' (2002:83). It is of concern that in a report of findings about ICT in secondary schools by Sewell from the Education Review Office that, 'more than half of the principals did not state a systematic way of making decisions' (1998:568).

Self-management of schools has added to the pressures facing leaders but the Ministry of Education has recognized this and provided recommendations in draft strategic documents released to schools over a five-year period. The Ministry of Education has also recognized that in order to maintain an infrastructure that supports teaching and learning, a constant source of finance is required. Providing schools with free Microsoft software has helped relieve some of the financial pressures. Additionally, the literature recognizes that if ICT is to become integrated into teaching and learning, teachers themselves must feel confident in the use of computers. While this requires schools to operate professional development (PD) programmes, the Ministry of Education has acknowledged that it is essential for teachers to have access to

computers. The laptop-leasing scheme for full time teachers put in place by the MOE has enabled teachers to have better access to computers.

Because decision-making processes are critical to eventual outcomes, Chapter 2 examines a range of generic decision-making models to develop a framework for the investigation pursued in this study. ICT decision-making processes within three case study secondary schools are then examined using these decision-making models as a reference point. Chapter 3 describes and justifies the methodology used. Chapter 4 presents the data collected from the three case study schools. This includes information about the school as background material, data collected through interviews and an initial analysis of these data. Chapter 5 examines commonalities across the three case study schools and provides an overall summary and theoretical discussion of the cases by relating the findings back to the decision-making models. While the theoretical models provide a reference point for the decision-making processes, the data collected, together with their analyses contribute to the literature on decision-making. Chapter 6 summarizes the research findings, discusses how ICT decision-making occurs, suggests implications for secondary schools and outlines possible areas for further research.

## **CHAPTER 2: MAKING DECISIONS**

### **2.1 Introduction**

The previous chapter examined some of the difficulties of decision-making confronting the secondary school leader created by a move to school self-management and rapid advances in technology. Decentralization of the decision-making process has given school leaders, who ‘possess privileged technical knowledge and skill unavailable to non-professionals’ (Leithwood, Jantzi and Steinbach, 1999:208), autonomy in the decision-making process. Decision-making, when applied to ICT, presumes school leaders possess the knowledge and skill required to make informed decisions. Rapid and continuous advances in ICT outside education present school leaders with a raft of additional issues, requiring different skills and a level of understanding that adds complexity to the decision-making processes. It was also noted that because of the rapid advancements occurring in computer technology, the decision-making processes must be able to take these changes into account. If this does not occur schools run the risk of becoming isolated from the ‘outside technologically focused world,’ and unable to provide a suitable infrastructure for teaching and learning.

This chapter discusses five generic decision-making models. A model is a means of ordering, sorting and analysing information to provide an insight into what has happened in the past and to help explain possible future circumstances (Armitage, Smith and Alpel, 1969:4). According to Estler (1988:306) models need to be able to explain observed reality. This chapter examines five generic decision-making models that have been developed to describe specific features of the decision-making process under different circumstances. Studying a selection of different decision-making models facilitates a better understanding of the reality of the ICT decision-making process by relating observations back to particular models and the identification of key concepts. This may lead to the development of different conceptualisations that may better explain what happens in the ICT decision-making process. Models of decision-making, according to Estler (1988:316), can provide knowledge so leaders

are better able to understand, and therefore cope with, the uncertainty associated with decision-making.

## **2.2 Decision-making Models**

This section discusses five decision-making models that have been chosen because they include a range of decision-making processes that may occur within secondary schools. The latter part of this section examines key aspects from the models that can be applied to secondary school decision-making and more specifically to aspects of ICT decision-making.

According to Bush (1989:3) ‘theory provides a rationale for decision-making. It helps managers by giving them a basis for action’. Models can be regarded as abstract tools for describing and understanding events. Ultimately the manager’s perspective or ‘frame’ on the event will influence the decision-making process. Bolman and Deal (1984:4): described frames of reference as the ‘windows on the world’ that enable the researcher to make sense of the world and decide what action to take. The frame of reference will, therefore, affect the decision-making process. Bush (1986:13) notes that a decision ‘reflects in part that person’s view of the organization’ and that these ‘views or preconceptions are coloured by experience and by the attitudes engendered by that experience’. The decision-making process is not a mechanical process. It requires understanding and interpretation by the decision-maker. Bush notes that this requires ‘familiarity with the arguments and insights of theorists’ which enables the leader ‘to deploy a range of experiences and understanding in resolving problems’ (Bush, 1989:13).

For a number of reasons it is important that school leaders are aware of the theories that underpin the practices of decision-making. Firstly, reliance on facts, as the main guide to action, is considered unsatisfactory because facts or evidence require interpretation. Referring to theoretical models provides insight and a frame of reference that enables sense to be made out of the complexities of everyday life (Bolman and Deal, 1984, cited in Bush, 1989:14). Secondly, depending on personal experience to interpret a situation and make decisions provides a very narrow

perspective sometimes excluding the views of others. Hewitson (1992:13) considers it is important that school leaders are aware that, because they establish the processes within their school, they will have control of the effectiveness of the decision-making process. Finally, experience may be very unhelpful as the sole guide to action if a manager begins to operate in a different context (Bush, 1989:15). Bush (1989:3) notes that ‘there is no single all-embracing theory to guide practitioners’, which creates, according to Bolman and Deal (cited in Bush, 1989:4), ‘conceptual pluralism’. They continue by saying that every theory has aspects that offer something towards the explanation of events taking place. Acknowledging this point, the Bureaucratic, Rational and Bounded Rational, Political, Democratic (Collegial) and the Ambiguity (‘garbage can’) Models are discussed, since aspects of each model may help explain the reality of the ICT decision-making process operating in secondary schools. It is possible that the ICT decision-making processes incorporate aspects of these models and it may also be possible that aspects of what is occurring in practice may not be explained by any of these five models. If so the present study may provide information that leads to the development of new theoretical insights into ICT decisions.

### **2.3 Formal Models – The Bureaucratic and the Rational Model**

Bush (1989:22) uses the term formal models as an ‘umbrella term’ to include a number of similar, yet not identical, approaches that emphasise ‘the official and structural elements of organizations’ (Bush, 1986:22). The formal models discussed are the bureaucratic and the rational and bounded rational models.

### 2.3.1 The Bureaucratic Model

Weber first described a bureaucratic model in 1947 and proposed that maximum efficiency could be achieved through a formal and rationally derived organization. Abbot (cited in Bush, 1989: 21) notes how the features of this model 'are present to some degree in most organizations, including schools' since organizational tasks are distributed among different people and constitute their official duties. Harling (cited in Bush, 1989) also notes that even employment in a school is often based on a recognised hierarchical arrangement of qualifications and expertise, for example, the positions from principal through to heads of departments and teachers. The bureaucratic model stresses the importance of the hierarchical authoritative structure which has formal levels of command and divisions of labour between different groups of people within the hierarchy. Schools operate on official guidelines and rules and there are specific pathways for communication and decision-making. As with other formal models the bureaucratic model emphasizes the 'goal orientation of the organization' (Bush, 1986:32). While the formal arrangement provides a structure for communication and decision-making, it runs the risk of not gaining the support of, nor using the expertise of people at lower levels within the hierarchy. In terms of ICT decision-making where the leader may need to rely on other people within the organization for his or her knowledge, this model may become problematic. This point is reinforced by Williams and Blackstone, (1983:94) who argue that:

if professional expertise is concentrated near the base of the bureaucratic pyramid the rules themselves must be largely a product of the consent of those to whom they apply. If the consent is not forthcoming the organization risks fragmenting into competitive interest groups.

It is important that the secondary school principal has some ICT knowledge and skill. If the principal leaves the responsibility for ICT decision-making to another member or group because of their knowledge, this group, which occupies a lower position within the hierarchy, assumes a more influential role, resulting in fragmentation of the decision-making process.

### 2.3.2 The Rational Model

The rational model of decision-making arose in response to making economically based decisions. It follows a linear path where different alternatives (inputs) are explored to meet a predetermined goal (output). Bush (1986:33) observes that a rational approach to decision-making emphasizes the processes rather than the organizational structure, as seen in the bureaucratic model, so that the decision-making processes take place by establishing goals and following a procedure. According to Clark and Marshall (2002:2), the study of decision-making has shown that usually people act according to their best interests. Because of this the decisions are rational because they choose the best or optimal course of action to meet their own personal goals.

In 1971, Allison proposed the rational-actor model where groups involved in this type of decision-making define common goals, select alternative means to reach those goals, weigh alternatives, assess risks, set priorities for actions, sequence tasks and calculate probabilities for maximizing gains and minimizing losses. That is, they behave in a rational manner. Drucker (1997:2) warns that the most time-consuming aspect of any decision is not making it, but putting it into effect. The biggest flaw occurs when no action commitment has been put in place. Until an action is carried out it is not a decision, merely an intention.

Even in situations where there is a degree of uncertainty, decision-makers are presumed to act rationally (March, 1982:91). Olsen (1979:85 cited in Kefford, 1994) suggests that the rational model could be applied to situations where there are fewer organizational members involved in the decision-making process and where the outcomes are not too complex.

There has been much debate as to whether a rational model actually represents the process of decision-making. According to Kefford (1994:9):

research has tended to show that decision-making is habitual, intuitive or instinctive involving neither a search for alternatives nor

deliberation. Research has also revealed some startling limitations in the ability of the decision-makers to think in probabilistic terms and to bring relevant information to bear on their judgements.

Problems confronting decision-makers are limitations on the number of alternatives that can be considered; limits on time to consider the possibilities and limits on the amount of, and accuracy of the information obtained. This model also assumes that the decision-maker will view the information entirely objectively, which is not entirely feasible, since subjective judgements will always be involved. Because Simon (1957) considered the demands on obtaining and processing information required to make decisions were unrealistic because of the cognitive limitations of the decision-maker, that made rational choice difficult to achieve, he proposed a 'bounded rational' model. Bounded rationality implies that the person will make rational decisions within the framework or the boundary of the simplified model, he or she has constructed from reality. Simon regarded decision-makers as rational, but rational only in dealing with constructed representations of the world and not with an objective portrayal of their complexity (Kefford, 1990: 32).

Rationality presupposes that clear goals have been set and that people follow these. When a rational decision is being made, the alternative chosen will often be a satisfactory solution rather than an optimal one. March and Simon (1978, cited in Kefford, 1994:9) consider that 'most human decision making, whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives'. This idea of satisficing (obtaining a satisfactory rather than an optimal end result) was a key principle in Simon's alternative to rational decision-making.

According to Shapiro, Benjamin & Hunt (1994), people bring both open and hidden issues and concerns into their interaction within the decision-making process. This is one of the features explained in the bounded rational model where the frame of reference or interpretation made by those making the decision will affect the eventual outcome. Research, according to Hammond, Keeney and Raiffa (1998:144), has shown that people use 'unconscious routines to cope with the complexity inherent in most decisions'. The different 'traps' that decision-makers fall prey to are:

- i. the Anchoring Trap, where the mind gives disproportionate weight to the first information it receives;

- ii. the Status Quo Trap, where decision-makers display a strong bias towards alternatives that perpetuate the same situation;
- iii. the Sunk Cost Trap, where choices are made that justify past choices even when the old choices are no longer valid;
- iv. the Confirming Evidence Trap, where subconsciously the decision-maker has already decided what to do before deciding why to do it. This leads to the decision-maker seeking information that supports his or her pre-existing view and affects where reliable information is obtained;
- v. the Framing Trap, where the first step in a decision is to frame the question and this can become a problem since the question can be framed as either 'gains versus losses' or framed with different reference points;
- vi. the Estimating and Forecasting Trap, where overconfidence leads to bad judgement; and
- vii. the Recallability Trap, where the decision-maker tends to make estimates and forecasts based on past events and his or her memory of these (1998:146-164).

There are limitations to rational models. There may be disagreement over outcomes, since the viewpoint of the individual concerned is not entirely objective. One of the most problematic features of rational models, according to Bush (1986:34), is 'the assumption that the choice of solution can be detached and impartial' and that individuals and groups have remained detached from their individual goals and have focused exclusively on organizational goals. In addition to the cognitive level required to sort through and make connections and sense of information, there is also a restriction on the amount of time available for the administrator or decision-maker to absorb and process information. Often complex decisions will involve large amounts of information that have to be processed and considered and it is difficult for people to be rational throughout the process because of the limits of 'human information processing capabilities' (Cats-Beril and Thompson, 1997:75). The 'bounded rational decision model' proposes that decision-makers try to simplify the process to reduce uncertainty by making incremental decisions measured against existing policies. Although there is an end goal and alternatives are examined, decisions are made on a trial and error basis, that is, procedures that exhibit a satisfactory outcome are retained, while those that don't are modified and adjusted until a satisfactory result is reached.

Cats-Baril and Thompson (1997) noted that, for a number of reasons, many decision-makers fail to follow a rational model. They fall short in searching extensively for new or contradictory information and do not organize the information to provide a coherent picture. They do not collect the correct type of information nor in sufficient quantity. This prevents decision-makers from accurately weighing up and developing alternative solutions. Etzioni (1998:45) argues that because the rational decision-making model requires comprehensive knowledge about every facet of a problem, 'in a world with too much information and too little time' this is not possible. This may be the case with decisions relating to ICT. The pace of technological change hinders the ability of the decision-maker to remain abreast of the changes. Because of the changes themselves there is an increase in available information making it progressively more difficult for the decision-maker to have all the information required to make a rational decision.

The two formal models discussed present different views on decision-making. While the bureaucratic model assumes a hierarchical arrangement for organizational and decision-making structure, the rational model presents a step-wise progression for processing decisions where information is weighed up and choices made in a seemingly rational manner. The limitations of both these models have been discussed. Decision-making as it applies to ICT within secondary schools means that the process operates within an organizational structure, which is predominantly hierarchical, allowing a clear definition of the roles that people are expected to play, and enabling communication to occur more readily between different groups or individuals.

Despite the apparent weakness of the rational model, according to Bush (1986:35), it 'remains dominant in much of the literature on schools' which seems surprising since the hectic pace of secondary schools would seem to preclude the amount of time required to gather necessary information and process it in a truly rational manner. The rational model appears to give structure and process to decision-making, which may provide some security for the decision-maker. The amount of information that must be considered, the knowledge required to make good choices and the time-frame it takes to consider all choices possibly places some restrictions on schools for using a rational decision-making process for ICT decisions.

## 2.4 A Political Model

In contrast to the models mentioned in the previous section, the political model is derived from a perspective which does not focus on rational choice with regard to objectives. Instead the emphasis driving the process is fuelled by political self-interest, motivated by the individual's needs and perceptions. Bush (1986) notes that there are a number of major features that can be applied to the political model. Firstly, the model focuses on group activity rather than the overall goals of the organization. This creates power-sharing situations in relation to other groups or individuals within the organization. Secondly, a political model is concerned with individual interests and interest groups. According to Lahti (1996) interest groups emerge with their own agendas and set of goals. Under these circumstances, Lahti (1996) notes that one of the ways power is exercised is by withholding information. Thus decisions are not made under optimal conditions. Thirdly, a political model stresses the prevalence of conflict where interest groups may pursue their own goals that may be different from overall organizational goals. Finally, decisions made under these circumstances emerge after a complex process of bargaining and negotiation. The concept of power is central to political theory so the decision-making process viewed from this perspective will ultimately be determined by the power of the individual or group. There are two main sources of power within an organization: firstly, power held as a result of authority, or legitimate power gained by the position held within the organization, (eg. the principal of a school); secondly, power which results from influence which occurs either because of personal characteristics or expertise. Power through influence may occur in a school where there are staff who have ICT knowledge and understanding not possessed by the school principal or other staff members.

The relevance of a political model of decision-making in education has been given increasing attention (Bush, 1986:69). According to Hoyle (1982, cited in Bush 1989:66) 'there is an organizational underworld, the world of micropolitics which has received only limited attention from theorists and researchers'. Glatter (1982, cited in Bush, 1986:69) claims that micropolitics is an 'essential perspective':

the language of power, coalition, arenas, contests, bargaining, negotiations, interests, ambiguity and so on seems very helpful in distinguishing rhetoric from reality [...] in drawing attention to the different purposes which different individuals, groups and institutions have and the various ways they set about attaining them.

Micropolitics, according to Hoyle (1982, cited in Bush 1989:66) 'consists of the strategies by which individuals and groups in organizational contexts seek to use their resources of authority and influence to further their interests'. The most important distinguishing features between management systems and micropolitics are the strategies used (Hoyle, 1982). Handy (1976, cited in Bush, 1989) identifies strategies as distortions of information, the imposition of rules and procedures and the control of rewards. Since the principal has the highest authority in the school, he or she can also exert a wide range of micropolitical strategies to influence the direction of decision-making, thus maintaining his or her own self-interest. Hoyle (1982, cited in Bush 1989:75) notes some of the more obvious strategies used. 'Dividing and ruling' can easily occur in a school situation because of the relatively loose structure of the organization. Full staff meetings that avoid discussion but provide only information, mean that the main decision-making process has occurred in a smaller group or informally. This prevents comparison of the information given to different groups. To challenge decisions made in this manner would result in conflict, which is usually avoided. 'Co-option' is another strategy used, where those who support a view or decision will be invited to join a group. Controlling information and meetings are another two powerful strategies that may be used.

A political model is predominantly descriptive which, according to Bush (1986:84), gives 'invaluable insights into the operation of educational institutions' and portrays a realistic approach to the decision-making process taking place in schools. The main limitation of a political model is the stress caused by the influence of interest groups on the decision-making process. Additionally, the emphasis on conflict ignores professional collaboration which does take place in schools.

There is potential within ICT decision-making processes for political and micropolitical approaches to occur. Because decisions require knowledge, and in some cases specialist knowledge, if the principal delegates this task to another staff member this person is placed in an influential position. Although the school may also

establish other processes for ICT decision-making, success will depend on the staff member who is seen as having ICT expertise. If he or she chooses to withhold information, control meetings, or meet informally and not become involved in the main decision-making process, this may disenfranchise those not embraced by the overall decision-making process adding to his or her individual power.

## **2.5 A Democratic or Collegial Model**

Approaches from a democratic or collegial perspective to decision-making within an organization enable members to have equal authority to participate in decisions which are then binding for all. In schools, a collegial model of decision-making puts the teacher at the centre of the process. For this to occur a network of committees is established within schools to grapple with the various aspects of decision-making. This, in effect, dispenses with a hierarchical arrangement, since it assumes decisions will involve those within the school with the ability, knowledge and skill to take part in the process. Committee structures are designed to break down hierarchical organization and give members an equal opportunity to participate. Ownership of a decision is paramount if the management wants the decision to be followed through by staff. Since decisions have been reached by consensus, it is assumed that the decision is binding on all members. By delegating responsibility for the decision-making process to a committee, the principal is removed from the actual process leading up to the decision and relinquishes much of the overall responsibility involved in the process and in the decision outcome. A collegial decision-making structure, while empowering staff, does have some difficulties. There must be very clear definitions and boundaries established for the committees (Capper, 1994:9) and the success of the committee will be dependent on the chairperson. Often, within school structures, there will be duplication of decision-making portfolios leading to an increased workload for staff, a sense of frustration and the ability for some staff to create a 'knowledgeable position' for themselves by serving on different committees. Indication from other research carried out in New Zealand (Sullivan, 1994; Capper, 1994 and Livingston, 1994) has shown that teachers' involvement in decision-making, since the 1988 educational reforms, has been hindered by excessive workloads. The majority of teachers surveyed by Capper (1994), considered being on a committee a

waste of time because most committees do not make decisions. Further disenchantment with committee structures was expressed by one respondent in Capper's (1994) study who thought that the committee structure was an inefficient means of decision-making with 'endless inconclusive meetings' (Capper, 1994:9). The biggest drawback to collegial decision-making, Capper (1994:9) found, is that 'the process is time consuming, prone to poor processes when there are time pressures and innately conservative'.

Delegation to specialist sub-committees for complex issues may be established within a school under the premise that a group, possessing specialist knowledge, can tackle the technical issues and report their findings back to a committee which has the responsibility for making the final decision. This presents an interesting paradox. While the collegial model assumes that there is equality within the staff and a hierarchical system does not exist, by forming a sub-committee a 'hierarchy' within the committee structure is developed. This occurs because the sub-committee is required to report its findings back to the 'higher' committee charged with making the final decision. Under these circumstances, the sub-committee has worked through the complexities of the decision it has reached, but the 'higher' committee may not be equipped to question this decision. The sub-committee is making the decision and the 'higher' committee provides a rubber-stamp. When a group of people relies on others for technical skill or knowledge, those possessing these skills have a 'power' over those who do not. Because of this, it is possible that a conflict of interest may develop between the management, or the 'higher' committee and the staff 'experts'. Dalton, (1950) and Janowitz (1959) also argue that technical expertise weakens hierarchical authority. Noble and Pym (cited in Bush, 1989: 43), refer to the process of delegating decision-making between higher and lower committees as an 'involved hierarchy'.

Although a collegial decision-making process may be established within a school, Capper (1994:12) found that issues often develop where members of senior management revert to 'rapid fire' hierarchical (bureaucratic) decision-making when under pressure. According to one principal in the study 'everyone wants to be involved in decisions, but the crux issue is whether they also want to be responsible' (Capper, 1994:13). The issue of the principal vetoing a decision that has been made somewhere else was noted by Capper (1994) in his study to be one of the most serious

impediments to establishing a collegial style of decision-making. While the decisions may be vetoed openly, because of reasons of anxiety or role definition, staff may use the existence of the principal's veto as a rationalization for 'escaping the responsibilities implicit in participatory practices' (Capper, 1994: 17) or staff will make the decisions that they know would be acceptable to the principal. In another New Zealand study, from findings made by the Education Review Office, Sewell (1998:567) noted that in response to leadership style, at least half the principals claimed that consultation, collegiality and collaboration typified their chosen style while a minority saw themselves as authoritarian and could see no reason for spending a large amount of time trying to reach a consensus.

The democratic or collegial model has some attractive aspects. It acknowledges and uses the expertise of staff able to participate in decision-making processes and it spreads some of the workload within the school. However, the time to process and decide is extensive, since all committee members must agree on the eventual outcome. Efficiency of decision-making is a weakness of this model. For those decisions that need to be made rapidly, the process tends to move away from a consensus approach to become more bureaucratic. While it would appear that a collegial model presumes that all members of committees have an equal part to play and derive satisfaction from doing so, the model hides the underlying issues of conflict that arise during the decision-making process. Baldrige, Curtis, Ecker and Riley (1978:33-34) consider that there is a major weakness in the assumption that decisions are reached by consensus since the model does not take into account the problem of conflict where there are often prolonged battles that occur before consensus is reached. Nor does the model consider that consensus is usually achieved by the dominance of one group over another. Schools do attempt to establish collegial or democratic decision-making processes, since it has been shown to be important to involve those affected by the decision in the actual process (Capper, 1994). Establishing a committee structure, where committees are delegated different tasks, enables those staff interested in specific issues to become involved in an appropriate committee. It is possible that if membership on committees is the result of self-interest rather than for the benefit of the school community, the structure of the committee will have an underlying political bias. Hargeaves (1994) refers to this as

‘contrived collegiality’ where although the process may appear collegial, it is in fact, political.

## **2.6 The Ambiguity Model – ‘The Model of Organized Anarchy’**

The ambiguity model differs from the other four discussed in this chapter in that it explains what happens in decision-making based on the premise that ‘choice’ underestimates the confusion and complexity surrounding the decision-making process. March (1978:228-9) notes that while the classical, rational administrator acts on the basis of knowledge about objectives, technology and past experience of the organization, in educational organizations all three are ambiguous. Ambiguity results from the difficulty in specifying objectives and in establishing clear and understandable goals. Even if goals are clear, often the lack of knowledge about the technology of the school or the issue itself will complicate implementation. Relying on past experience can also add to ambiguity since it is difficult in an educational organization to interpret accurately what really happens. Learning from experience depends on clear and accurate interpretations of what has happened. It is unlikely in decisions relating to ICT development that those making the decisions have the knowledge and ability to consciously consider what might have happened and the reasons for the result and then to use this experience to address current issues and problems. Any capacity for rational decision-making is undermined by the ambiguities present in educational administration (March, 1978:236). Within educational organizations anarchy prevails, where the organization is characterized by ‘organized disorder’. Firestone and Herriott (1981, cited in Kefford, 1994) support this view having also found that secondary schools in particular, resemble organized anarchies, and are characterized by diverse goals and loose coupling among their components.

Three generalized properties characterize organized anarchy – problematic goals where the organization appears to operate on a variety of inconsistent and ill-defined preferences; unclear technology, where the organization does not understand the processes but tends to operate on trial-and-error procedures; and fluid participation,

where individual participants and the amount of time and effort they devote to the issue may vary.

March and his colleagues described their organized anarchy model, using the metaphor of a 'garbage can', to explain the ambiguity that arises, particularly in educational decision-making. They viewed their proposed model like a 'garbage can' where a mix of garbage will occur in a single can. There is little control over the type or order of the garbage that goes in and the mix will depend on what garbage is being produced at a particular time and the speed at which the garbage is removed. Relating this back to the organization confronted with making a decision there is often no link between problems and solutions. Decision-makers will generate problems and solutions and drop these into the 'garbage can' as they arise, moving from one decision opportunity to another in such a manner that the solutions, the time needed and the problems seem to rely on a chance alignment of components to complete the decision (Lahti,1996). The components are the combinations that are available at the time of the decision, the problems needing solutions, solutions needing problems and the external demands on the decision-makers (Cohen, March and Olsen, 1972). Decisions tend to fall into one of three different styles, resolution where choices resolve problems after a period of working on them; oversight, where a choice is made without any attention to existing problems and with a minimum of time and energy; and flight, where problems leave the choice after a while, making it possible to make a decision. There may be a combination of these three decision styles. For example, some choices involve both flight and resolution where some of the issues leave while the others are resolved. The most important aspect for an organization to consider is the proportion of completed choices. This success may relate to a number of different aspects such as, problem activity, or the numbers of problems and issues being considered at a particular time; problem latency, the situation where a problem may be active but is not attached to any choice; decision-maker activity, reflecting how much time and energy is expended in reaching a decision and finally decision difficulty, or the ease with which an organization reaches a decision. Heitsch, Hinck and Martens (2000), noted that organizational structure often controls the access of problems towards choices and of participants towards choices. That is, which participants are allowed by the organizational structure to make which decisions?

In schools, issues occur on a daily basis and decision-makers can find themselves swamped and unable to deal with some issues before the next one arrives, often with a more pressing need to be resolved than the previous one. The 'garbage can' model explains the often untidy, chaotic and therefore non-linear decision-making process that occurs within a secondary school. Estler (1988:314) also considers that the 'garbage can' model provides a picture that captures the everyday contextual realities of educational decision-making. While the usefulness of a theoretical model rests with its ability to be able to describe what is observed in the organization, the model does not represent an efficient means of arriving at a decision. The model is not designed to inform decision-makers of a process to follow. It is, instead, a powerful descriptive tool that enables decision-makers to recognize features within their own organization and to predict possible outcomes.

The great advantage of trying to see the 'garbage can' metaphor as a process is that it can be used to understand events occurring in the organization so that decision-making can be better managed. From an ICT decision-making perspective, this approach may help the organization to understand that the very rapid changes occurring in technology, affecting the decision-making processes of the school, are woven into the overall chaotic, complexity of a school. The pathway through an ICT decision does not happen in isolation but will be affected by other events taking place within the school occurring at the same time.

## **2.7 Summary**

This chapter examined five generic decision-making models and the positive aspects and limitations of each of the models as they applied to ICT decision-making processes and structures within secondary schools were discussed. These are theoretical representations of approaches to decision-making that provide frames of reference for examining and explaining the actual process of decision-making. Decision-making is a very complex process that is affected by structures and processes established within the school, such as school organization, committee organization and routines, and factors, such as the views and knowledge held by the

people making decisions. Adding to the complexity of ICT decision-making is the pace of technological change and the knowledge required to keep abreast of those changes. In each of the models discussed there are elements that can be applied to explain decision-making within secondary schools that tend to be based on a hierarchical structure with clearly defined roles, positions and routines. However, there is an attempt made by schools to establish a more collegial approach to decision-making. For this reason most schools, although organized with a hierarchical arrangement of management teams and heads of departments, will have a committee structure with specific responsibilities. Although organizations develop structures for decision-making and communication it has been shown that micropolitical processes are apparent within those structures. Schools are no different. Knowledge and expertise are seen as key attributes that can lead to the creation of influential positions. ICT decision-making requires knowledge and expertise, often resulting in schools appointing either an individual or a group to key positions. It is important that the school leader is aware of the potential political aspects of the decision-making process when establishing structures within the school, since micropolitical processes could affect ICT decision outcomes.

It has also been suggested in this chapter that most decision-makers within a school would consider that they approach the process in a rational way, since information is considered and choices are made in a seemingly rational manner. However, as has been discussed earlier because of a number of factors, such as the quantity of information, the lack of time and the subjective nature of the people involved in the decision, it is possible that decisions are not made on an entirely rational basis. With the increase in information and the fast pace of technology development, the ability to make a rational choice may become more difficult. The bounded rational model provides an explanation of how decision-makers possibly reduce the amount of information they consider so that the pool of information is reduced to a manageable form.

It was also discussed that if a bounded rational model is used for ICT decision-making, while the views and boundaries can be restricted to encompass a manageable amount of information, technological changes continue at a rapid pace in the 'outside world'. If the school does not keep abreast of current technological advances

decisions made will quickly become out of date in relation to changes going on outside the school.

Schools operate in a turbulent and unstable environment often having to react to decisions made elsewhere, over which they have little influence. This makes rational planning and decision-making difficult. In times of change schools display what March and Cohen (1994, cited in Bush, 1989:134) refer to as 'organizational ambiguities'. Under these circumstances it may not be clear what the goals are and people within the organization may perceive different goals or identify different priorities. This situation happens as rapid technical advances occur. The uncertainty of where the technology is leading may create an ambiguity of purpose.

This summary has highlighted some of the concepts and views associated with understanding the decision-making problems as they relate to ICT in schools. The next chapter explains the methodology adopted to examine the practices of ICT decision-making taking place in three case study schools.

## **CHAPTER 3: METHODOLOGY**

### **3.1 Introduction**

This chapter outlines the research design for the study. It begins by examining different methodological approaches, or paradigms, that guide research, before explaining the rationale behind the methodology chosen to examine the decision-making process as it relates to ICT development, management and integration in a secondary school. Following this, the method considered to offer the most appropriate approach and its associated data collection and analysis techniques are discussed.

### **3.2 Methodology**

According to Bateson (1972:320), ‘all human beings are guided by highly abstract principles’. These principles combine beliefs about ontology, the nature of reality, epistemology, the relationship between the inquirer and the known, and methodology how we know the world and gain knowledge. (Guba and Lincoln.2000:19). Silverman (1993:2) considers that ‘methodology is a general approach to studying a research topic’. The methodology establishes how the research question can best be answered and is underpinned by the method or methods that are most appropriate for data collection and analysis. Guba and Lincoln (2000) consider that researchers are bound within a net that contains their epistemological, ontological and methodological premises that can be referred to as a paradigm or an interpretative framework – a ‘basic set of beliefs that guides action’ (Guba and Lincoln, 2000: 19).

Three different research paradigms – positivist, interpretive and critical science were examined as possible methodologies for this study. Each differs in the underlying assumptions that ultimately guide the choice of the methodology and methods. Table 1: summarizes some of the main differences between the three paradigms. The table is adapted from Cantrell (1990:3). Drawing from Table 1, it is clear that the positivist paradigm is concerned with the acquisition of knowledge independent of the researcher. It is based on a scientific approach that considers all genuine knowledge

can only be substantiated by empirical research. The positivist approach includes proposing an hypothesis, choosing a method or methods to collect data to either prove or disprove the hypothesis and from this, formulating a theory or law based on the factual evidence collected. The view held by many is that 'positivism may be characterized by its claim that science provides the clearest possible ideal of knowledge' (Cohen and Manion, 1994:12). Positivists believe that reality exists apart from the researcher who is independent and value free in the quest for factual evidence. The main difficulty with this approach, when applied to a social setting, is that it:

regards human behaviour as passive, essentially determined and controlled, thereby ignoring intention, individualism and freedom (Cohen, Manion and Morrison, 2000:19).

As Table 1 indicates, within the interpretive paradigm, researchers try to understand and construct reality inside the social and cultural context of the natural setting. Smith (1988:171) considers:

inquiry is not a matter of offering interpretations of reality, but one of offering interpretations that become reality, to the extent they are agreed upon.

While this type of subjective inquiry is open to the criticism that interpretations made by researchers cannot be value free, Fetterman (1988:18) argues:

that what people believe to be true is more important than any objective reality; people act on what they believe. Moreover, there are real consequences to their actions.

The last column in Table 1 shows that critical science shares many of the tenets of the interpretive paradigm. Both attempt to understand reality and human behaviour within its social context. The main difference is that while the former focuses primarily on understanding and interpretation, critical science has a commitment to social change and the paradigm focuses on emancipation and the critique of ideologies. The approach taken to this study is drawn from this set of research paradigms.

<b>Methodological Paradigms</b>			
Underlying assumptions and beliefs about:	<b>Positivism</b>	<b>Interpretivism</b>	<b>Critical Science</b>
Purpose of research	Discovers laws and generalizations which explain reality And enables predictions to be made.	Understands and interprets daily occurrences and social structures as well as the meaning people give to events and phenomena.	Emancipates people through critique of ideologies that promote inequity and through change in personal understanding and action leads to transformation of self-consciousness and social conditions.
Nature of Knowledge {Epistemology}	Events are explained based upon knowable facts, real causes or simultaneous effects; law like and predictable regularities exist.	Events are understood through mental process of interpretation which is influenced by and interacts with social context – mutual simultaneous shaping of knowledge. People act on what they believe.	Events are understood within social and economic contexts with an emphasis on ideological critique and praxis (practice as distinguished from theory).
Relationship between the knower and the known	Independent	Interrelated, dialogue	Interrelated, influenced by society and commitment to emancipation.
Role of value(s) in research	Value free	Value bounded	Value bounded; ideological critique and concern for inequities.

**Table 1: Contrasting Views Underlying Alternative Methodological Paradigms**

### **3.3 Choice of Research Methodology**

Olson (1995:3) considers that methodology develops from the researcher's 'ontological and epistemological stance' since the construction of reality and knowledge will be crucial in determining if the approach chosen is to be objective (a positivist approach) or subjective (an interpretivist approach).

The focus of this research is to investigate ICT decision-making processes in secondary schools. The study intends to examine the interactions between key people operating within the social context of a secondary school. Although the outcome of decisions may be able to be measured in scientific terms using a positivist methodology, the aim of this study is to develop an understanding of 'how' and 'why' decisions have been made and by whom, not 'what' the decision was. That is, the study aims to examine the perspectives of people involved in the process, to address the question of - what is happening here? (Preissle-Goetz & Le Compte, 1991). Given this position, the methodology most appropriate for this research study is interpretivist, since this points to methods of data gathering that will assist in isolating an explanation and understanding of the decision-making process as it is constructed within the natural setting of a secondary school. As summarised in Table 1, the interpretive paradigm helps researchers to 'understand and interpret daily occurrences and social structures', essential features of a study of this kind.

Since methodology guides choices concerning method/s, the following section examines different methods before selecting those appropriate for this interpretative study, explaining the reasons for their choice.

### **3.4 Methods**

This section examines and discusses the different methods that can be used within this paradigm to collect data. Finally, issues that may arise from using qualitative research methods are discussed.

Guba and Lincoln (2000:22) consider that 'strategies of inquiry put paradigms of interpretation into motion'. The strategies of inquiry 'connect the researcher to specific methods for collecting and analyzing empirical materials'. Smith (1989: 170) clarifies the relationship between method and methodological paradigm by considering 'method as technique'. Cohen, Manion and Morrison (2000:45) further define method as the: 'range of approaches used as a basis for inference and interpretation, for explanation and prediction'.

Qualitative methods attempt to show meaning and patterns through the collection and analysis of subjective data. The aim, according to Silverman (1993:10), is to 'gather an authentic understanding of people's experiences'. Rather than the big picture obtained from quantitative methods, qualitative methods show a more 'in depth' view of a smaller social setting or phenomenon, enabling explanation and understanding of a particular social or cultural situation. Babbie (1983: 537), defined qualitative analysis as, 'the non-numerical examination and interpretation of observation for the purpose of discovering underlying meanings and patterns of relationships'. Qualitative researchers favour a more open and unstructured research design and while there is no standard approach to the use of qualitative methods, the choice of methods may depend on 'how intrusive the researcher is required to be to gather the data' (Marshall and Rossman, 1989 cited in Silverman, 1993:23). There are five main qualitative research methods:

- i. grounded theory, where the theory is developed inductively from a corpus of data acquired by the researcher;
- ii. phenomenology, which describes the structures of experience as they present themselves to consciousness, without recourse to theory, deduction, or assumptions from other disciplines;
- iii. ethnography, where the focus is on the sociology of meaning through close field observation of sociocultural phenomena;
- iv. historical, which involves a systematic collection and objective evaluation of data related to past occurrences in order to test hypotheses concerning causes, effects, or trends of these events that may help to explain present events and anticipate future events; and

- v. case study, which attempts to shed light on a phenomenon by studying in-depth a single case example. The case can be an individual person, an event, a group, or an institution (Neill n.d: 2 ).

Each of these methods is, according to Guba and Lincoln (2000:23), ‘connected to a complex literature and each has a separate history, exemplary works, and preferred ways of putting the strategy together’. The case study method that is linked to the interpretative paradigm and well suited to answering the research question about how ICT decision-making processes have been established that contribute to the development, management and integration of ICT within the school is case study. A discussion of the reasons for choosing this method and the subsequent data collecting techniques will be undertaken in a later section.

While the use of naturalistic methods can provide insight into the issue being investigated, it is important to realize that there are a number of issues that should be considered. Some researchers argue that qualitative research methods are not free from researcher bias. It is possible that the presence of the researcher will alter the situation (Hawthorne Effect). It is also possible that information given about the situation or participants might be used selectively in subsequent situations. Because samples are small, information cannot be generalized easily to other situations. These potential weaknesses must be kept in mind when methods are chosen for a study.

### **3.5 Choice of Methods**

Case study method will be examined in more detail in this section and the underlying reasons leading to the choice, and the strengths and weaknesses of this method will be highlighted.

There are factors influencing the process at both the individual level and also in the wider context of the social setting of the school environment. The most effective way of sharing views and experiences is ‘through the eyes’ of the individuals involved in the process. According to Kirk and Miller (1986: 9, cited in Silverman 1993: 29) ‘qualitative research is a particular tradition in social science that fundamentally

depends on watching people in their own territory'. It is the aim of researchers to 'proceed as if they know very little about the people and the places they will visit' (Bogdan and Biklen, 1982:55).

According to Yin (1994), one of the first and most important conditions for distinguishing between different research methods is to be clear about the type of research question being asked. Yin (1994:9) suggests that research questions based on 'how' and 'why' are more descriptive of the observed processes and that the case study method enables these questions to be traced with operational links over a period of time. In particular the case study is appropriate when the aim is to define topics broadly (Yin, 1993). Nesbitt and Watts (1984:72, cited in Cohen, Manion and Morrison, 2000) consider a 'case study is a specific instance that is frequently designed to illustrate a more general principle within a "bounded" system, such as a school or a community'. Case studies are able to establish cause and effect and they are considered to 'investigate and report the complex, dynamic and unfolding interactions of events, human relationships and other factors in a unique instance' (Cohen, Manion and Morrison, 2000:181). Yin (1994: 13) considers a case study is an inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between the phenomenon and the context are not clearly evident. For these reasons case study has been chosen as the method for this research project.

Case studies can either be single or multiple. The single case study approach is applicable when the case is:

- i. critical or unique, or where the researcher is able to access a previously remote phenomenon;
- ii. critical for testing a well formulated theory; and
- iii. an exploratory study or pilot study shown to be representative of a large population (Smith, 1988; Yin, 1994).

Herriott and Firestone, (1983 cited in Yin, 1994:45) consider that the evidence gained from a multiple case approach is more rigorous and complete than a single case study because of the ability to triangulate evidence. Stake ( 1994, cited in Guba and Lincoln, 2000) saw triangulation as a process by which multiple perceptions are used to clarify

meaning. That is, the researcher examines data from different standpoints, thereby verifying the repeatability of an observation or interpretation. There are several ways of obtaining different viewpoints (Cohen, Manion and Morrison, 2000). These include:

- i. data triangulation by using different data sources;
- ii. investigator triangulation by using two or more researchers;
- iii. theory triangulation, using different perspectives to interpret data; and
- iv. methodological triangulation by using multiple methods to gather data (Silverman, 1993; Yin 1994).

Yin (1994:45) suggests that a good way of viewing multiple cases is ‘to consider multiple cases as one would consider multiple experiments.’ Each similar case is a replication of the others within the multiple case study. Replication of cases can be either literal, where each case predicts similar results, or theoretical, where contrasting results are produced for predictable reasons (Yin 1994:46).

The case study method produces results that are frequently written in everyday non-professional language. As noted by Stake (1995: 134) the aim is to portray the ‘case comprehensively, using non-technical descriptions and narrative’. There is a call by some researchers to let the case ‘tell its own story’ (Stake cited in Guba and Lincoln, 2000:441). The results are strong on reality and can provide insights into other similar situations, thereby assisting interpretation of other similar cases. Results also capture unique features that may otherwise be lost in a large-scale investigation. While all these features can be seen as strengths of the case study method, there are a number of weaknesses that need to be kept in mind. Probably the main criticism of the case study method is that results cannot easily be generalized. Results also are not easily open to cross-checking which may lead to biased and selective results (Nesbit and Watts, 1984 cited in Cohen, Manion and Morrison, 2000:184). As with other research methods, the trustworthiness of the case study method must be ensured. Maykut and Morehouse, (1994) note that it is essential that confidence can be placed on the outcome of the study. Careful research design can avoid, or at least reduce the criticisms directed at case study research because of the lack of rigor or trustworthiness and the possibility of bias within the method (Patton, 1990, Yin, 1994, Lincoln and Guba, 1985). A later section will address the issue of ensuring the quality

of data collected. Since the study sets out to obtain a holistic view of the decision-making process and because the focus of the research is to examine *'how'* and *'why'*, a case study method is seen as being appropriate. In order to provide a wider view of the decision-making process occurring in secondary schools and to enable some data triangulation, the single case study will be repeated at three secondary schools, thereby establishing a multiple case study. The main body of data is acquired in the field during the research process and where possible analytically linked to existing decision-making theories. The observations collected in the field may not be able to be linked to existing theories but may generate new findings about decision-making when applied to ICT decisions.

### **3.6 Data Collection Techniques**

This section examines the different data collection techniques and the potential merits and difficulties of each. From these techniques, the one considered most appropriate to collect data in the case study schools and the reasons for the choice will be discussed.

Yin (1994) and Stake (1995) identified a number of sources of evidence in case studies. Techniques that may be used to gather data to provide sources of evidence are, observation, documentation, archival records, and interviews.

#### **3.6.1 Observations**

The purpose of observations is to provide the researcher with direct or first hand experience of a situation. The degree of observation can range from 'pure observer' to 'pure participant' (Bogdan and Biklen, 1982, cited in Cantrell, 1990:10). Both extremes are difficult to achieve since the pure observer requires the researcher to be 'as unobtrusive as wallpaper' (Tellis,1997:8), while the latter requires the researcher to become involved in the process, or circumstances being studied, which may have an affect on what is happening. While observation has a number of strengths, in that it provides a context for the study and gives the researcher first-hand experiences with

events as they occur, the main disadvantage of this method of data collection is that the researcher may become too involved. Using this method takes time to collect information. As a technique for data collection, this method was discounted for the present study since observation of a decision-making process would require sustained periods in the schools observing all meetings. Also, it is conceivable that the decisions may not always be made in these forums, but occur elsewhere in the school.

### **3.6.2 Documentation**

Documents can be minutes of meetings, agendas, letters, newspaper articles, in fact any paper evidence that may be part of the investigation. Archival documents are often documents that have been stored as records, for example, organizational records or service records. All forms of documents can be useful to triangulate evidence collected from other sources. It would be possible to trace decisions made through documentation, such as ICT committee minutes, providing these were kept in a consistent manner and have recorded aspects of the decision-making process. When the case study schools were approached about this possible data collection technique, it became clear that there was insufficient documented material recorded in schools relating to ICT decision-making. It was also considered that these documents, if available and accurate, would show decisions that had been made rather than the process involved. This data collection technique would help answer ‘what’ had been decided rather than ‘how’ or ‘why’. Because of these two reasons, document analysis was not considered feasible.

### **3.6.3 Interviews**

Interviews provide one of the most important sources of data for the case study, since they allow the researcher to gather descriptive data in the subject’s own words. According to Cantrell (1990:11) this ‘enables the inquirer to develop insights into how the participants interpret and make meaning of the world.’ Cohen, Manion and Morrison (2000) based on research by Patton (1980) discuss four different interview types highlighting the strengths and weaknesses of each type. The ‘informal,

conversation' interview is characterized by questions that emerge from the context of the discussion and while this increases the relevance of the questions, the main drawback is that different information will be collected from different people. In the 'interview guide approach', topics and issues to be covered are specified in advance and the interviewer decides on the sequence of the questions during the interview. While the outline increases the comprehensiveness of the data, the interviewer may miss important points, failing to include them in the outline, thus restricting the ultimate interview to the researcher's limitations. In 'standardised open-ended' interviews the exact wording and sequence of questions is determined in advance so that all the interviewees are asked the same basic questions. This increases the comparability between the interviews but a standardisation of the question wording may limit the naturalness of the interview and affect the type of responses given. Finally, in the 'closed quantitative' interview, questions and response categories are predetermined with responses being limited to the question. This enables simple data analysis as all respondents' views can be compared. The main weakness of this interview type is that the subjects must fit their responses into the categories determined by the researcher.

Each of the four types of interviews discussed have both strengths and weaknesses that must be considered when a choice of interview is made. Silverman (1993:199) warns of:

'interview naivety' where the interviewer believes that an open interview will capture an authentic experience and overcome the supposed limits of structural sociology.

A greater depth to the interview process can be obtained if there is a 'sustained relationship between the informant and the researcher' (Burgess, 1980 cited in Silverman, 1993:95). This requires a rapport based on a shared knowledge and understanding (Reason and Rowan, 1981, cited in Silverman, 1993:95) to be developed between the interviewer and interviewee. Collins (1990, cited in Miller and Glassner, 1997:105) claims that if researchers are going to make legitimate knowledge claims they should have 'lived or experienced the material in some fashion'.

The research questions to the study address ‘*how*’ and ‘*why*’ decisions relating to ICT development, management and integration have been made. It was decided that in order to answer these questions the technique chosen would require in-depth information that would enable the decision-making process to be traced back as well as considering the pathway for future decisions. The most appropriate way of collecting this kind of information is by talking to the people involved in the process. By establishing rapport, through an interview technique, it was believed that decisions could be traced back and the process involved in reaching a decision could be determined more readily than with any other technique. Although not knowing any of the interviewees on a personal level, a shared professional understanding of both the management structures and systems within secondary schools and the issues confronting leaders when they make decisions relating to ICT was possible because the researcher is a member of a management team in a state secondary school with responsibility for leading ICT development and integration. This common basis of understanding enabled the researcher to have an understanding of and empathy with the interviewee, thereby carrying out an open interview technique. While it might be argued that because the interviewer was involved in ICT development and integration themselves, this might provide a bias within the interview process. However, because the initial questions were open and asked the interviewee to describe any decisions recently made in ICT and subsequent questions used within the interview were predetermined, this would reduce possible bias.

### **3.7 Case Study Schools and the Interview Process**

Having identified that a multiple case study method will be used in the research design, and that data will be collected by the use of an open interview technique this section examines in more detail the secondary schools used, the reasons for the choice and describes the interview process. Figure 3.2 provides a visual summary of the research process that will be discussed in more detail in this section.

### 3.7.1 Case Study Schools

Three city secondary schools were selected as case study schools. The schools chosen were all state, coeducational schools, varying in roll size and decile rating<sup>5</sup>.

Each separate school site was the subject of a single case study. Since the investigation set out to examine decision-making relating to ICT development, management and integration, it was decided that this would probably show different and potentially independent processes operating at different school sites. The three separate single case study schools are part of a multiple case study design at multiple sites.

Initial contact was made by phone to the principals of the three schools. A summary of the outline of the research project [Appendix 3.2] was sent to the principals after they had agreed to take part in the research. Each was assured that the school and information pertaining to the school would be kept confidential. Schools were assigned a letter code to ensure confidentiality but to enable the information to be traced by the researcher. Each principal was asked to suggest four other people from the staff who might take part in the interview process although, it was suggested to the principal that one of the people should be the chair of the ICT committee and perhaps three other members of this group. The final selection of staff to be interviewed was left to the principal. While it was realized that asking the principal to select staff to be interviewed, even with guidance given by the researcher about who should be included, could have provided a biased interview sample, it was decided that staff seen as important by the principal in the decision-making process would be more actively involved than staff obtained by random selection. Because only four other staff members, in addition to the principal, were interviewed, it was essential that all of the people interviewed played a major role in the overall decision-making process.

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<sup>5</sup> Decile rating reflects the socio-economic area of the school's catchment. Decile 1 schools draw their students from areas of the greatest socio-economic disadvantage, whereas, decile 10 schools draw students from areas of the least socio-economic disadvantage.

### 3.7.2 Interview Process

The principal and four other staff members were interviewed at each of the three case study schools, making a total of five interviews per site.

Figure 3.1 summarizes the type of school and interviewees in each of the three case study schools. Each interviewee is categorized according to gender and position held.

Permission to interview was gained prior to beginning and all were assured of confidentiality. Each interviewee within the school was assigned a letter code to ensure anonymity and yet allow the interviewee to be traced during data collection, analysis and interpretation.

An outline of the opening questions was sent to the schools prior to interviewing [Appendix 3.1]. Because the questions were open-ended, this enabled interviewees time to reflect on any decisions relating to ICT development, management and integration that had occurred in the school and the reasons for them. It was not intended that the interview would put 'people on the spot'. Allowing the interviewees to view the questions prior to the interview reduced this problem.

It is essential at the outset to anticipate potential problems associated with interviewing and to avoid these where possible. Field and Morse (1989, cited in Cohen, Manion and Morrison, 2000:280), advise avoiding interruptions from outside, minimizing the risk of 'stage fright', avoiding asking embarrassing or awkward questions, jumping from one topic to another and giving advice or opinions instead of actively listening. With this in mind, all interviews were carried out in a quiet space to reduce distractions. At the outset of the interview the research topic was explained to each person. This allowed the interviewer and interviewee time to adjust to the process before starting the questions. The interviews were taped and permission was gained from the interviewee prior to commencement. A small dictaphone tape recorder that made no noise during the recording process was used to keep the recording low key and not interfere nor unduly influence the actual interview process.

**Figure 3.1 Summary of the Type of School and Interviewees in the Three Case Study Schools**

<b>School A</b>		
<b>State Coeducational</b>		
(on the outskirts of a regional N.Z. city)		
Roll size: 1150		
Decile rating: 9		
<i>Interviewees</i>	<i>Position held</i>	<i>Gender</i>
1	Principal	Female
2	ICT Coordinator	Male
3	Teacher with ICT responsibility	Male
4	Teacher with Timetable responsibilities	Female
5	School Librarian	Female

<b>School B</b>		
<b>State Coeducational</b>		
(within a N.Z. regional city)		
Roll size: 571		
Decile rating: 3		
<i>Interviewees</i>	<i>Position held</i>	<i>Gender</i>
1	Principal	Male
2	Deputy Principal	Male
3	Head of Computing	Female
4	Timetabler	Male
5	Computer Technician	Female

<b>School C</b>		
<b>State Coeducational</b>		
(within a N.Z. regional city)		
Roll size: 799		
Decile rating: 5		
<i>Interviewees</i>	<i>Position held</i>	<i>Gender</i>
1	Principal	Female
2	Deputy Principal	Male
3	Network supervisor	Male
4	Computer Technician	Male
5	Computing Teacher	Female

The interview began with the open questions that had been sent to the interviewee. The sequence and framing of the questions in this manner provided a less threatening environment, putting the interviewee at ease and settling him/her into the process (Patton, 1980:210-11). Interviewees were asked to discuss these questions openly and to provide their own viewpoints as faithfully and honestly as they could. They were reminded that information given during the interview would remain confidential to them and the interviewer. When responses lacked sufficient detail or clarity a probing question was asked to encourage the respondent to expand ideas further. Rubin and Rubin (1995:148) consider that probing questions help to specify the depth the interviewer wants and can also signal to the interviewees that a more detailed or specific answer is required. Some additional questions were asked if the information had not been covered in the initial discussion [Appendix 3.3]. When this was done, similar questions were used in subsequent interviews to enable comparisons of responses to be made. The first additional question explored IT strategic planning and was an attempt by the interviewer to probe into decisions relating to the integration of ICT into teaching and learning. The focus of two of the other additional questions was to determine what effect the Ministry of Education initiatives of documentation and Ministry sponsored software to schools had been on the decision-making process. The final question relating to laptops was an open question that enabled any decisions

made in relation to development, management and integration of the laptops to be described.

During the interview the researcher kept brief observation notes [Appendix 3.4]. Rubin and Rubin (1995:127) advise that even if tape recording the interview, it is a good idea to make notes since this ensures that the interviewer is listening to what is being said. Keeping notes also enables a check back to the audiotape during the analysis stage.

Interviewees were told that at the completion of the interview, the points raised would be summarized into no more than a five page summary and this would be returned to them for verification and any further comments that they may wish to add.

### **3.8 Analysis of Interview Data**

According to Kvale, (1996:145) an ideal interview will meet several ‘quality criteria’ one of which is that the interview is ‘self-communicating’ since ‘it is a story contained in itself that hardly requires much extra description.’

Interviews ‘offer a rich source of data which provide access to how people account for both their troubles and good fortune’ (Silverman 1993:114). It seems important to keep in mind that the interview is a social encounter and not just for purposes of data collection.

Data collection and analysis often occur simultaneously in qualitative research. Patton (2002) suggests that analytical insights and interpretations may emerge during data collection that can be used in the final analysis. Most interview data analysis involves the faithful transcription of the audiotape including pauses, overlapping talk and other parts of superfluous conversation, in addition to the information being given as answers to the questions. The discourse is subsequently analysed using a transcription convention. Since this study sets out to build a picture of the decision-making process, through the eyes of the interviewees, the stories that they tell become the essential data, not the manner in which they tell it. Analysis of the transcripts using the

transcription conventions reduces the data to a 'process level' which loses sight of the underlying practice of 'how' and 'why' decisions have been made. For this reason a different approach to the first level of analysis was undertaken.

The process of analysis undertaken in this study initially involved the researcher carefully listening to the audiotape recorded at the interview to get a 'feel for the data'. After this, the audiotape was run again in small sections and transcribed directly by the researcher using a special tape recorder with foot control to enable the transcription to be typed concurrently with the audiotape. The summary was kept, where possible, to no more than five pages, since it was considered that when the summary was returned to the interviewee there would be more chance of the interviewee reading and commenting on it if it was kept to a manageable level. This summary was sent back to interviewees with a covering letter explaining the process that had generated the summary and asking that they clarify, comment or add additional comments in writing before returning the summary [Appendix 3.5]. The interviewee's responses were then incorporated into the summary document which became the final data set that was analysed [Appendix 3.6].

Interviews, in each of the case study schools, provided the first level of analysis and were used to build up a picture of the overall ICT decision-making process. By asking similar questions, it was possible to check information given by different respondents. This enabled verification and clarification of the information, by obtaining another perspective of the same issue. Because the research design used similar open-ended questions to gather data, this interview format helped to reduce interviewer bias and allowed comparisons to be made between the interviews. Finally, the draft summaries were returned to each interviewee for clarification and further comment. This ensured that the information given during the interview, and the interpretation made by the interviewer, were checked by the informant. All transcript data tapes were burnt on to CD ROM so that they could be referred to again if required. The initial typed transcript from the interview and the returned and altered copies from each of the respondents were also kept. Thus there was a chain of evidence from all data used in the analysis that could be traced back to the original source. Verification of the stories told by interviewees in the individual schools, and comparison of similar issues

relating to the ICT decision-making process in the three separate schools allow the data to have ‘captured and respected multiple perspectives’ (Patton, 2002: 544).

According to Stake (1994, cited in Denzin and Lincoln, 2000: 249) from case reports ‘we learn both propositional and experiential knowledge’. He goes on to explain ‘that what we learn from the singular case ultimately derives from how the case is like and not like other cases’. The descriptive analysis of the single case schools provided the first level of analysis. The second level involved a cross-case analysis of the three case study schools. This provided a deeper understanding and explanation (Miles and Huberman, 1994: 173) of aspects of decision-making as they apply to ICT development, management and integration. By using analytic induction, the findings from these three case studies were examined to ascertain how and what they might contribute to decision-making theory and the literature relating to decisions about ICT development, management and integration within schools.

### **3.8.1 Ensuring Quality of Data**

To what extent can we place confidence in the outcomes of the study and do we believe what the researcher has reported, are questions that need to be asked (Maykut and Morehouse, 1994). Because of the criticisms made that naturalistic studies are undisciplined and merely subjective observations, Lincoln and Guba (1985) argued that interpretive qualitative research inquiry required different criteria for viewing the quality of research compared with the approaches associated with traditional social science. They suggested a new set of criteria – credibility, transferability, dependability and confirmability as a means of determining the overall ‘trustworthiness’ of data. These five terms were suggested as analogues to the positivist terminology of validity, external validity, reliability, objectivity and rigor.

There are three aspects of the research design that contribute to the overall trustworthiness of the data. Interviews from five different people involved with the ICT decision-making process using a common format for questions, would enable

credibility of data to be established and checked by the researcher. In addition to this, member checking was used, where individuals had interview summaries returned for checking and further comment.

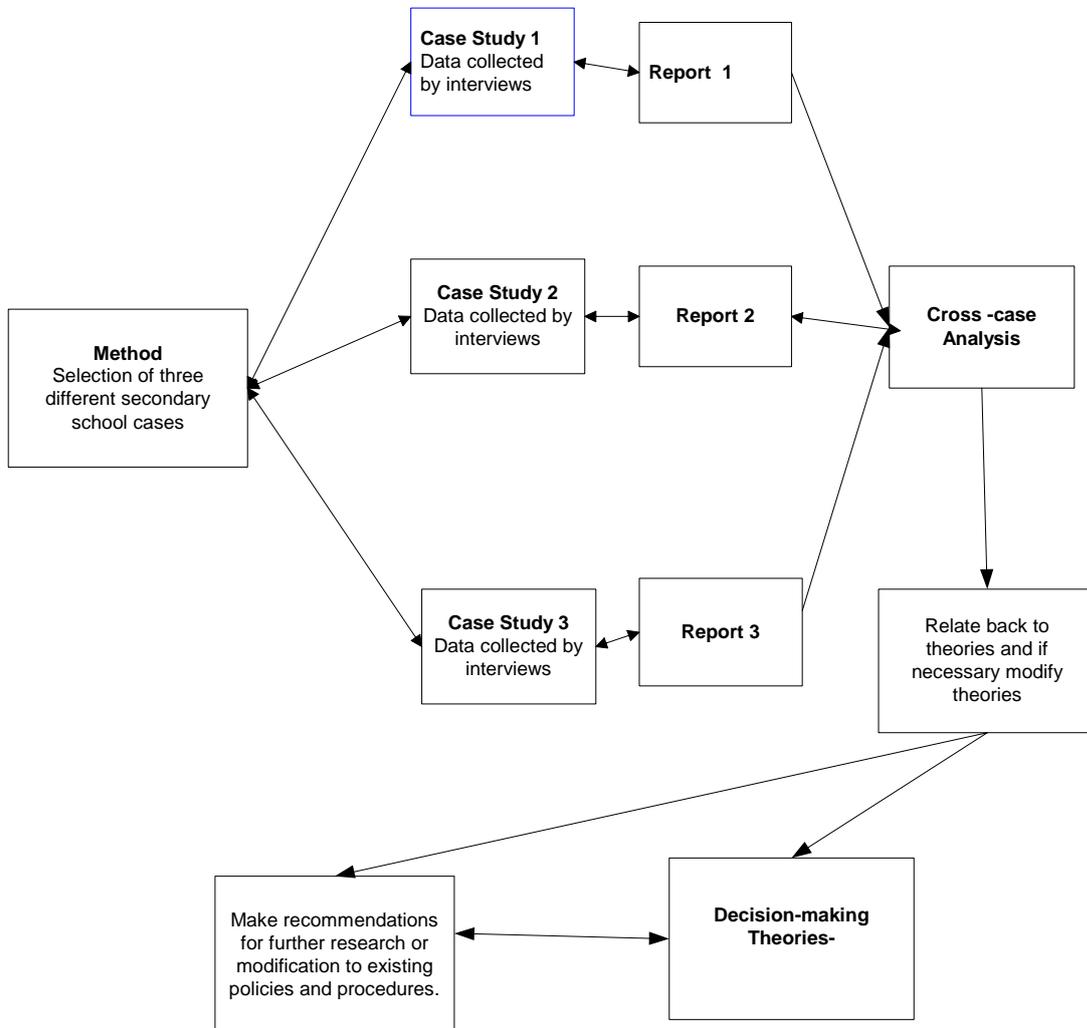
Retaining all interview data, summaries and additional written comments from the interviewees enabled a chain of evidence to be tracked throughout the whole process. Data were not lost but could be traced to the original source. This established a means of ensuring dependability and confirmability of the information. The descriptive analysis of the individual case study schools and the inductive cross-case analysis between schools would facilitate a detailed description of the overall process of ICT decision-making as it relates to theoretical approaches. This would provide a basis for transferability to other case studies.

### **3.9 Data Presentation**

The following chapter is devoted to a description and first level analysis of the data collected from the three case study schools. A second level analysis is undertaken in Chapter 5 through cross-case study. The chapter begins with an overall introduction that applies to all three case study schools. Each school case study is introduced with background information about the school including the roll size, decile rating, ICT platform and current development and integration of ICT within the school. This is followed with a discussion of the data about the decision-making process gathered in the interviews and the preliminary first level analysis.

### Figure 3.2 Outline of the Research Design

This figure shows the study design is linked to the theoretical basis which positions the study and to which the study contributes.



### 3.10 Summary

This chapter began with a discussion of three different methodologies or paradigms that can be used to guide the research process. These were the positivist, interpretive and critical science paradigms. The interpretive paradigm was chosen as the methodology for this study since the purpose of the research is directed at understanding and interpreting the daily occurrences and social structures of the decision-making process in secondary schools.

Since the study set out to examine the 'insider' view of the decision-making process by collecting information from the field, and because 'why' and 'how' questions were being asked the case study method was chosen. This method enables these questions to be answered and when underpinned with existing theories, it is possible to make analytical inductions from observations about theory or which can in turn inform theory.

The data collection technique used for the case study method was the interview. By using five common, open interviews at each school, the trustworthiness of the data were enhanced and were further supported by the use of member checking. The summarized interview transcripts were returned to each interviewee for verification and further comment. Three secondary schools were chosen as separate case studies and all interviews used the same common open interview approach. Similar issues at multiple case study sites allow some analytical generalizations to be drawn from the data.

## **CHAPTER 4: ANALYSIS OF CASE STUDY SCHOOLS**

### **4.1 Introduction**

The study describes and analyses how self-managing secondary schools establish a process for making decisions that contribute to the development, integration and management of Information and Communication Technology (ICT). The study examines the decision-making process established within the schools and discusses the influences, both within the school and externally, that affect the ICT decision-making processes.

This chapter is the first part of the analysis and focuses on interview data collected from three case study schools and provides within-case analysis of the three case studies. Chapter 5 will draw on the information gained to provide a cross-case analysis.

As discussed in the previous chapter, the three case study schools are all state, co-educational, secondary schools either within or on the outskirts of a regional city within New Zealand. Each analysis begins with a description of the type of school, locality, decile rating and roll number, since this enables school decision-making processes to be placed within a context. Although the three case study schools differ in these aspects many of the issues relating to ICT development, integration and management are common to all. While the magnitude of decisions for bigger schools is different from those for a smaller school, the key processes and end results are the matters under investigation. The study does not attempt to correlate decision-making with elements such as roll size, decile rating and ethnic composition but rather investigates decision-making processes independent of these variables.

Because the study is examining and describing decisions relating to ICT development, integration and management, the computer systems currently in operation are described, since this provides insight into decisions that have already been made within the school and indicates the pathway for decisions yet to be made.

Interviews with five key individuals within the ICT decision-making process form the basis of the data collection. The principal is interviewed in each school since it is acknowledged in the literature that the principal plays a key role (Trotter, 1997; Slowinski, 2000). The other four interviewees are people whom the principal considers to have a role in the ICT decision-making process. However, because schools will possibly require a technical person to operate and run the network and usually a committee to enable more staff to be involved in the decision-making processes, representatives from these groups, in addition to the principal, form a common interview basis in the three schools. From the interviews an overall picture of the decision-making process is established. The literature has highlighted a number of essential requirements for successful integration, management and development of ICT and interview data are discussed with these in mind. These are an overall strategic plan for the integration of ICT into teaching and learning and a technical plan that guides development and supports teaching and learning goals (Atkin, 1997; Ringle and Updegrave, 1998; Cartwright, 2003). Professional development is essential in enabling integration of ICT into teaching and learning programmes and this is also examined, (Lai and McMillan, 1992; Stratford, 2000). Because each case study school has introduced laptops within the last year, under the Ministry scheme, the decision-making process leading to the laptop introduction and integration into the school is examined. This provides a similar example, involving ICT decision-making, that has been made by each of the schools and facilitates comparisons for the cross-case analysis in Chapter 5.

A brief overall summary of the decision-making processes as they relate to decision-making literature, concludes each of the cases.

In order to ensure anonymity schools have been assigned a letter code and staff are referred to by their titles rather than by names.

## 4.2 Case Study School A

### 4.2.1 Background Information on Computer Network

School A is a large, decile 9, co-educational school, with a roll of approximately 1150, on the outskirts of a regional city. Recently, because of an increased roll, the school has undergone an extensive rebuilding programme, resulting not only in a number of new buildings, but also in buildings being spread over a large area of the school grounds making this a challenge for computer infrastructure<sup>6</sup> development.

The school has four computer laboratories with approximately 120 computers distributed between them. Two of the computer laboratories are used exclusively for teaching computer-based subjects, such as Text and Information Management, leaving only two of the smaller laboratories available for booking by teachers working in different curriculum areas. One of these areas is in the library which has the newest machines in the school. There are also six pods of between four to eight computers in areas around the school. Most of the offices also have a computer, bringing the total number of computers within the school to approximately 150. At the beginning of 2003 this number increased by 64 with the Ministry of Education's offer of laptops to permanent, fulltime teachers. The ratio of computers to students is 1 : 5.37.

Although the new laptops arrived from the Ministry with Microsoft Windows ® networking software<sup>7</sup> incorporated in the desktop operating system of Microsoft

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<sup>6</sup> Infrastructure refers to the physical connection between computers in different buildings. The connection could be by fibre-optic cable, other types of cabling or wireless.

<sup>7</sup> Microsoft networking –although not exclusive to the Microsoft products, roaming profiles (where the individual's desktop configuration follows users to different computers in the school), synchronization (where files are automatically updated between the laptop and the network) are features that make the Ministry supported software easier to implement.

Windows ® XP<sup>8</sup>, a decision had been made to retain the network system as ‘Novell Netware’<sup>9</sup> and the desktop operating system as Microsoft Windows ® 98<sup>10</sup>.

There is technical support provided within the school by the ICT coordinator -a teacher who teaches one mathematics class. Most of the technical network support is provided from within the school by the ICT coordinator. Assistance and some technical advice for the network is provided by an outside company who works only with schools<sup>11</sup>. Other staff with some responsibility for computing are the Head of Computing and a staff member who has been given time to assist with some of the more routine-type tasks such as setting up new logins and printer accounts.

The school was successful in obtaining two Ministry of Education contracts – one for establishing an ICT Professional Development (PD) cluster with two other secondary schools and the other for Learning. These contracts provide additional funding to enable the school to carry out the Ministry guidelines. The ICT Professional Development contract has, in addition to supplying additional funding to the school, enabled the school to work with two other schools, sharing resources and ideas. The contracts are short term and the ICT PD contract is due to finish at the end of 2003 while the Learning contract will finish in 2004. Once these contracts are completed this source of funding will be unavailable to the school and new sources of funding

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<sup>8</sup> Windows ® XP is the latest release of the Windows operating system, introduced in 2002 and will be fully supported by Microsoft until 2006.

<sup>9</sup> Networking software – Novell Netware provides all the networking protocols required for file sharing and printing. In the mid 90’s Novell was the dominant networking system with around 90% of the market. However, as the Internet grew and the need for web-based delivery became the focus it was apparent that new network protocols had to be developed to take account of the growth of the Internet. Both Microsoft and Novell needed to rewrite their products to address the Internet protocols. Novell failed to provide a satisfactory product and suffered in the competition with Microsoft. By 2003, Novell’s market share had dropped to around 20% and now the preferred networking software is Microsoft.

<sup>10</sup> Windows ® 98 – released in 1998, entered the Microsoft extended phase in June 2002, non-supported phase June 2003 and will enter the ‘end of life’ phase June 2004.

<sup>11</sup> ‘Outside company’ is used in a wider sense because the only clients are schools. The company grew out of school support. They have an expertise in school systems and support and are therefore in a sense part of the school systems.

will need to be obtained to maintain the level of professional development currently in place.

The school appears well served by the computer network. Although computer laboratories are set aside for teaching computing-based subjects, an attempt has been made to provide spaces for other curriculum areas to book as required. The introduction of laptops has provided staff with ready access to computers and although there is some use of the laptops within the classroom for teaching, the main use is administrative, such as completing computerized reports.

The principal and ICT coordinator are aware of the need to integrate the technical aspects of computing into the overall goals of teaching and learning and consider that the Ministry PD contracts have provided excellent assistance in meeting these goals. The principal and ICT coordinator are very pleased with the progress the school has made in the area of ICT and refer to the school as a 'lead school'.

Examination of the computer network reveals that the desktop operating system of Windows ® 98 entered the Microsoft non-supported phase on June 30, 2003 and will move into the 'end of life' phase in June 2004.

The laptops supplied to schools by the Ministry had all been designed and built by the computer companies to recent specifications so that they were configured with the latest software and hardware. This allowed the machines to be optimized for networking systems that could take advantage of hardware and software developments such as USB2 ports<sup>12</sup>. However, the school made a conscious decision to 'retrofit' software, that is, to replace the latest software supplied from the Ministry with their existing Windows ® 98 software. The decision not to move forward made it difficult for the laptops to be integrated into the school network and required additional technical work.

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<sup>12</sup> USB2 port stands for Universal Serial Bus (2<sup>nd</sup> version) which allows the hardware to automatically detect and configure new hardware devices such as digital cameras, printers, scanners, optical mice and memory sticks etc. Without this technology the user cannot connect new hardware devices that use this USB interface.

The next section discusses the role of key people within the overall ICT decision-making processes and links to other parts of the decision-making process.

## **4.2.2 Key People**

The key person with overall responsibility for management decisions within the school is the principal. Because of the technical requirement in running a computer network, the staff member with this responsibility also plays a key role. To enable more staff to take part in ICT decision-making, the ICT committee is involved in the decision-making process. The role of these two key people, plus representatives from the ICT committee will be discussed.

### **4.2.2.1 Principal**

The principal is responsible for the management decisions made within the school and she liaises directly with the Board of Trustees who has overall responsibility for all governance decisions.

Although the principal has attempted to set up a collaborative decision-making process by establishing an ICT committee, this group does not make many of the key decisions. In fact the principal considers that the role of the committee has diminished in importance. The principal comments:

*I have got some pretty strong beliefs about some things – there are some things that committees are going to decide and there are some things that others are going to decide [P: int. 171-173].<sup>13</sup>*

Possibly the role of the committee has diminished because the principal has placed more reliance on the ICT coordinator. The principal has a very close working relationship with the ICT coordinator and appears to trust implicitly the computer direction and advice he supplies. ‘*He has this wonderful view of everything with great ideas.*’ [P: int. 115-116]. Many decisions are made after informal discussions and emails between the principal and the ICT coordinator. This isolates other staff from involvement. The principal does not appear to have a very good understanding of some of the technical issues regarding the network, since she seemed unclear why

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<sup>13</sup> The identifying code is: letter of participant’s title, followed by interview lines.

there had been problems introducing the laptops. It therefore appears that she is not able to challenge nor question proposals made by the ICT coordinator.

Because the principal depends totally on the one person for technical decisions, this places the ICT coordinator in a powerful decision-making position. *'There isn't anyone more valuable on the staff than the ICT coordinator..... there are no other people with the same expertise.'* [P: int. 189-190]. Other staff are unlikely, therefore, to challenge the information and direction of computer developments since these appear to have been sanctioned by the principal.

In 1997 a major issue about lack of access to computers for staff teaching in curriculum areas outside computing arose. The principal explains:

*things came to a head when one of the computer rooms was really problematic [computers unreliable]. For people that teach in there all the time it is so stressful. There was quite a lot of bitterness and upset because we had put all our resources into getting it [computers] out around the school and neglected this area.* [P: int. 180-185].

*The decision that we made was that one of the laboratories would no longer be a classroom but could be booked. That was a major decision and brought staff on board. The decision was made because people said to me – 'it's hopeless. Don't talk to us about using computers, we can't get near them. We are not interested in being on your committee or anything unless you can do something about it.'* [P: int. 193-200].

The principal knew that a decision had to be made quickly. She also knew that it would be a *'tough decision'* [P: int.178] and so she made a bureaucratic decision, seen as *'a decree'* by some staff [HOC: int. 109], that one of the computer laboratories could be booked by other curriculum areas and not used at all by the computing area. Under this stressful situation, where a decision was required quickly, the principal moved from a collaborative decision-making style to a bureaucratic one. However, realizing this she then made a great effort to ensure the staff were brought back on board and involved again at staff meetings.

*Having made those decisions we<sup>14</sup> had to have a lot of staff involvement to sort of make certain they (the decisions) worked* [P: int. 175-176].

There are probably two reasons the principal reverted to a bureaucratic decision-making style when under pressure from the staff (Capper, 1994). Firstly, the overall planning about the distribution of computers in the school had not taken into account all factors, including length of time computers can remain viable and reliable, and so a critical situation occurred – teachers of a main curriculum area, where computers were essential, faced unreliable equipment. Because the plan had been to put as many computers out into different areas in the school rather than upgrade older computers – *‘one of the computer rooms became problematic’* [P: int. 181]. This created a stressful situation with staff members telling the principal that they didn’t want to be involved in using computers. Since all staff would be affected by the outcome of any decision, the principal chose to make the decision and then to work with staff to gain their support. Secondly, the principal realized from the comments made by the staff that there needed to be better computer access for all staff to enable them to integrate computers into their teaching and learning programmes (Lai and McMillan, 1992; Stratford, 2000).

Towards the end of an academic year the principal makes an arbitrary decision about the amount of money that will be allocated to ICT for the next year–*‘I pull a number out of a hat’* [P: int.1-2]. The principal discusses this budget figure with the ICT coordinator before the request goes to the Finance Committee of the Board of Trustees for approval. This decision establishes the amount of money that can be spent on ICT the next year and lets everyone know *‘what we have to spend’* [P: int. 4-5].

It is the task of the ICT committee to decide how the budget will be divided equably among departments. For this reason, the principal considers it is important for her to be on the committee and that there are representatives from different departments to ensure they all have a say in where the ICT resources will be distributed. The principal notes:

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<sup>14</sup> We refers to the principal and the ICT coordinator.

*it is meant to be a mixture. Now if areas are not involved people are invited to come along to the meeting, especially now it is mainly a budgeting sort of committee [P: int.36-39].*

#### **4.2.2.2 ICT Coordinator**

The ICT coordinator plays a pivotal role in all ICT decisions relating to development, management and integration as indicated many times during the interview with the principal who explained - *'almost all decisions are made by the ICT coordinator'* [P: int. 157-158]. Although trained as a teacher and appointed to the school to teach mathematics, the ICT coordinator, over a period of years has developed technical 'expertise' in the computer area and currently, with the exception of four hours teaching, the remainder of his time is allocated to the role of ICT coordinator. Part of the school's recently completed building programme included a new administration building. The ICT coordinator's office is in the administration building - only two doors away from the principal's office. The position of his office not only provides him with status, since he is situated in the main management area of the school, but also separates him physically from the main computer network areas. If a problem occurs staff can contact him in his office by phone or emails. The position of his office is an interesting feature, since it is usual to find ICT coordinators close to the main file server areas and certainly within easy access of the computer areas. The reason for the separation is possibly two-fold. Firstly, since the principal relies almost entirely on the advice and skill of the ICT coordinator and considers him the most valuable person in the school, the principal would not want to lose his technical expertise from the school and so she looks after him. Secondly, the continual work level required to maintain the network means staff will require assistance. The principal alluded to this when asked how problems and issues are dealt with. She said:

*we have a spot on our intranet where we<sup>15</sup> can list problems, but we winge to the ICT coordinator [P: int. 103-105].*

Possibly by removing himself physically from the main computing areas he is more able to control his workload. The principal expressed her concerns about the amount of time the ICT coordinator had to complete his work - *'one of the major issues is that*

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<sup>15</sup> We – refers to staff in general.

*the ICT coordinator doesn't have enough time'* [P:int. 181]. The ICT coordinator also spoke of the difficulty of completing tasks and of meeting with other staff. He says:

*it [computer committee] doesn't meet as often as I would like and that's a time for me issue [ICTco: int.65].*

*This year I haven't typed up the ICT plan even though every other year we have had one. It has been a time thing [ICTco: int.60-61].*

Because of his central role, he has a large amount of power in the decision-making process. His job description encompasses a number of different aspects. He chairs the ICT committee, provides technical support for the network and liaises with the external computing firm. He has the overall view of ICT within the school – future planning and development and responsibility within the two Ministry contracts for ICT Professional Development and Learning. He makes many decisions autonomously, for example remaining with Windows ® 98. These decisions appear to be unchallenged, probably for a number of reasons. Firstly, he has a high status position that has been created by his apparent technical knowledge, the principal's dependence on him and by the physical site of his office. Secondly, it is difficult to challenge ideas when there is no formal forum in which to do so. Thirdly, staff have become dependent on his technical knowledge and skill level.

It is essential for the ICT coordinator to keep abreast of the latest technological advances and how these may affect what is happening in schools. When asked from where he obtained his technical knowledge, he replied:

*from picking the best out of what other people in the community say – I will talk to a number of different people. So in the ICT PD community – the lead school community – I will talk to a number of different people [ICTco: int 115-118].*

He went on to reply when asked if he attended the latest software launches:

*I had it in my diary for the Windows 2003 weeks ago and I had a meeting on the same day and so I couldn't get to it. [ICTco: int.119-120].*

Although lack of time would appear to prevent the ICT coordinator from attending software launches, since the view held by the ICT coordinator is that the school was

involved in and moving with the ‘*lead school community*’ [ICTco: int.116], it is possible that he does not consider it a priority.

#### **4.2.2.3 ICT Committee**

The role assigned to this group in the decision-making process is that of a group of people (between 8-10 staff members) who meet only to consider the distribution of ICT resources to the different departments once the budget has been set. As already noted, the principal sees the main role of this group dedicated to finance and budgeting. It seems that over a number of years the role of the committee has changed. According to the principal:

*we used to meet a lot – a couple of times a term, but now we probably only meet a couple of times a year. When we were meeting much more regularly it was a bigger deal because we were making some big decisions at the time. ....often the decisions made about what we will spend the money on are easy [ P: int. 45-38].*

The Head of Computing considered that there was now less need to meet so often because much of the discussion about issues occurred informally through the use of emails. The principal explained that:

*in the last year it [meeting times] has been very rare. .... in terms of any major decisions there is sort of ad hoc consultation, for want of a better term [P.: int. 17-22].*

There appeared to be an acceptance among the other ICT committee members of the need to meet less, because there did not appear to be any major decisions required. The composition of the committee is cross-curricular but seems relatively fluid since the committee is open to anyone who wants to be on it. Not unexpectedly, when it comes down to dividing up the budget, there is keen interest from the different departments to make certain their views are heard. Only the principal, ICT coordinator, Head of Computing, librarian and teacher with ICT responsibility make up the main core of the committee

Although the principal is not responsible for chairing the committee, because of her presence, decisions can be reached at the meeting without further authorization. This point was noted by the teacher with ICT responsibilities who said:

*I guess the good thing is that the principal is actually a member of that committee. The final decision can be made at that committee [TICTR: int.98-100].*

Although there is an ICT committee and an attempt to develop a collaborative decision-making process, the group meets very infrequently and then only to discuss where ICT resources should be allocated within the budget constraints decided elsewhere. This task shifts the decision-making from collaborative to politically-based, since everyone is out to get as much of a share of resources as they can for their own department. Cartwright (2003) warned of politically-based fund allocation.

The ICT coordinator is responsible for presenting information to the committee and for providing an annual plan that appears to be technically based and not specifically linked to teaching and learning. In the preparation of this information he may elicit comments informally via emails and conversations with the Head of Computing and the teacher with ICT responsibilities. Committee meetings usually revolve around editing the document the ICT coordinator has prepared. The meeting does not get involved with discussing underlying issues - *'normally it takes the case of whatever that document was, being edited, often actually during the meeting, into a final version.'* [TICTR: int. 96-98]. It would seem that the function of the committee is to legitimize decisions already made by the ICT coordinator. As he said:

*I guess I would be surprised if the ICT committee said – look we really need to have this [ICTco: int. 95-96].*

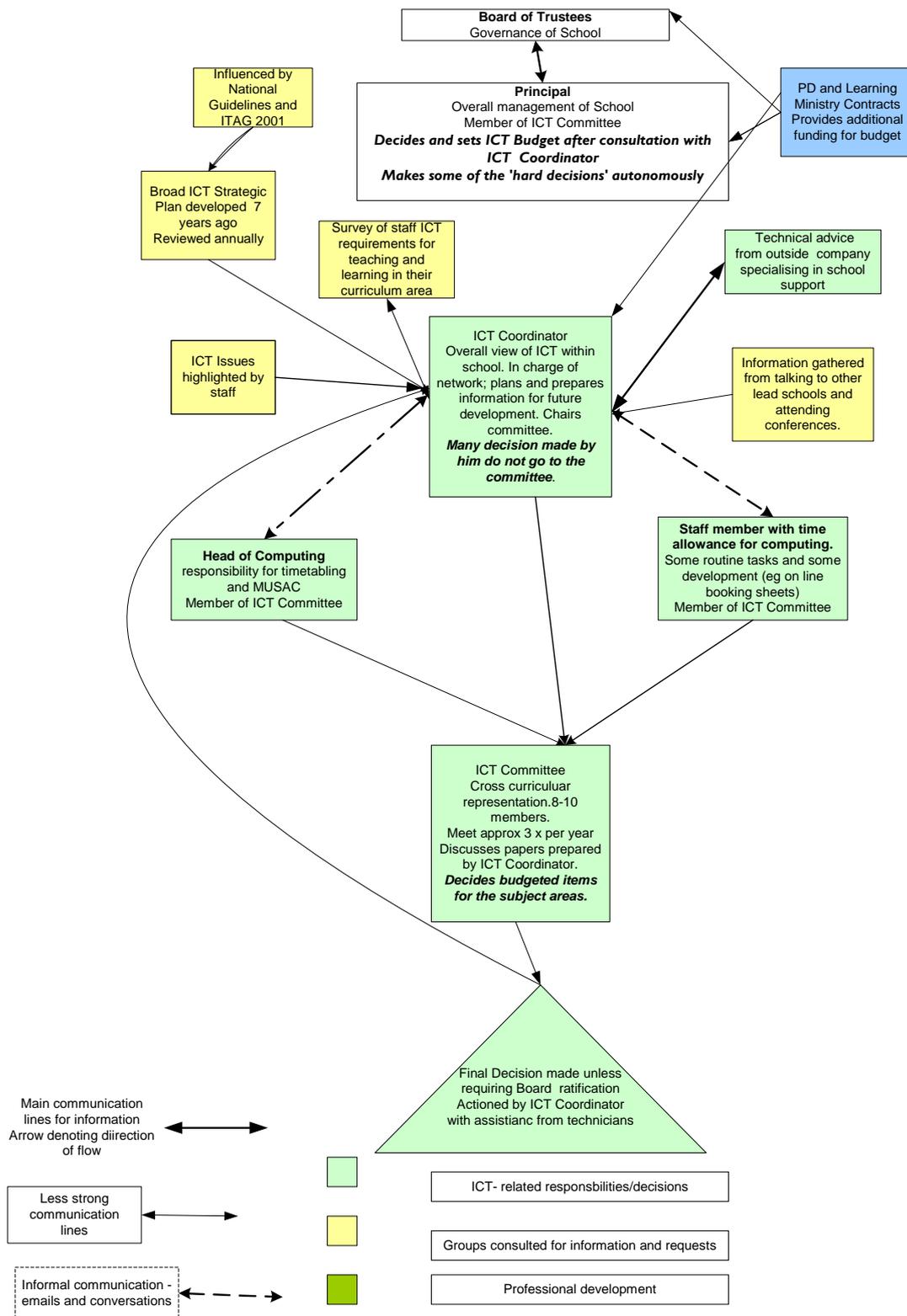
The ICT coordinator holds the central role for all ICT decision-making occurring within the school. He collects information from departments about what they want. This is usually a 'wish list' presented as technical requirements rather than what the department would like to be able to do related to teaching and learning. He then, processes the information, researches the best possible technical path and presents the report to the committee for ratification. Although in close communication with the principal, she is either not able to or does not want to question technical decisions. Trotter (1997:1) warns against allowing people with apparent technical knowledge, often created by weaving an aura of mystique, being placed in a position which is difficult to challenge.

In order to demonstrate the decision-making relationships and information flow at School A, Figure 4.1 has been constructed. The powerful, central position of the ICT coordinator in the decision-making process can be seen by the large square in the centre of the figure. All communications go to him as shown by the arrows on the figure. The ICT coordinator draws up the strategic plan, consults staff for spending requirements and makes all the technical decisions after some consultation with the external computer company. He is also responsible for ensuring the Ministry PD contracts are carried out. The diagram shows a strong two-way communication flow (darker, two-headed arrows), between the principal and the ICT coordinator and also between the ICT coordinator and the external computer company, who carry out work detailed by the ICT coordinator and who also provide some advice when requested to do so. Communication links with the Head of Computing and the teacher with ICT responsibility are usually informal and shown by a dotted line on the figure. The ICT committee is well removed from the main decision-making process and involved only in the distribution of resources to departments. The triangle at the base of Figure 4.1 indicates that the committee is made up of 8-10 members, representing different curriculum areas.

### **4.2.3 Key Processes for ICT Decision-making**

It has been shown by many (Cartwright, 2003; Duderstadt, cited in Ward and Hawkins, 2003; Ringle and Updegrave, 1998), that it is essential to have clear strategic and technical plans that guide the development, management and integration of ICT. The strategic plan considers the curriculum development and pedagogy associated with integrating ICT into teaching and learning while the technical plan should be produced to support and underpin teaching and learning requirements. Although the Ministry of Education has provided schools with guidelines, because the decision-making process has become decentralized, schools are autonomous in their overall planning and decision-making processes. There is no requirement to follow these outlines. They are merely guidelines or suggestions.

**Figure 4.1: ICT Decision-making and Information Flow in School A**



It has been shown that professional development is essential for the integration of technology into teaching and learning programmes (Atkin, 1997; Lai and McMillan,

1992; McKenzie, 1998; Stratford, 2000;). Unless teachers are familiar with the technology, they will not use it within the classroom to provide better teaching and learning experiences for their students.

The following section discusses school A's strategic and technical plans, the influence the Ministry of Education documents have had and professional development.

#### **4.2.3.1 Strategic Plan.**

The overall strategic framework, or ICT plan, was established about six years ago by a group of staff. National Guidelines were consulted and ideas were researched and gleaned from other schools, including Bendigo in Australia. Eventually from these sources five broad strategic directions were chosen. The ICT coordinator described these as the:

*infrastructure of the school; technology appropriate for curriculum areas; shared technology appropriate for areas; professional development and a review of the plan. [ICTco: int. 17-19].*

He went on to say:

*the vision was about using technology to enhance teaching and learning and so it [the strategic plan] was tied to that and also with the professional development [ICTco: int. 19-20].*

Rather than establishing a three or five year plan the ICT coordinator explained:

*within each of the strategic directions there was a description of where we are at, what is likely to come up, what our priorities would be for the following year and what is likely to happen in the future. So there is a bit of gazing as well [ICTco: int. 24-28].*

After referring to the original strategic plan the ICT coordinator puts together a discussion paper with suggestions for the possible direction the following year. This is examined and discussed by the ICT committee. The ICT coordinator does all the strategic thinking, while the ICT committee provides an endorsement of 'his vision'. This view was acknowledged by the Head of Computing who said:

*the ICT coordinator puts the plan together the way he sees it and then he brings it to the committee and says 'well here is what I think [HOC: int. 48-49].*

*It (the plan) is not modified greatly – there may be the odd word here and there changed [L<sup>16</sup>; int 20-21].*

When asked if people were able to challenge the view put forward by the ICT coordinator, the Head of Computing replied:

*anybody is free to ask questions. Why do we have to have this bit on the network? – and the ICT coordinator would explain the reasons why [HOC: int.50-52].*

The plan is therefore presented to the committee and drawing from comments made by interviewees it is apparent that discussion of the paper hinges around semantics rather than a contribution to the overall strategic direction of ICT development, management and integration. Should members of the committee ask questions or challenge ideas, the ICT coordinator views these as questions that require clarification. Changes are certainly not made to the plan as a result of the meeting.

The initial strategic plan had incorporated professional development. However, because the school has been involved with two Ministry contracts – ICT Professional Development (PD) and Learning, separate ICT goals have not been set annually. Instead ICT has been incorporated as a ‘theme’ for both these contracts.

The strategic directions decided several years ago are very broad and include both strategic and technical goals combined in the same document. Ringle and Updegrave (1998) advise that technological strategic planning should comprise two separate components or strands: (i) strategic goals, where issues relating to curriculum, pedagogy and the integration of ICT into teaching and learning are planned; and (ii) a technical plan, which should be responsive to the needs established by the strategic plan. To combine both components into one strategic document blurs the boundary and does not give clear direction for future development. The ICT coordinator did not see this as a concern and this point is supported when he says:

*as we have reviewed them [strategic directions] we haven’t actually changed them a great deal at all. Possibly because they are general and specific enough for our purposes [ICTco: int 209-212].*

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<sup>16</sup> L refers to Librarian who was one of the five staff interviewed.

Some confusion about the role of ICT in teaching and learning is also shown in the ICT coordinator's comment:

*we have added one in [to the strategic plan] about information literacy – developing common approaches. Not specifically ICT, but closely aligned with ICT [ICTco: int. 33-34].*

#### **4.2.3.2 Technical Plan**

The overall plan for the development of the infrastructure to support teaching and learning goals is also done by the ICT coordinator, and as already mentioned in the previous section, the technical infrastructure plan is contained in the overall strategic plan.

At the end of 2002 the ICT coordinator made an important decision about the networking software. The need for this decision was precipitated by a lack of licences to cover the increase in computers and so it was not a forward-thinking decision, but more a reaction to changing circumstances. This would have been a good time to examine the type of networking software to see if it was meeting teaching and learning requirements. But rather than make the move to new technologies, the ICT coordinator made the decision, after consultation with the external computer company who dealt exclusively with schools, to retain and upgrade the Novell, Netware system for 2003. This decision was made near the end of 2002 and the ICT committee played no part in it. It seems that the teacher with ICT responsibilities realises the issues facing the school. He explains:

*I think the big unresolved thing for us at the moment is that our network is built up, not in an ad hoc way, but not in a very integrated way and there are lots of patched solutions that keep different bits of it talking to each other. I think we have to take a deep breath and integrate everything much better. I mean, the particular thing is that the network software is Novell but all the Internet server stuff is Microsoft and the authentication of users across one system to another is difficult [TICTR: int. 114-118].*

From these remarks it is possible to glimpse the extra workload created because of the decision to remain with Novell. The ICT coordinator makes two mentions about not being able to do something because of a lack of time - not enough to call more committee meetings and not enough time to attend promotional launches of new

software. The lack of time for the ICT coordinator is also raised by the principal who sees it as a major issue ‘that he does not have enough time’ [P: int. 116].

Developing often-difficult solutions to cobble the infrastructure together is very time consuming. It also creates extra work for staff who have to use the system. For example: because of the decision to remain with Netware, the solution to be able to operate Web applications was to provide another separate Microsoft server. Instead of the process being simplified and automated, the procedure became complex. The teacher with ICT responsibilities explains:

*trying to integrate users off one and on to the other is a complete pain. We have a staff net page running which is on the intranet which requires you to log into that as well despite the fact that you are already logged in on the network. That’s not picking the Novell user name and password [TICTR: int. 118-120].*

Although the system is not easy to use and it takes time to think of creative solutions there is also a reluctance expressed about making changes if the system seems to be working. The Head of Computing explains her view:

*it becomes an issue if something doesn’t work. As long as Novell keeps working and does what we want it to do. There are a few issues with that but by the same token we are not ready to just ditch it for another set of problems I guess [HOC: int.89-90].*

Changes bring with them new issues and potential problems. It seems easier therefore, to remain with the system that is known even though that requires effort and technical skill to patch systems together. However, the reality is that although:

*there is probably a way of doing that [integrating the two systems] but then again it just becomes so technically difficult that solving the issue may end up being more complex and costly than ultimately biting the bullet and reconfiguring things [TICTR: int. 121-123].*

The decision to remain with Windows ® 98 as the desktop software for 2003 was also made by the ICT coordinator. He explains:

*we are essentially Windows ® 98. I am not sure what we will do next year. Whether we will be Windows® 98 or 2000 [ICTco: int.82-82].*

When asked if he kept in mind the Microsoft Lifecycle for software he pushed the need for this aside– ‘yeah we make decisions on what is reasonable to have.’ [ICTco:

int 73]. Undoubtedly one of the reasons why Windows ® 98 is retained is because the older computers will not support the new software. Because the laptops arrived in the most recent latest technological advance, this added another dimension to the network by mixing the desktop software, since all of the desktop computers were running Windows ® 98, while the laptops were running Windows ® XP. However, the ICT coordinator considers that:

*there was no compelling reason to go to XP [on the desktops] other than if we want to make most of our machines obsolete [ICTco: int. 90-91].*

This point highlights a key issue. Because the main computers in the school are so old, they can only run ‘obsolete’ software. Part of the technical plan should have been taking future technological developments into account and moving machines out of the system on a regular replacement cycle. There was already evidence that the technical plan had not taken into consideration the viability and reliability of computers in 1997, seven years ago, creating a stressful issue that was resolved only by a bureaucratic decision made by the principal.

The development of an intranet<sup>17</sup> is a useful teaching and learning resource and should be a consideration when developing and planning the school infrastructure. The principal noted that:

*we see the intranet as a tool. I guess it's that anytime, any place thing. It needs more structure....lots of things are patched together. It is just a case of where to go to next [P: int. 160-169].*

Although the development of an intranet is seen as being important the Head of Computing notes that:

*there is not a lot happening with it [intranet] at the moment. I guess the ICT coordinator is looking at different ways of trying to do things [HOC: int.60-61].*

Intranet development, that enables access from home, requires a web interface. The school has chosen to operate two separate systems, neither of which integrates with

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<sup>17</sup> Intranet – this is an internal system that looks like a private version of the Internet. School intranets contain administration and teaching and learning resources. They require the same protocols as the Internet and web to operate.

each other - Netware for the network and a separate Microsoft server for web applications. Lack of integration between the two systems creates difficulties as already indicated in the interviews and will make intranet development more difficult.

#### **4.2.4 Ministry Draft Documents**

The principal commented that the Ministry documents had not been very useful since she considered the school's development paralleled the advice being sent from the Ministry. The principal did express concern that:

*the Ministry doesn't give us much guidance about what we do within our school. I mean to have complete freedom that's scary – isn't it? [P: int. 128-130].*

This comment highlights some of the difficulties experienced by the school as a result of the decentralisation of decision-making.

The view of the Ministry documents expressed by the ICT coordinator was:

*I could say they that it's [Ministry documents] in line with our strategic plan. I guess because we had done a lot of that thinking either ahead of time or looking outward, we didn't really need another document that would help us in our decision-making [ICTco. Int. 187-192].*

However, the recent laptop scheme web-site has proved useful to the school in the preparation of documents and policies. Because this information was available before the laptops were released it was current, relevant and therefore helpful.

Although it is important that there is an overall strategic goal for integrating ICT into teaching and learning and that this is supported by infrastructure, it is also essential that teachers are confident and competent in the use of ICT. Professional Development is therefore crucial.

#### **4.2.5 Professional Development**

The principal had been active in obtaining a Ministry contract for Professional Development, which extended over a three-year period and provided additional funding specifically for ICT Professional Development. This saw the school forming a cluster with two other secondary schools in the area enabling teachers from the different schools to meet and share ideas. Initially time was spent in preparing resource material for the Ministry Web Site – TKI (Te Kete Ipurangi).

The principal considered that professional development had assisted the staff to increase in confidence and skill level. She realised how important professional development was in enabling ICT to become integrated but expressed concerns that, without extra funding obtained from the PD contracts, she was unsure how to provide the necessary level of professional development. The principal explains:

*we have had an enormous amount of professional development. The skill level of staff has improved and we are better integrated into the classroom, but that is a huge job – a slow process [P: int.226-228].*

*The big decision we are going to have to make in the future, once we don't get the funding, is how are we going to do professional development? ..... We can't do it without extra funding [P: int. 234-237].*

Raising staff skill level through continuous professional development is a vital aspect for ensuring that ICT will become integrated into teaching and learning. However, this needs a large financial commitment over an extended period to provide professional development to all staff. The financial commitment to enable professional development to take place has been alleviated, in the short term, by the school obtaining Ministry contracts, but clearly there is a financial issue for the school once these contracts finish.

#### **4.2.6 A Recent Decision -Introduction of Laptops**

The offer made by the Ministry of Education to finance two thirds of the cost of laptops to all permanent, fulltime teachers gave schools the opportunity to provide

most of their teachers with an computer with current specifications and software. The introduction of laptops requires the school to make decisions about a number of issues; firstly how the laptops will be integrated into the existing infrastructure; secondly, since it is essential staff know how to use the laptop and feel confident to do so, professional development is also a vital consideration. The overall process for the introduction of laptops therefore, allows an insight into a series of recently made decisions since it is important for the school to decide how the laptops will be used for teaching and learning; what professional development will be required to support teachers and the technical requirements to integrate the laptops into the existing network.

When the Ministry offer of laptops was made, the ICT committee met initially to discuss how the third of the lease agreement that was the responsibility of the school would be financed. The committee recommended to the Board that staff were prepared to pay a sixth of the final cost owing on the lease. However, the Board overturned this decision and because the laptops were seen as '*a tool of the trade*' [P: int. 78-79] decided to pay the full third. This meant that permanent, full time staff received, at the beginning of 2003, a leased computer at no personal cost.

Once the Board had approved the finances for the laptops the principal and ICT coordinator checked the eligibility of the staff and signed off the lease contracts. The staff member with some extra time for computing took responsibility for writing the policies and procedures and once these were written they were edited and checked by the principal and ICT coordinator. Two initial professional development sessions were run with the staff by the teacher with ICT responsibilities who:

*took them through a reasonable amount of do's and don'ts and stuff like that [TICTR: int. 20-21].*

#### 4.2.6.1 Strategic Planning

Apart from some initial professional development to enable staff to use the laptops safely, there was no further planning about how the laptops could be used within the classroom to enhance teaching and learning.

#### 4.2.6.2 Technical Planning

Introducing 64 laptops all at the same time requires thought and planning. The ICT coordinator, in conjunction with the teacher with ICT responsibilities and the technician from the external computer company who had been involved with helping other schools integrate laptops, were all involved in the initial planning. The ICT coordinator explains:

*how we were going to integrate within our current systems, what pressure it was going to put on our systems, how we were going to do the roll out, how we were going to ensure for example, people backed up. We started from the belief that if a machine really gets stuffed up and we can't fix it within 45 minutes we will re-image it [ICTco: 159-164].*

In addition, the school had to consider the security of laptops being used by staff and the need to have extra switches and cables so staff could have access around the school.

However, there were issues when the laptops arrived that created some concerns. The principal explains:

*we had a big problem at one stage where everything slowed down. Eventually, after several weeks of investigation they [ICT coordinator initially and then the external computer company] discovered that there was a cache setting that had to be changed [P: int. 100-102].*

Taking several weeks to fix this problem was an issue. However, there appeared to be a general acceptance from staff that this type of problem was to be expected. The principal notes:

*it was a really big problem. But people tended to realise that having an extra 65-70 computers would have an impact [P: int.105-107].*

One of the main aspects that had not been taken in to the technical planning was the decision made by the ICT coordinator to upgrade the networking software at the

beginning of the year. This coincided with laptop introduction. The teacher with ICT responsibilities explains:

*yes, well we did a really smart thing of bringing in 60 laptops and upgrading the network software over the Christmas holidays as well and so when they all came together at the end of January there were certainly a few issues. ....Some people were pretty frustrated for a while [TICTR: int.27-32].*

Using the laptops at home and then being able to bring the data back and link into the school infrastructure requires the ability to be able to synchronize<sup>18</sup> between the two systems. Instead of making the move to use the networking software that was provided by the Ministry, the school provided a work-around solution to enable synchronization of files. The Head of Computing comments:

*one of the things we put on everyone's desktop was an icon for synchronization and this literally synchronizes a particular folder on the laptops with a particular folder on the network. People know that as long as they stick stuff in their laptop folder this will be synchronized on to the network [HOC: int. 76-80].*

This method for synchronization requires teachers to understand what they are doing and possibly adds a layer of complexity to the process. Because the school is using, a work-around solution, folders and icons have been installed to compensate for when the laptop is not connected to the network. The user manually updates between the folders by copying the data across.

#### **4.2.6.3 Integration of Laptops – Professional Development**

On introduction of the laptops into the school the teacher with ICT responsibilities ran two professional development sessions. Both the principal and ICT coordinator were also present at these sessions. These sessions were to familiarise teachers with the new computers and explain how the laptops would operate on the school network.

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<sup>18</sup> Synchronization – is a process which keeps the files on the laptop and network up-to-date and allows the user to work with their network files on their laptop at all times including when the network is not present. Microsoft provides built-in tools to deal with this and although Novell eventually provided tools for this procedure, School C chose not to use the Novell tool and instead developed their own method.

The impact on the school is seen as being very positive by the principal. The principal explains:

*I think that it is much easier to use email as a communication tool .... That has had a big impact in terms of cutting down the administration, changing the way we do many administrative things. [P: int.87-94].*

It would appear that the main focus of the introduction of laptops for staff has been for administration.

#### **4.2.7 Summary**

The ICT coordinator is central to the school's ICT decision-making process.. He develops the overall strategic vision that also incorporates the school's technical direction. Ringle and Updegrave (1998) stress the importance of ensuring that there is a separate strategic plan so that technical requirements can be identified and connected to the teaching and learning process. This is not the case in school A.

Stratford (2000) and Hay (2001) both note that the necessity for successful integration relies on well-maintained and reliable technology. However, there are several instances where the technical infrastructure is either unreliable, as seen in 1997 when a classroom of machines became unusable, or difficult for staff to use because of decisions made to provide 'work-around solutions'. This is evident in the difficulty of logging on between two different file servers and in synchronization of files between laptops and the network. An area of concern that is related to this is the general acceptance by staff of these difficulties. Only one person has commented that he thinks decisions about the network structure need to be made to reduce the ad hoc and patched nature of it. However, there does not appear to be a forum for raising these issues since the ICT committee meets only twice a year. The principal, who does play a relatively key role in ICT development, integration and management, does not appear to realise that there are issues. Probably this is because the principal views the ICT coordinator as the only person on the staff with technical expertise. The principal considers the information he presents as correct and no other analysis or perspective is required. Fleit (2000) and Heterick (2000) both consider it is essential for leaders to keep up-to-date themselves, by reading widely and consulting outside experts, so they

are able to question people with technical responsibilities within their schools. However, the principal is unaware that a major technical decision has been delayed and that the delay is already having an affect on how the system is run, creating extra work for the technical people and making staff access and use of the computers more complicated.

The issue is, why has the ICT coordinator not moved on with the technology? It appears that he has turned the clock back even though there are indications from the outside world with web and intranet developments and the Ministry of Education laptops provided for schools with the latest software installed? It seems that the ICT coordinator has decided that the status quo situation is better. He does not appear to consult outside the school arena since his information is gained from discussion with other schools and at conferences. The outside company that he uses for advice has been established to work exclusively with schools so that they also do not bring a perspective from outside schools.. He seems to find difficulty in setting aside time to attend software development launches and examine vital guidelines produced by the Microsoft Lifecycle. Hammond, Keeney and Raiffa (1998) would consider that the ICT coordinator has fallen into the 'status quo' and 'justification traps' of decision-making. In reality the decision to move with technological advances is not the ICT coordinator's decision to make. It is made by the outside world. It could be argued that not moving with technological advances continues to keep him in his comfort zone, increases his powerful position because only he can fix problems. It makes him indispensable, but isolates the school from new technologies. The amount of work and the difficulties of running certain applications on the network are seen by the rest of the staff and the principal as being positive attributes to the system rather than negative ones that need to be questioned.

The role of the ICT committee has become diminished, possibly as the importance of the ICT coordinator has increased. The group meets rarely and usually only to make decisions that have financial ramifications. It is the role of this cross-curricular group to ensure that the allocated budget for ICT purchases is fairly distributed. Cartwright (2003) notes that budget decisions should follow strategic planning and not the other way around as seen in this school where the budget is set and then divided among departments. Cartwright (2003) warns that by allocating resources in this manner the

process is not strategic but politically based. Decisions cease to be made by a collegial decision-making process that a committee structure usually facilitates and decision-making becomes political, based on self-interest.

In school A the introduction of laptops, although creating some minor technical problems, partly because of the existing network system and partly because other changes were made to the network concurrently, has been seen as a very positive move towards enabling more efficient administrative practices to take place. For integration of teaching and learning this aspect of planning needs to become the prime focus. It would appear that because this is not clearly indicated in the planning and because the ICT coordinator has been appointed because of his technical expertise, the focus for most of the decision-making in ICT is technically based. However, analysis of data did suggest that the school saw the successful integration of ICT into teaching and learning requiring continuous professional development. This should not, however, occur in isolation of the overall strategic plan for teaching and learning. Atkin (1997) and Slowinski (2000) warn that to do so, will mean that the process will continue to be driven by technology

## **4.3 Case Study School B**

### **4.3.1 Background Information on Computer Network**

School B is a state, coeducational school established in 1975 on an eight-hectare site located in the western suburbs of a regional city. Although the school was originally designed for a maximum roll of over 900, the roll has fallen considerably over the years. The roll is now small, by city standards, with only 571 students, made up of approximately 73% Pakeha, 18% Maori, 5% Pacific Island and 4% Asian. The decile rating of 3 reflects the lower socio-economic area from which the students come. The low roll number benefits current students by providing spacious buildings and grounds and very good specialist facilities for music, technology and ICT.

The school is organized into a hierarchical, management structure with the principal as the main manager who liaises with the Board of Trustees for all governance decisions. There are two deputy principals who, together with the principal, make up the senior management team. The middle management consists of heads of curriculum areas and some staff designated for specific tasks, such as timetabling. A consultative structure of committees underpins the overall management structure.

Because of some difficulties within the school, and in particular in obtaining sufficient members for a Board of Trustees, the school was told by the Ministry of Education at the beginning of 2003 that two statutory managers would be assigned to look at school systems and make suggestions about possible changes. The statutory managers did not arrive at the school until July 2003, leaving the school in a state of limbo from the beginning of the 2003 school year. At the time of data collection in the school, the statutory managers had not started their work.

The perceived need for statutory managers indicates that there are areas of concern in the governance and management systems within the school. Waiting for the arrival of the statutory managers into the school has had an unsettling effect. There seems to be a reluctance to make decisions and move forward.

For the relatively small roll number the school is quite well equipped with computer areas. There are three computer laboratories, two used to teach computer-based subjects, while the third room is available for booking by staff, who teach in different curriculum areas. In addition to this there are computers in the library.

The network and desktop operating systems are Windows ® 2000<sup>19</sup>. There are 150 computers, and with the Ministry of Education's offer of leased laptops to permanent full time staff, this number has risen by 30. The intranet is in a very rudimentary stage of development.

In 2001 the school was successful in obtaining a Ministry of Education contract for ICT professional development (PD). In addition to receiving extra funding, the school became part of a cluster with three other schools. This has provided an outside view of some of the ICT professional development issues occurring in other schools.

As well as the computer technician, other staff in the school involved in ICT are the Head of Computing, who has responsibility also for overseeing PD contracts, and the timetabler. These staff, together with members of the management team and some other staff representatives make up the membership of the ICT committee, referred to by the principal, as a task force.

The network system has recently been changed from Novell Netware to Microsoft ®2000, a move which has enabled staff to access computers from outside the school; a mainstream email package and a more centralized means of technically supporting the network. The school computer technician provides the link from the school to an outside computer company which is responsible for all technical developments and maintenance. Some of the outlying regions of the school do not have computer access. This is a result of insufficient cabling, an area that is yet to be addressed. There is a good ratio of computers for the number of students in the school. - the ratio of computers to students is 1:3.7. However, two of the laboratories are used exclusively

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<sup>19</sup> Windows ® 2000 – network and desktop operating systems. Both are Microsoft products, released in 2000 and therefore still well within the Microsoft support phase of the lifecycle. The network protocols are TCP/IP which makes it easy for the school to connect to the Internet.

for computer-based curriculum areas, making it difficult for staff in other curriculum areas to access computers for student use. Effectively, there is only one laboratory space available for booking by staff, although there are computers that can be used in the library. With the Ministry's offer of laptops, staff access to computers has been greatly improved. However, at the moment teachers are using the laptops mainly for administrative purposes, such as report writing.

This section has described features of the school and in particular the school network to provide a basis for the following section which discusses the role of key people within the overall ICT decision-making process.

#### **4.3.2 Key People**

The principal has overall responsibility for management decisions. However, the deputy principal is also a member of the management team and computer task force, and is therefore in a position where he could play a key leadership role. The computer technician maintains the network although technical work and advice is supplied from outside the school by a contracted computer company. The Head of Computing is responsible for the ICT curriculum, but also has the overview and responsibility for ensuring the Ministry PD contracts are carried out. The timetabler is one of the staff with a practical interest in the network, since he is dependent on it for providing the timetable for the school. These key people are all members of the current ICT task force and were all interviewed. From their perception of the decision-making processes, the jigsaw pieces of information will provide an overview of the decision-making structure, as it relates to ICT development, integration and management.

This section examines the role of the principal, computer technician and ICT task force, seen as being the key links in the overall decision-making process. Information from the other interviewees is woven into the descriptions to support the information presented.

#### 4.3.2.1 Principal

The principal spoke with authority about a strategic plan that had been developed by a staff member, who had experience in the business world with strategic planning, approximately seven years ago. A task force was called together at that time and staff and other schools were consulted. Fortuitously, the proposed five-year plan coincided with the school having some money. The principal explains:

*we chugged through this [the plan] [P: int.8].*

On completion of the five-year plan the task force was disbanded.

The formation of the next task force was in response to an offer of money from the Ministry of Education. In order to encourage schools to formulate a strategic plan, the Ministry of Education requested that schools furnish a strategic plan to gain extra funding. In the principal's words:

*we had to justify to the Government for some money and so that was a fairly skimpy sort of exercise [P:int.19-20].*

Once again, on completion of this strategic plan, the task force was disbanded. However, at the beginning of 2002 the principal called for a new 'task force'. The reason given this time was that the Board of Trustees had approved a sum of money for ICT development. The main job, therefore, of the task force was to decide how best to spend the ICT funding approved by the Finance Committee of the Board of Trustees.

It appeared that there had been a substantial strategic plan developed several years ago and that the work on this plan had been completed. A very quick strategic plan to obtain Ministry funding was the next one prepared, although in terms of providing overall direction for ICT development, integration and management it is unclear. When asked about a new strategic plan, the principal went to his filing cabinet and retrieved a document. He explains his views:

*to develop an integrated plan for the development of ICT requires a medium term of three years. So this means taking stock of the situation, issues arising, leading to a desirable situation for 2005. This includes a plan for professional development. It's got to be linked in with the 10*

*year property plan, changes to the curriculum and other aspects of the school [ P: int.32-37].*

Listening to this explanation it would seem that there was a current strategic plan. However, when pieces of information are put together from different interviews it is seen that this is not the case.

The principal considers it a better idea to call a group of staff together for a specific task than having a committee that meets on a regular basis – hence the term task force. The recently formed task force, formed at the beginning of 2002, is chaired by the principal. The reason for this is partly reluctance by the staff to become involved and also, as he explains:

*last year with the industrial things and so on, people were reluctant to do things. So I took over [P: int.73-74].*

In addition to chairing the task force he sees his job as '*finding the money*' [P: int. 85].

#### **4.3.2.2 Computer Technician**

The computer technician is also the school's science technician. She has learned her technical computing skills 'on the job' and considers '*it is a big learning curve*' [CT: int. 60-61]. The deputy principal expressed a concern about the '*steep learning curve*' {DP: int. 124} required to be able manage the changes. He notes:

*she is very knowledgeable, she is very good, but I do worry about her capacity to be able to manage it all and keep it [the network] going [DP: int.125-126].*

She communicates with the timetabler and Head of Computing, to find out staff needs. As well as an administrative role, in that she is responsible for student logins, printing accounts, reports and computerized attendance records, she liaises with a contracted external computer company which is responsible for carrying out all technical work on the infrastructure. She is the only member of the original task force that produced a clear strategic and technical plan for ICT which has now been completed. She is a member of the current ICT task force and considers her main role, since she does not have a teaching background, is to provide technical advice. She outlines her perception of her role on the ICT task force:

*I don't get into the teaching and learning part. I try to stay on the technical side so that my expertise on the task force would be saying what our network is capable of, where I think we need to go, what I think we need to do in terms of what the people from the curriculum areas are telling me [ICT: int. 17-21].*

From technical matters discussed at the meeting she sees it as her job to ensure that the technical work is carried out. However, concern was expressed by the timetabler that this places the computer technician in an inappropriate and difficult position. As he notes:

*she is the school liaison person with the technical people. If you are being paid a lowly hourly rate you are not being paid \$60 per hour to make those decisions. So she has got to be told, instructed, informed or whatever and said – this is what is happening can you relay this information? [to the external computer company]. It's not her job to explain to the staff, either, why there has been a balls up. That's someone else's job [T: int. 94-98].*

#### **4.3.2.3 ICT Task Force**

The principal established the new ICT task force in 2002 after calling for people interested in joining. The Head of Computing states:

*whoever was interested went on. Some of us [staff] just naturally ended up on it because we wanted to have better input [HoC: int.38-39].*

The principal chairs the group of between 6-8 staff members, and it is his responsibility to call meetings and set the agenda. Because the principal is a member of the task force, decisions made by this group do not have to be ratified by another group unless they require further Board approval. The task force was given the specific task of examining how best to spend the money approved by the Board for ICT development, management and integration. During the course of 2002 the group met only two to three times to work through issues related to spending. The Head of Computing was unsure how the amount of money was determined by the Board, since there had been no staff consultation and there was no overall strategic plan in place to guide the funding. The Head of Computing states:

*it [the task force] started off last year [2002] when we basically had \$80,000. I am not sure how that figure was arrived at. It seemed to just*

*come from the Board, rather than our needs. So it was sort of a wee bit backwards I thought [HoC: int. 47-49].*

The need, identified by the task force during the 2002 meetings, was to upgrade unreliable and old computers in one of the labs where computing was taught. Since the budget amount really covered only this decision, as the Head of Computing pointed out, *'there was not a lot of decision-making required really'* [HoC:int.55-56]. However, once the first decision had been made, there were other follow-on decisions that related to where the old machines would move to within the school. At this point staff were consulted and asked for recommendations to be made. There was a lot of staff interest and one department was very keen to have a pod of computers in its area. The ICT task force met to look at the submissions from staff but at the meeting discovered that the staff request of having a pod of computers set up in a more isolated part of the school was not technically possible, because of the age of the machines and the distance from the hub. The deputy principal expresses his frustration about this situation:

*but ultimately the technician said that wasn't a particularly practical idea – something to do with the distance it was from the network hub and the fact that the computers would not be very reliable or fast. This was a technical decision in the end [DP: int. 19-21].*

This set of circumstances suggests that the task force needed to be clear about the technical requirements of the old machines before they put out an open invitation to staff asking for their requests. Once the technical information was discovered, the task force made a decision to site the pod of computers in a room closer to the network hub. This has not had a satisfactory outcome, as the deputy principal explains:

*in the end we put a pod – about a dozen computers into A2 which is close to the network hub. The fact is, it is two terms down the track and it's not working all that well. The computers are slow. They are not managing the new software well and I think people are a little bit reluctant to use them [DP: int. 36-38].*

Accepting satisfactory, rather than optimal conditions for this decision is explained by Simon (1957, cited in Kefford, 1994: 9) as satisficing, where in order to reach a seemingly rational decision within the boundaries available, satisfactory alternatives are chosen.

The task force has met only twice in 2003 and there was concern expressed that the meetings were too few and that they lacked focus. The timetabler provides his view:

*I think there are a lack of meetings to cement things into place [T: int.73].*

*well, I suppose it [the task force] has lacked direction to be honest for the last 18 months, I suppose..... I think all the committees need to refocus where they are going and what is happening [T: int. 26-30].*

It is possible that, because the budget figure for ICT had not been established for 2003, the principal saw no need to call meetings. He commented during the interview that he was currently 'waiting for a decision from the Board finance committee about how much money is available as to what we then do next [P: int.24-25].

Although minutes are produced from meetings there are no clear action items recorded to indicate a time frame for the decision nor whose responsibility it is to ensure that the decision is carried through and to communicate this back to staff. At the following meeting the previous minutes are not tabled nor referred to again. The computer technician spoke of the difficulty of not having clear action items and of not having minutes referred to again, since she considered it her job to implement the technical decisions supposedly decided at the meeting. She comments:

*I would expect that at a formal meeting those minutes would be tabled and accepted. That, for me, would be another point where you could say – well you realize that this will require us to do this? There are no actions and I personally feel that it is just up to me to carry them out.*

*another lot of information comes through [at the next meeting] and the task force looks at something else. I feel it is very disjointed [CT: int.64-67].*

Unclear processes operate at meetings and this leads to confusion. The computer technician considers it is her job, once any technical matters are discussed, to begin implementation even though there are no action items in the minutes. However, the outcome from meetings viewed from a different perspective indicates, that certainly in the case of the deputy principal, he is unaware that any decisions have been reached. He observes:

*several things have happened in this school over the last couple of months, which have never been discussed at the committee. I mean*

*they are technical things that the rest of us would say – yes well OK if you teckies say that's what needs to be done then get on and go and do it [DP: int.57-60].*

Confusion over the role of the task force is evident. The principal sees the main purpose of this group as the distribution of ICT resources once the budget is set. Once this task has been completed he does not consider that the task force plays any further part in ICT decision-making. However, the timetabler comments that he thinks there should be a clear strategic focus that guides the technical decisions. The computer technician, who had been a member of the original task force that prepared and worked through a strategic plan, also holds this viewpoint. She notes that the task force '*are technically the people who should be deciding what is happening in the school*' [CT: int.1-2]. However, the deputy principal expressed a concern about the future of the group by saying:

*to be honest I am not quite sure what the future of that committee would be. It could well be that, in terms of making the decision last year it has done its job [DP: int. 55-56].*

Part of his reason for doubting the value of the task force is his reluctance to be involved with any of the technical decisions. He views them as separate to the overall process of ICT development, management and integration, and a factor that ultimately controls all of the decisions being made. He observes:

*well I mean, even the decision not to site the computers down in D block – they had to go to A block. These were made because of network and technical reasons [DP: int. 60-62].*

In summary, there is little evidence of a transparent process for ICT decision-making as it relates to development, integration and management. The principal, as leader of the school, has established a task force with the sole task of deciding how resources can be used within the allocated budget. Possibly, because of the group's designated limited function, the principal does not consider that there is a need to call more regular meetings. However, other members of the task force believe that not only should there be more regular meetings but that there should also be a clear strategic plan underpinning the role of the group. Because membership of the group is voluntary, staff with either a vested personal or department interest in ICT, join the group. As a result of the membership composition and also the task assigned to the group of distributing resources within a fixed budget, the group focus shifts from a

collegial to politically based approach. Although meetings of the group are considered formal, with an agenda set and minutes recorded, the minutes do not contain action items, nor are they referred to again. There is, therefore, no clear direction as to whose responsibility it is to implement the decision nor clear communication lines back to staff about what is happening. The effect of this is that the computer technician assumes the responsibility of actioning any technical discussions. Often these actions are not understood by some of the other committee members, and the staff are not informed of any of the processes nor follow up made to ensure that staff are competent with using the network.

### **4.3.3 Key Processes Required for ICT Decision-making**

As already discussed the literature recognizes the importance of developing an overall strategic plan that guides the integration of teaching and learning. Underpinning this plan is a technical plan (Ringle and Updegrave, 1998; Cartwright, 2003). It is essential that the driving force behind the planning is the overall institutional goals and strategic plan. It is also important that the technical plan supports these goals and is not developed independently. Since the development of both these plans is critical for the successful integration of ICT into teaching and learning, they serve as a benchmark for the decision-making process occurring in the school. For that reason the strategic and technical plans will be examined and discussed. Additionally, it has been shown that professional development is also an essential feature of any plan to integrate ICT into teaching and learning (Dede, 1997). Professional development processes will also be discussed.

#### **4.3.3.1 Strategic Plan**

In case study school B, a very clear plan had been formulated about seven years ago. This had involved a group of staff and an outside consultant, surveying staff teaching and learning needs and putting together ideas into a cohesive plan, including an implementation timeline and action items. The plan had been linked into the ICT budget and the task force operating at that time was involved in discussions and overseeing parts of the plan as they became ready to set in place. This plan was

completed. Apart from a very temporary strategic plan drawn up to obtain additional funding from the Ministry, no further strategic plan has been prepared by the school. Since the role of the ICT task force is allocation of resources, it would appear that no part of the school system has been charged with this responsibility.

The school was fortunate, however, in being able to piggyback on another school's submission to the Ministry for an ICT professional development contract. The initiative and work in preparing the submission did not come from this school. The Head of Computing comments:

*we are part of a cluster and so teaching and learning should have been the focus for the last two years – we are in our third year now [HoC: int. 2-3].*

The contract, now in its final year, has helped to focus some of the staff professional development, but because there is no strategic plan in operation at the moment, professional development sits to one side of the overall ICT development and integration process.

The frustration of not having a clear sense of purpose was expressed by the timetabler, who said, *'in terms of a longer- term vision or plan or timeline, it's not there and I think that needs to be done [T: int. 33-34].*

#### **4.3.3.2 Technical Plan**

The computer technician was the only staff member who had been part of the initial task force implementing the original and comprehensive strategic plan which had included technical planning. She realised what was required by the task force in the planning process and noted:

*between our one [strategic plan] finishing, when we met the time line that we set up, there was nothing and then there was this new task force set up last year [2002]. From my experience, I believe they [task force] should really be looking at what is required in the school and how that should be implemented to best meet the needs of the staff and students [CT: int 9-13].*

*If it was operating, as I see it [the plan], then we would have the same sort of documentation for what we wanted to do, where we are going in*

*terms of the next year, the next two year – the next five years [CT: int. 30-33].*

However, there is no overall technical plan to guide developments, let alone having the plan linked to teaching and learning goals. So decisions appear to happen in an ad hoc manner, usually as a result of deciding how to spend allocated funds.

There is keen interest to develop a school intranet site and technically the school is able to do this. However, there has been little direction given to staff and no time allowance to enable this initiative to take place. The Head of Computing commented:

*everyone would like one but no one is actually doing it [HoC: int.73].*

One of the most recent decisions has had a profound effect on the school and staff. This was a major decision to change the networking system from Novell Netware to Microsoft Windows ® 2000. Tracing back the reasons for this decision it appears that at the end of 2002 staff had, at an ICT task force meeting, raised the need to have external access to the computer system from home. This request was initiated by staff, not because of a desire to provide a different way of delivering the curriculum to students, but because staff wanted to be able to complete reports and access their school files from home. At the beginning of 2003 three additional issues arose. These were, the introduction into the school of new laptops running the latest software; the need to have a similar work platform between the two computer laboratories teaching computing and the numbers of Novell Netware licences becoming insufficient for the numbers of computers in the school. All these matters were raised at an ICT task force meeting in Term 1, 2003. It was discussed by the group that there should probably be a move from Novell Netware to Microsoft Windows, particularly since the Government was financing Microsoft packages. In fact it would cost more money to remain with Netware. Although the ICT task force discussed these issues, there were no action items recorded in the minutes nor an implementation timeline set in place as the timetabler describes the situation:

*I think the only thing that fell down was implementing when it was going to occur..... There hasn't been any direction to say – yes that will be done in May or be done when and how. In terms of the actual implementation it wasn't properly documented. As I said, a time line, or whatever frame you want to look at wasn't put in place [T: int. 51-56].*

In fact, because of the general discussion at the meeting with no firm action decisions being made, most staff on the task force seemed unaware of what was going to happen. The Head of Computing tells the situation from her perspective:

*the change had been vaguely discussed at a committee meeting last year. It wasn't discussed in detail and staff were not made aware. And so when they came back at the start of this term there was a lot of unrest [HoC: int.85-88].*

Other task force members also expressed some surprise that the discussion that had taken place at the meeting became an actioned decision. The deputy principal comments:

*yeah it [the decision to move from Netware to Windows] just seemed to have happened. Apparently it was a good idea.....somewhere the decision was made – yes, we need to do this and it's happened. It has never been discussed at management<sup>20</sup> which is interesting [DP: int. 63-67].*

The timetabler, although noting that the decision to move from Netware 'was certainly minuted in the minutes last year' [T: int. 40], was nevertheless unaware of the timing of the changes and came into school during the holidays to complete work, only to find he was unable to log on to the network. He explains his frustration:

*I came in on the first week one day to work on the timetable and the system was down. I came back in after Easter for a day and again it was down. So I left it but I had set aside two days in the holidays to do a whole lot of work which I am now trying to catch up [T: int. 64-69].*

The lack of direction within the ICT task force, no technical nor strategic plan to guide the decisions, no actions minuted and no-one overseeing the process nor communicating back to staff would have meant under normal circumstances that the decision would have remained, as Drucker (1967) says only an intention and not a decision. However the computer technician realised the need for the technical changes to take place and so actioned the decision and gave the 'order' to the outside computer company to make the changes over the two-week holiday break. This information was not communicated to anyone else in the school because the computer technician did not see this as her role. The timetabler, when asked who knew about the changes, comments:

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<sup>20</sup> Management team – made up of the principal and two deputy principals.

*yeah, as I say it is a lack of communication. It was probably just the computer technician and computer firm knew it was going to happen [T: int. 87-89].*

There were several reasons underpinning the decision made by the computer technician to move the network from Netware to Windows. From the task force meeting she was aware that staff wanted to be able to have external access. She also knew that the two computer labs needed to have the same system to make teaching in that area more efficient. In addition to this, she knew that the school was about to receive laptops from the Ministry and these would arrive with the latest software installed. Coinciding with all these issues was the number of licences the school owned for Netware. The increase in computers would require more licences at a cost to the school. By comparison, a move to Microsoft products would make use of the Government's offer of free software to schools. She says:

*we were running a Novell [Netware] server running Novell 4.2 which had come to a point where it couldn't cope with the new software. The other issue was that we had reached our total number of computers for our current licencing and so we had to increase our licencing for Novell which was in terms of thousands of dollars. So really with the Microsoft schools' programme we really had to take advantage of that. We couldn't really ignore that. So that was another reason why I decided to change to Windows 2000 [CT: int. 105-111].*

*[the change to Windows 2000] makes life certainly a lot easier for staff and also students [CT: int. 56].*

Clearly from her comments '*I decided*' [CT: int. 111] meant just that. The timeline to complete the work was subsequently discussed and decided between the computer technician and the external computer company. No one else was involved in the implementation process. There was no communication back to the task force, neither informally via emails nor formally through a meeting, nor to staff from the task force. Because the task force never put action items into the minutes nor referred back to minutes again at its infrequent meetings, the computer technician was used to assuming from the technical 'discussion' that she would then put any matters raised into place. That was her role, as far as she was concerned. However, she did not see her role extending any further than this and therefore did not consider that she needed to communicate back to the staff about what was happening on the network. She was adamant about it not being her role to communicate issues back to staff. She says:

*at two meetings last year [2002] it was discussed about changes and priorities were set for the current network. I have gone ahead and implemented those but because there has been no feedback to staff through the committee, I have found myself in a situation where I have made major changes and it hasn't been smooth and then I have been in a situation where staff have been unhappy [CT: int. 34-39].*

*I don't think it is my role to communicate back to staff. My role should be as the technical person to the IT committee who then implements what that committee agrees to do and then puts out information to the staff. The original IT committee I was on did it that way [CT: int. 125-128].*

Two problems arose as a result of the computer technician's initiative to action the decision. Firstly, the discussions she had with the external computer company did not take into account an adequate timeline for the work to be completed over the two-week period. Secondly, because staff were not aware that a major change was going to take place over the holiday period, they were surprised and frustrated when they arrived back at school to find they couldn't log on the way they had done in the past.

The discussions with the computer company took place in isolation from other school matters, even the principal and deputy principal did not know about the changes. The computer technician and computer company were not aware, for example, that the timetabler would require access to the network during the holiday break. The length of time to complete the changeover was miscalculated and so the network was not functioning correctly by the time staff returned from holidays. This led to a high frustration level and a lot of staff ill-feeling. The timetabler outlines the situation:

*I think them trying to change everything over from the Novell server – you know everything in a fortnight that they set themselves to do with Easter falling in the middle and Anzac Day at the end of the holidays. They lost three working days out of ten. You know 30% time down and I don't know if they underestimated the job, or it backfired on them, or the network was harder to work things [T: int. 76-80].*

In the timeline there should have been consideration given to professional development for staff, since changes from one system to another require new skills such as a different log on and email system. However, because the computer technician is concerned only with the technical changes and because there was no timeline nor forward thinking done at the task force meeting, these issues were not considered.

The second problem of not communicating the changes to the staff created a stressful situation for the staff and also the computer technician who became the main target of the frustration. The computer technician describes how she felt:

*staff have been unhappy [about the changes]. This is not a problem but it is stressful and I don't think it needs to be that way {CT: 39-40}.*

The deputy principal also expressed his concern about the overall process. He notes:

*it has been very much an on-going saga, but again, dare I say, none of this, well perhaps it wasn't foreseen, but neither was the management of this work process discussed and considered – how can we actually manage this process? What is going to happen? What will be the impact on people trying to get their work done? These are important decisions because they seem to have come apart at the seams and to have taken longer and been more complex than they thought and led to a fair amount of anxiety, frustration and almost anger from the staff [DP: int.71-78].*

In this comment the deputy principal raises some key planning points and it probably needs to be questioned that since he is a member of the task force, why these issues were not raised by him at the meetings. Perhaps this can be traced back to the leadership of the group and also the perceived 'task description' assigned to the task force by the principal. The computer technician considered that, even when the discussions were taking place at the meeting, she felt the people on the committee were not really aware of the changes that would be required. She points out:

*they [the task force] didn't realise what they had actually implemented – or what they had agreed to do and so my understanding of what they wanted and their understanding of what was required to get what they wanted was different [CT: int.41-44].*

The point made by the computer technician is supported by the view held by the Head of Computing. She explains:

*people [staff] knew we were probably going to get access from home but not what we had to do to get that and so there have been a lot of very disgruntled people this week {HoC: int. 118-119}.*

It would seem from the interview data that there was a lack of open discussion with all the information presented, no clear agenda for the task force and little to no communication and discussion back to staff. Communication pathways that enable

people involved in making the decision are considered essential in the models of decision-making discussed in Chapter 2.

Although the decision to move the network from Novell to Windows solved some of the issues confronting the school, the manner in which the process occurred has had a very negative effect. Tracing the problem back, it is apparent that there was unclear leadership. Leadership of ICT is seen as critical to the overall process (Gebhart, 2003: Barone, 2001). However, the lack of insight into the overall process is clearly seen when the principal says:

*the staff, I understand, were not told. So of course they came back after the holidays and found a different system [P: int. 58-59].*

The deputy principal, also with a strong leadership position in the school, appears almost to have abdicated responsibility for ICT decisions when he describes his feelings:

*I think as a school we look rather stupid because a lot of, I think fairly weighty decisions, have never basically come past us [DP: int. 75-80].*

From the preceding analysis it is clear that there is no strategic plan in the school able to be linked to a technical plan, something considered essential by a range of researchers (Ringle and Updegrave, 1997; Duderstadt, cited in Ward and Hawkins, 2003). For this reason decisions appear to be ad hoc and based usually around a sum of money. Cartwright (2003) makes it very clear that a strategic and technical plan should drive the ICT processes in schools so that budget decisions are derived from these. However, in this situation the budget drives all further decision-making. Without a structure and process to guide decision-making there is every chance of ad hoc decisions being made by different people within the school. The computer technician expressed her concern about this possibility. In her words:

*I am concerned about ad hoc bits being added. I am talking about a particular department or staff who may see that they desperately need or have to have a computer and so they go and see whoever is in charge of that and the person says – OK- yes that's right. If you don't have an overall plan you then get these little bits being added and they may well cause hiccoughs in the network [CT: int.116-120].*

She sees it as her role to ensure that ad hoc decisions to add computers to the network don't happen. She says:

*I think if you don't have someone like myself overseeing that is the sort of thing that can happen and I think that the potential for that to happen is here if I didn't stand up for the network [CT: int. 121-123].*

The essential role the computer technician plays in preventing ad hoc decisions occurring was noted by other staff. The Head of Computing suggests that:

*the computer technician is really great and she is very aware of not just carrying things through – like getting a request to put a computer here. She is very conscious of not doing that because we don't want our network made unstable [HoC: int. 111 –113].*

As noted there was a high level of staff frustration when they returned from the holiday break to find that the system was different and still not completely operational. However, instead of questioning the overall process, because the changes were technically based, there was resignation and acceptance by many staff that this is what is to be expected when big technical changes are made. The deputy principal and timetabler describes the situation:

*I think it will be better. I mean access from home I think will be a big thing, especially as report sessions come up [ DP: int. 99].*

*It is a well set-up network. I mean they tell us it's one of the best. So it is a great system we have, but it has problems at the present time. They [the computer technician and computer company] will iron them out [T: int.84-85].*

Figure 4.2 shows diagrammatically the people and processes involved in the decision made to move from a Novell Netware networking platform to Microsoft Windows ® 2000. The issues that the school considers are important to try and solve have been drawn as 'a cloud shape' to represent these issues 'floating' somewhere above the decision-making process. The figure indicates that it is difficult to solve these issues if the current networking system remains. However, this information has not been communicated back to the ICT task force. When the computer ICT task force discusses the issues the computer technician, who is a member of the task force, picks them up. There is a lot of discussion between the computer technician and the outside computer company about the issues and the best way to solve them. The heavy two-way arrow on the figure shows this. Acting on advice given to her by the external

computer company and knowing that the ICT task force wants to be able to solve the issues she gets the computer company to make the changes. As shown in the figure this information is not communicated back to the ICT task force. Although the task force has identified the issues they have not set in place time lines for the work to be done nor communicated the situation to the rest of the staff. In fact, they play no further part in the decision-making process. As can be seen in the figure, the pathway for the process to the staff is independent of the actual decision-making process which ultimately leads to the network system being completed over the holiday break with only the computer technician and outside computer company being aware of what was happening.

#### **4.3.4 Ministry Draft Documents**

The Ministry draft documents sent out to all schools did not appear to have guided any of the decision-making processes. They had never been tabled at any of the ICT task force meetings. The computer technician comments:

*I haven't seen any of these. Nothing like these have been tabled at any of the task force meetings I have been at [CT: int. 85-65].*

The only response shown by the school to the Ministry request was to complete a hurried draft plan to obtain funding. As noted by the principal:

*we [task force] then in 2000 brought the group together. We had to justify to the Government for some money and so that was a fairly skimpy sort of exercise [P: int. 18-19].*

#### **4.3.5 Professional Development**

The school is part of a cluster, with two other secondary schools, for ICT Professional Development (PD). The decision-making relating to professional development is initiated through a Professional Development Committee and separate from the ICT task force. However, the funding received from the Ministry of Education is for ICT Professional Development. Initially the focus of the cluster was to develop ICT

teaching and learning resources for the Ministry Web Site (TKI<sup>21</sup>), but more recently the focus has changed to teaching and learning. Many of the staff have, as part of their professional development, attended conferences within New Zealand. The two deputy principals have both visited Glen Waverely in Australia to look at different ways of integrating ICT into teaching and learning. The principal considered that the Ministry Contract and staff conferences, together with the visit to Australia by the two deputies, had identified the need to become a 'Thinking School'. With this in mind a Teacher Only Day later in the year has been set aside for staff to look at ways of teaching thinking skills. Although not directly linked to ICT, the Head of Computing thought that this was a step in the right direction to begin the integration of ICT into teaching and learning. She points out her view:

*the focus has to go the other way. What ends up happening is that the deeper people look at their teaching and learning the more they seem to naturally flow on to using ICT. But rather than looking at how can we use computers in our class the focus is the other way and they end up realising that the computer is what is going to give them up to date information [HoC: int. 21-26].*

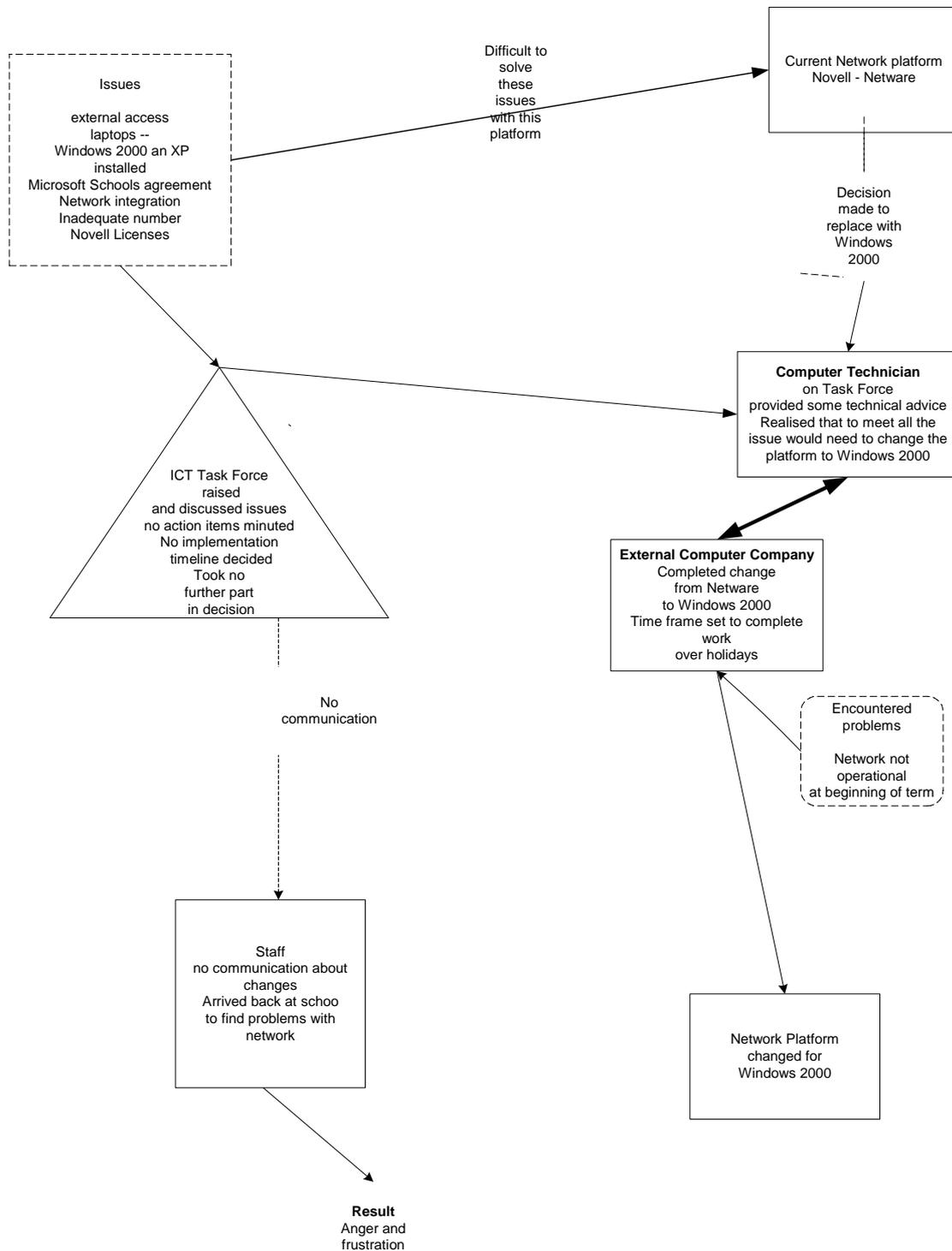
Even though there has been an attempt to become involved in a professional development cluster and money has been spent sending staff to look at other schools, there is no overall professional development plan. The move towards a 'Thinking School' is a step towards linking ICT into curriculum and pedagogy (Stratford, 2000; McKenzie, 1998; Atkin, 1997).

Linking ICT professional development to technical needs is not discussed, since these issues are not raised at the ICT task force meetings. Evidence of this was seen when the decision was made to change the networking from Netware to Windows. Staff training and development should have been an important part of the discussion. However, it didn't take place. Possibly, as a result of the unclear direction for the task force, professional development is not considered the brief of this committee.

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<sup>21</sup> TKI = Te Kete Ipurangi, the Ministry of Education's bilingual education portal. Providing access to curriculum, assessment, professional development advice and support.

**Figure 4.2: People and Processes Involved in Decision to Move the Networking Platform**



Although the computer technician picks up any technical issues and converts the discussions from the meeting into actions, because she is not a teacher, she sees no

role for herself in being involved with decisions relating to professional development. There is, therefore, no link between professional development requirements and technical requirements. As noted by the technician: *'My role should be as the technical person to the IT committee .....who then puts information out to the staff'* [CT: int,126-128].

The Head of Computing runs some ICT based professional development courses after school to assist with up-skilling staff, but skill levels have not been identified and there is no coordinated approach. The timetabler explains the situation:

*there have been the odd sessions she [Head of Computing] has offered after school and good on her. People have gone and got a little help. There are positive things happening but they are not happening in a coordinated way* [T: int.178-180].

A strategic plan that incorporates a professional development programme into the overall school goals will provide better success for integration of ICT into teaching and learning (Stratford, 2000; Hay, 2001). Although there are pockets of professional development activity in the school, without planning this will have little overall benefit. Planning and forward thinking in turn requires good systems and careful leadership (Chapple, 1992). It would seem that neither of these factors are currently evident.

Figure 4.3 outlines the ICT decision-making and information flow within the school. The figure shows that there are three separate vertical strands operating within the school – professional development on the right of the figure, all technical decisions in the central section, and the task force and staff on the left of the figure. These strands illustrate that there is no interweaving of planning, professional development nor underpinning of the technical decisions to support teaching and learning, development and integration. Each strand appears to operate independently resulting in confusion, as identified by some staff in the analysis of the data, many of whom see the immediate need for planning and refocusing of the committee's role.

The principal is linked in the figure to the Board of Trustees, finance committee and Ministry contracts. Because of the budget and Ministry contract the principal then establishes a task force with the specific role of spending the funding. Although the

principal indicated that his decision-making process was based on a strategic plan, analysis of the interview data indicated that this plan had been established seven years ago. For this reason the strategic plan is linked only to the principal in the figure and is drawn on the diagram as an irregular shape to represent a plan with little direction or influence on the overall decision-making process. The main decisions arising from the task force are related to the budget. That is, this group decides how best to allocate the allotted amount of money within the school. The task force, although receiving some information from staff via the members on the committee plays a minimal part in the overall ICT decision-making process. This results from the lack of a strategic and technical plan to guide the decision-making process. Even professional development is separated from the task force role, isolating ICT professional development decisions. This situation was highlighted in the data when laptops were introduced into the school and there was no staff professional development established.

The central role for all technical decisions is shown by the central position on the figure of the computer technician and the external computer company. All technical information from the task force minutes is actioned via the computer technician to the outside computer company. There is strong communication, therefore, between the computer technician and the computer company, but this information is not communicated to staff nor back to the task force.

The figure indicates that, although responses from staff are elicited with regard to ICT issues and spending requests for departments, in fact the staff are isolated from the decision-making process. This is seen in the figure. There are no communication lines back from the technician and outside computer company with regard to technical changes; no information back from the task force and only a small amount of information related to professional development during a teacher only day.

#### **4.3.6 A recent Decision – Introduction of Laptops**

The ICT task force was not involved at all in any of the decisions leading up to the introduction of laptops into the school. This, while not being desirable, it is probably to be expected since the task force had been given the specific brief by the principal of establishing how the budget for ICT should be distributed. For this reason there was no ICT group with specialist knowledge to examine all the issues associated with the laptop offer nor to make submissions to the Board. Instead an approach was made, from the Heads of Department committee to the principal, for consideration to be given to the Ministry's offer of laptops. Although the principal was reluctant, the issue went to the finance committee of the Board of Trustees, where the staff representative spoke strongly in favour of the Ministry laptop offer of providing financing for two thirds of the value of a laptop for permanent teaching staff. The Board agreed to allow the school to apply for laptops and gave approval for the Board to finance the additional third cost per machine. The timetable outlines what happened:

*it was a very late decision made last year mainly through a few of us pushing more at an HOD's [Heads of Department] meeting. I don't think the principal was really totally supportive of wanting to do it, but it was really pushed by some senior staff who spoke out quite strongly in favour of it [T: int. 135-140].*

##### **4.3.6.1 Strategic Planning**

The pending introduction of laptops did not encourage the school to consider a strategic plan to look at how laptops could be used to improve teaching and learning. The main focus seen by teachers was that the laptops would become a tool to assist them with administrative tasks.

##### **4.3.6.2 Technical Planning**

Once the Board had given approval, the principal told the staff that all those eligible for a laptop would be receiving one. Because there was no group designated to oversee the introduction of the laptops there was no forum for deciding how the

laptops would be introduced, what would be the technical requirements of the network and what staff training and security issues would need to be considered. The computer technician, who personally did not qualify for a laptop<sup>22</sup>, had no opportunity to consider the technical requirements. She had ascertained from the Ministry web site that the laptops would come installed with the latest software which included linking to networking system of Windows®2000 and having client software of Windows®XP. No account had been taken of what the software requirements would be to fit in with the school infrastructure, nor of professional development and staff information.

The timetabler expresses his concern:

*when you get an influx of a huge number of machines like that you have to be really well thought out – how they are going to be issued, how they are going to be trained [T: int. 155-156].*

When the laptops arrived, the principal announced that staff could take the laptop once they had signed their contract. The timetabler explains what happened:

*basically it ended up with the computer technician overseeing [the distribution of the laptops to staff]. The principal announced that staff once they had signed their documents could take them [laptops]. She [computer technician] did not want that to happen nor did the technical people in the background. They said no they had to be ghosted<sup>23</sup> to our system and there were a lot of things that had to be done [T: int. 141-145].*

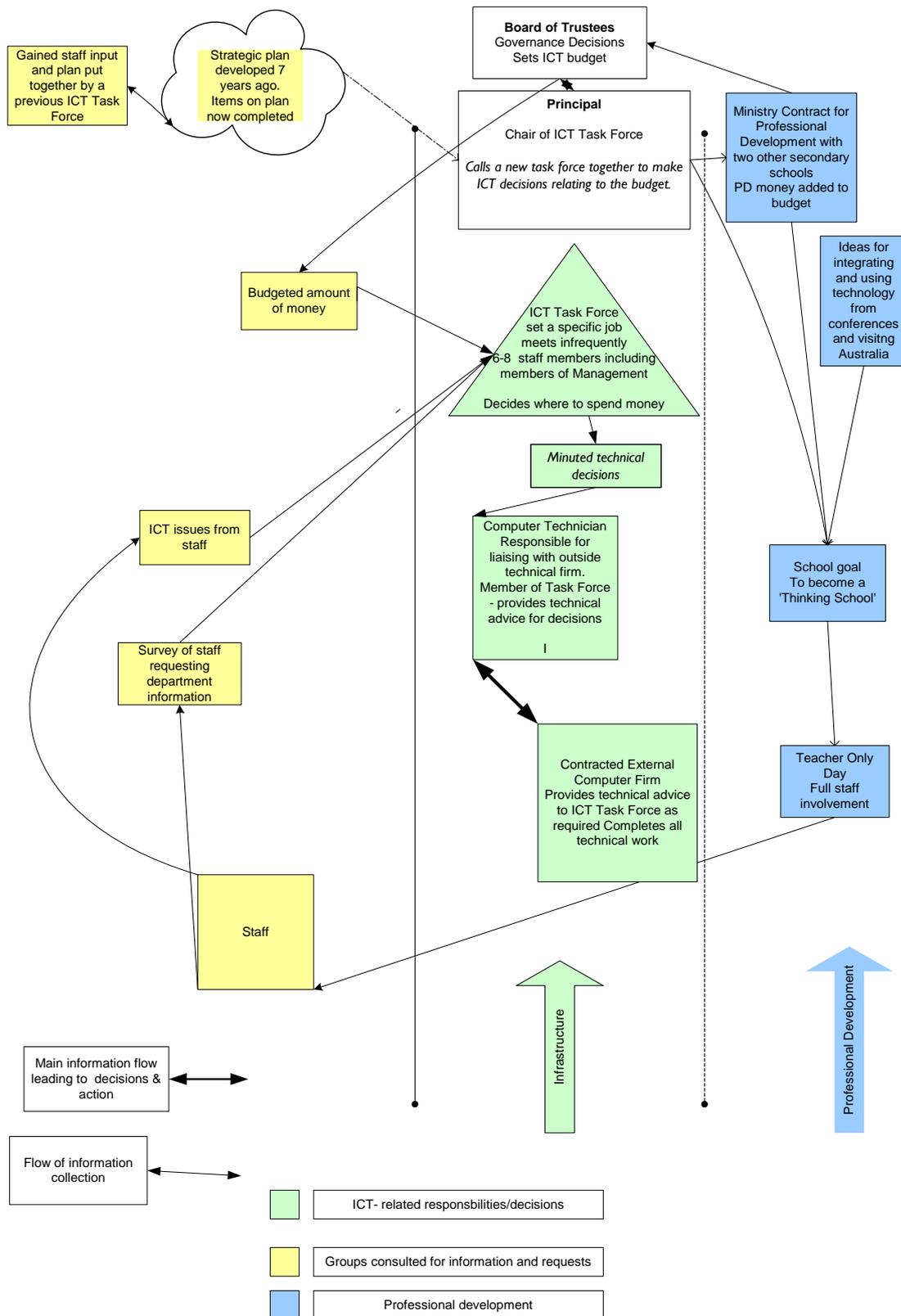
However, there was no designated forum for discussion of these issues. Effectively the principal took bureaucratic control of the process. Part way through the distribution of laptops to staff, the principal left to go overseas. The task of allocating the laptops then fell to the computer technician.

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<sup>22</sup> Because the computer technician was not a teacher she was not eligible under the Ministry scheme for a laptop.

<sup>23</sup> Ghosted = a system that will install a set of the same standard software on all machines.

**Figure 4.3 Decision making and Information Flow in School B**



#### 4.3.6.3 Integration of Laptops – Professional Development

Adding to the problems of not having the laptops correctly configured to the network was the lack of professional development given to staff, since the external computer company provided only a small amount of professional development when the laptops were first issued. After this very brief introduction to the laptops there was no further professional development, a situation created because of the lack of an overall plan for the laptop implementation and the separation of professional development and computer technical matters in the school. The timetabler describes the effect:

*a little bit of knowledge is dangerous with computers. Some of them have changed password numbers or they have happened to change them and they don't know how they have done it. It all needs sorting out [T: int.152-154].*

The uncoordinated way in which the laptops were issued has created extra work for the technical people, and caused a good deal of frustration among the staff. The Head of Computing notes:

*one of the effects of this [laptops introduced] has been the increase in workload of the computer technician and mine too to an extent with people converging on you and asking you things. Which hasn't really been dealt with at this stage [HoC: int.100-102].*

There has been a long delay in sorting out the technical details so that the laptops can be used – a much longer delay than would have occurred if the decision had been followed through with a coordinated implementation plan involving technical and professional development aspects. The timetabler explains:

*there have been problems with security around the school. Right now they are only just starting to get hooked up back to the network [T: int.164-165].*

Careful planning prior to the introduction of the laptops would have meant that the staff anticipation about the laptops could have been used by the school to gain a better commitment by the staff for the use of computers for teaching and learning. However, with inadequate staff training and lack of support this has had, in some cases, a detrimental effect. The timetabler comments: *'I haven't worried about mine [laptop]. I just leave it at home and use it there'* [T: int. 166-167].

#### 4.3.7 Summary

In school B there is little apparent leadership from either the principal or deputy principal in any of the issues relating to ICT development, management and integration. In fact, when the issue to change the networking platform took place, both the leaders expressed surprise. Although Riffel and Levin (1997) note that technological change involves complex processes within the organization, it has been clearly established in the literature that the leader plays a critical role in all ICT decisions (Capper, 1994; Gebhart, 2003; Barone, 2001; Fleit, 2000). As noted by Ross and Weill (2003), abdication by the leader results in disaster. While the principal in school B has not formally abdicated nor shifted the leadership for ICT to someone else in the school, there is no direction nor focus that has been established to enable a coordinated approach to ICT development, integration and management.

At the end of 2002 a new task force was formed by the principal. This group is made up of members of the management team, the computer technician, the Head of Computing and other staff who are interested in ensuring that they have a say in the way resources are allocated. It is the principal's responsibility, as chair of the task force, to set the agenda and call the meetings. However, the group meets very infrequently and does not have a clear direction nor procedure once decisions are made. The role assigned to this task force at the end of 2002 was to look at ways of spending the ICT budget approved by the Finance Committee of the Board of Trustees. Cartwright (2003) warns of allowing a budget to drive the decision-making process. Instead there should be clear goals and objectives set by the group. The budget then underpins what can be achieved at that point in time. By making the group responsible for dividing resources between departments, the committee does not function collegially, but assumes a political stance, with members making decisions based on what is either best for them individually or for their department.

The computer technician and the computer company have a pivotal role in all technical work. The computer technician is a member of the ICT task force, and although she sees her role as informing the group about technical decisions, she does

presume a level of technical understanding that the group does not appear to have. Once the task force has discussed the matter or issues and suggestions have been made, she considers that this is the catalyst for beginning technical changes in conjunction with the computer company. From this point on there is no further communication with task force members nor the staff as a whole and so technical changes become surprises for the staff. This situation is exacerbated by the limited brief given to the task force who are not involved in planning an overall strategy for the school. Limited and infrequent meetings also reduce the opportunity for any further discussion and a lack of action items in the minutes makes the purpose of the meetings unclear. In fact, without the action taken by the computer technician to implement changes, no technical progress at all would be evident.

Lack of planning and goal setting has meant that the intranet development, a vital teaching and learning resource, is not operational. Although the school has received Ministry funding for professional development, and this has provided the opportunity of linking with other schools in the PD cluster to share ideas and resources, the effect has been limited to those departments and staff actively involved in the PD contract. It is not a school-wide initiative. It could also be argued that gathering information from another school does not necessarily enable staff members to move out of a comfortable school mode and find out what is really happening with technological changes outside education. Riffel and Levin (1997) warn that schools consult narrow sources of information and that most of the information gathered comes from other schools. This provides an introverted view and tends to reinforce opinions already held, rather than shaping new ideas. The additional funding has enabled some staff members to attend conferences and to bring ideas back into the school. This has resulted in the school focusing on becoming a 'Thinking School' with the hope that once staff members are looking at different ways of teaching, ICT will become better integrated into teaching and learning. However, because the data indicates that professional development is not linked to ICT technical planning and that there is no strategic plan, it is possible that the initiative of using ICT to become a 'Thinking School' will not follow through to all staff members. Certainly the data indicates that any up-skilling of staff members in ICT happens on an ad hoc basis when the Head of Computing is able fit in some time after school. Once again there is not a coordinated approach with clearly designated people who have a role in the process.

The introduction of 30 laptops into the school, although providing many staff members with access to computers for administrative purposes, has also created a number of issues possibly because of a lack of planning and management. While professional development was run by the external computer company when the laptops first came into the school there has been no follow-up, with the result that many staff members are not gaining maximum benefit from their laptops.

Analysis of the data indicates that there does not appear to be a coordinated approach for technical developments linked with teaching and learning and supported by professional development. There is strong feeling expressed by the staff members interviewed that this is important. The failure to do so has been shown to result in decisions and initiatives occurring within the school on an ad hoc basis. Perhaps the decision-making model that this appears to follow is the garbage can model, since computers are bought and put into parts of the school without any real thought or planning about how they might be used. Professional development, a separate decision-making area in the school, puts in place an initiative to become a Thinking School. As noted by the Head of Computing it is hoped that teachers may, through the 'Thinking School' strategies see a way of integrating computers into teaching and learning. If it should happen then it will be because of a chance alignment, and not initiated as a result of a careful plan.

## **4.4 Case Study School C**

### **4.4.1 Background Information on Computer Network**

School C is within easy reach of a regional city centre and major tertiary educational providers. It is a medium-sized co-educational state school serving the needs of its immediate, diverse community. The total roll of 719 students, with an additional 80 fee payers, is made up of almost equal numbers of boys and girls. The ethnic composition of the school is approximately, Pakeha 76%; Māori 10%; Pacific Island 8% Asian and others 6%. The school considers that it is multi-cultural and celebrates each culture, encouraging tolerance and acceptance of those with different cultural perspectives. The school's decile rating was changed by the Ministry of Education from 6 to 5 at the end of 2002.

The management team is made up of a principal, deputy principal and two assistant principals. The hierarchical management structure is underpinned with four major committees. The Heads of Department committee has been recently established by the new principal and includes all department heads in addition to the senior management team. The principal chairs this committee. The other committees include the reporting, assessment and profiling committee, curriculum committee and teaching and learning committee which manages professional development. The Heads of Department committee meets on a fortnightly basis, while the other three committees meet on alternate weeks, making it possible for members from the Heads of Department committee to choose to attend any one of the other three committees. Membership of these three committees is voluntary.

Computers, in some form or other, have been in the school since 1992. Currently there are five major computer suites, with between 15-30 computers in each. There are also five pods of between 7-13 computers, making a total of approximately 270 computers. In addition to these, 50 laptops were introduced into the school at the beginning of 2003 for permanent full-time staff, boosting the overall computer

numbers. For the size of the school, there are a large number of computers with a ratio of computers to students of 1:2.44. The principal indicates:

*I don't think we have too many but, I think we have a lot and yet we can't find 10 computers for the library, even though we have brought 50 laptops into the school [P: int. 54-55].*

The networking system is Novell, Netware 6, while the client machines are predominantly running Windows ® 98, with the new laptops running Windows ® XP. The network is based on a fibre optic cable backbone, although this does not extend to all areas of the school. Coverage has recently been improved by the addition of wireless. It is the intention of the school to complete the cabling as soon as possible, since the wireless connection is slower.

The network is managed and maintained by the network supervisor who is a trained teacher. He is also currently the acting head of computing and so the other 50% of his week is spent managing a department and teaching. Other technical support is provided by a technician, who works 30 hours per week and an additional part-time technician, who comes in for a few hours at the end of each day. About 8% of the overall school budget is allocated to ICT development.

Intranet development is in the rudimentary stages and currently offers some administrative services. As staff are able to, subject areas are also being developed. The use of the intranet as a teaching and learning tool is limited at the moment.

In summary, the school seems well served with computers. There are certainly a large number, although access and availability are issues alluded to by the principal. By taking up the Ministry's offer of laptops, the school has provided better staff computer access.

The next section discusses the role played by some key people in the ICT decision-making process. These include the principal, network supervisor and the ICT committee. Although other people from the ICT committee were interviewed their

viewpoints are incorporated into the overall discussion, rather than being treated separately.

## **4.4.2 Key People**

### **4.4.2.1 Principal**

Since her appointment the principal has made some major changes to decision-making structures within the school. The main committee is the Heads of Department committee and she considers that this group serves a very important role in the school. She says:

*the Heads of Department committee is a large committee because we don't have faculties .....and it is quite often making decisions which I will either accept or not and mostly I do. If the Heads of Department have agreed on it and we have come to a consensus then that is the decision made [P: int. 173-177].*

Apart from the senior management team, the Heads of Department committee occupies a prominent position in the decision-making process. Representatives from all parts of the school provide a good sounding board for ideas for the principal. The principal relies on the feedback from this group and if there is agreement about an issue within the group the principal considers that the decision has been reached and there is no need for her to consider it further. Apart from the fact that the group provides a wider perspective on the school, the principal also considers that she would expect recommendations, particularly about teaching and learning issues, to come from this group since *'they have the expertise'* [P: int. 186] in this area.

The reporting, assessment and profiling committee, curriculum committee and teaching and learning committee occupy the next layer down from the Heads of Department committee. Each of these committees meets on a regular fortnightly basis. Although there is an ICT committee, the principal views the role of this group as providing her with recommendations that enable her to make decisions. The group, therefore, does not have a decision-making role, merely an advisory one. Before becoming principal she was a member of the ICT committee, but now attends only if she wishes to present information. The deputy principal notes that:

*as principal she normally doesn't go unless she needs to. She would rather wait for recommendations to come through. It is much easier for her unless there is something she wants to present to them to leave the rest of us to do it [DP: int, 67-70].*

The principal expressed a concern about the constant expense created by technological demands. Under the system established by the previous principal there had been no depreciation fund for computers, with the result that there was no reserve of money built up to replace old computers. She laments:

*I don't think we have a good policy at the moment on depreciating computers in the school and that's something I am really keen that we look at so that there is a bit of cash in hand to replace them [computers] when we need to {P: int. 49-53}.*

#### **4.4.2.2 Network Supervisor**

The network supervisor is a staff member who also teaches three classes and is acting Head of Computing with the associated responsibilities required of this position. Fifty percent of his time per week is devoted to teaching and Heads of Department duties. The remainder is spent managing and developing the computer network. He also chairs the ICT committee and is responsible for calling meetings and preparing agendas. By being an acting member of the Heads of Department committee, in charge of the computing curriculum area, responsible for the technical side of the network and chair of the ICT committee, he is privy to information and has a prominent position in the ICT decision-making processes occurring in the school. In fact the network supervisor makes all the technical decisions. He outlines the process:

*the technical decisions are made largely by me and I guess that's appropriate because I am the person with the best overview of what is happening [NS: int.12-13].*

Although he does discuss his ideas and plans with the computer technician and the other part-time technician, it is not clear how much influence they have on an eventual decision. The computer technician says:

*he [network supervisor] pretty much flicks everything past us – but ultimately he is in charge of ICT in the school and I guess he has got more of the big picture stuff [CT: int. 3-5].*

The principal's view of the situation was that, although all submissions and technical work were carried out by the network supervisor, because there were two other technicians working in the school this provided a safety net, ensuring that the information and direction chosen were reliable. She outlines her view:

*together they [network supervisor, two technicians] work very much as a team. So it is never just one mind that looks into a number of different possibilities [P: int. 25-27].*

The network supervisor's information and knowledge gained for running the network comes from discussions with other people, in particular the two technicians. He tries to attend at least one conference annually and although there is usually some technical information available, the focus is predominantly on teaching and learning. He says:

*the focus of these conferences tends to be on teaching and learning but there are usually some workshops of use in network infrastructure administration. There are very few resources for network administrators in schools but I do keep up to date by reading magazines and searching the Internet [NS: int. 138-143].*

Occasionally, the school will seek outside help for a specific problem. This has recently been the case when there were issues with the Pupil Administration package – MUSAC and assistance was sought from the software company. Trotter (1997) advises that leaders should have some technical understanding and consult outside specialists for technical opinions. It is certainly important that leaders do not come to rely on just one individual within the school for all technical advice.

#### **4.4.2.3 ICT Committee**

The ICT committee has between 8-10 staff members present, although the number of people on the committee varies from year to year. Membership is open to all staff, but there is a heavy weighting of Heads of Department. The principal outlines the situation:

*most of our committees are open so whoever wants to go on can. With the ICT committee it tends to be – the guy who runs the network, obviously and he is also the main computing teacher in the school now, head of technical, head of commerce since they are huge users of computers, head of art. They are the main immediate users and then quite often there are other people who are representing the classroom teacher who may or may not use them. The number of people on the*

*committee depends and varies from year to year. It depends on who wants to be there [P: int.34-42].*

Committee membership, therefore, depends largely on those staff who are interested in being on it for either personal or departmental reasons, or who have some technical understanding of issues. The deputy principal and principal explain their views:

*that body is largely an interest group so it involves key people who are using computers all the time. They sort of put themselves on there, anyway just to keep track of it [DP: int. 63-65].*

*I think that the people who sit on that committee [ICT committee] have the knowledge that is needed and they are obviously the ones who are specifically interested and often with a vested interest, either because they have got a pod of computers like graphics and languages or because they are people who are using computers as a tool every day [P: int.178-183].*

The network supervisor chairs the ICT committee. It is his role to set the agenda and call the meetings. The committee does not meet on a regular basis, as the other committees in the school do, mainly because there does not appear to be an on-going role for the committee and also because members from this committee will be required to attend other committee meetings – such as Heads of Department or curriculum. When there are regular meetings scheduled in a school for only some of the committees, those without pre-arranged meeting times tend to miss out. The principal notes:

*at present they [ICT committee] will meet at least usually once or twice a year, but when it is coming up to the budget round to work out what we can and can't spend. So not on regular monthly basis or anything like that [P: int. 81-84].*

The main focus of the ICT committee from the principal's perspective was that it made recommendations to her, related to expenditure and allocation of computer resources. The principal explains:

*it [ICT committee] doesn't make decisions, it makes recommendations. ....we can afford on a year to year basis, rather than saying a percentage of the budget will go into ICT. It is a little bit ad hoc probably [P: int. 29-33].*

The deputy principal echoed the principal's view that the role of the committee was mainly related to recommendations concerned with financial and resource allocation.

He says:

*well normally it [ICT committee] has a big role in the funding of ICT – the maintenance, the upgrading, any new things we want to do [DP: int. 56-57].*

The network supervisor, as chair of the committee, plays a central role in this process.

The principal explains what happens:

*the [network supervisor] does all the paper work consulting with departments, looking at their needs, looking at the age of the computers, knowing where all our hardware requirements are. All that sort of stuff goes through him. So he puts the paper together and then the committee goes through and prioritizes. A list of priorities for the school and those recommendations are then made to the principal for budget considerations each year [P: int. 44-49].*

The principal thought that, although the main role of the committee centred around trying to achieve an equitable division of the budget between departments, which according to the network supervisor – '*is always the most difficult meeting of the year*' [NS: int.20-21], there was still a need for an ICT committee. By putting spending items into a prioritized list for the principal this protects her from individuals approaching her for spending requests. She comments:

*I think there is a need for the committee to have a look at prioritizing. Otherwise everyone comes here to lobby. It provides a buffer for me but they also have the technical experts there. I don't have that expertise and so I rely on them [P: int. 182-184].*

In summary, the ICT committee is a group, seen by the principal as those with the necessary technical knowledge, to prioritize a spending request list for ICT resources. Decisions, therefore, about the distribution of computer resources are approached with a technical focus rather than from what is required for teaching and learning. In fact, teaching and learning recommendations are made by a different committee within the school. Although the request list precedes the budget amount, money is still the main focus of discussion. For that reason the membership of the committee, although fluid in that it will change from year to year, is predominantly made up of those staff with a vested interest in the process. The committee, while not making the final decision, still has the power to make the overall recommendations to the principal, who admits

she doesn't have the technical knowledge and therefore, relies on recommendations from this group.

The way in which the committees are structured in this school does not provide a collegial and consultative decision-making approach. In fact, there is a hierarchical arrangement of committees with the Heads of Department committee at the top of the pyramid, underpinned by the three slightly less important committees of reporting and assessment, curriculum and teaching and learning. The ICT committee is ranked even lower in that it meets approximately two times a year to allocate resources which can be considered a political role rather than collegial decision-making process, since the members' main focus is to divide up the budget between the different departments based on judgements about computing interests. Members on the ICT committee also serve on other committees within the school. There are a number of Heads of Department who are also members of the ICT committee. Membership of the Heads of Department committee, that occupies a more prestigious position within the hierarchy of the decision-making process, enables those members to hold privileged information on matters discussed, which may have some bearing on the outcomes from the different committee meetings (Noble and Pym cited in Bush,1989; Dalton, 1950; and Janowitz,1959).

Figure 4.4 illustrates that the principal, although responsible for making all the management decisions within the school, relies on the Heads of Department committee to raise issues and to provide a sounding board for all school matters. This committee will make decisions when there is consensus reached. The figure shows that there is two-way communication between the principal and the Heads of Department committee and that it is also possible for members to side-step the decision-making process and lobby directly to the principal on issues where a department may have some extra funding and makes a special request directly to the principal. The network supervisor occupies a key position in all technical matters relating to the network. This can be seen in the figure by the central position of the network supervisor. Although he consults with his two technicians, shown by a darker two-way arrow, and with Heads of Department, it is he who makes final recommendations to the ICT committee for them to consider. He has the overall technical plan. He makes decisions autonomously with regard to technical,

infrastructure matters and in isolation of teaching and learning requirements. The role of the ICT committee is shown as a triangle on the figure to depict that the committee is made up of a group of between 8-10 members. Because of the composition of staff members on the committee and the role that is assigned to the group of distributing requirements based on the budget the committee is dominated by the politics of lobbying and self-interest.

#### **4.4.3 Key Processes Required for ICT Decision-making**

##### **4.4.3.1 Strategic Plan**

The senior management team and principal meet to consider aspects of the strategic plan. This initial document goes out for consultation to the staff before the senior management team and principal complete the final document. The strategic plan contains all aspects of teaching and learning but does not include a link to the technical plan for network development. Although a new strategic plan is currently being written, the network supervisor noted that there was no-one overseeing aspects of teaching and learning within the strategic plan nor linkage to the technical plan, although *'most curriculum areas are incorporating ICT into their work at each year level. Nobody is ensuring that this happens'* [NS: int. 145-147]. As noted by Ward and Hawkins (2003), decisions relating to technology are key strategic decisions for an organization.

##### **4.4.3.2 Technical Plan**

It appears from the data that the principal does not have a clear view of the technical plan and leaves this to the network supervisor. She describes the situation:

*we have strategic plans but not as far as ICT goes. Well we do but it is held really in the head of the network supervisor more than anything. I think he probably does have stuff written down but whether we end up implementing that depends often on the available cash* [P: int.85-88].

It was clear that she hadn't been instrumental in any of the technical planning and there was no link between the strategic plan, involving the development of teaching and learning and the technical plan, to support any initiatives. Both plans operated independently. Whereas the strategic plan had involved staff consultation and

discussion at management level, the technical plan was entirely the responsibility of the network supervisor. This means that the network supervisor has a pivotal role in all technical decisions. He outlines the situation:

*there is not a great deal of very long term planning. We have got an ICT policy document – an ICT plan which is only really written to get that Government funding that was offered three years ago, but it is still the basis on which we do most of these things. We come back and consult it. The plan needs updating, but it never seems to get to the top of the priority list in terms of the amount of work that we have to do [NS: int. 24-29].*

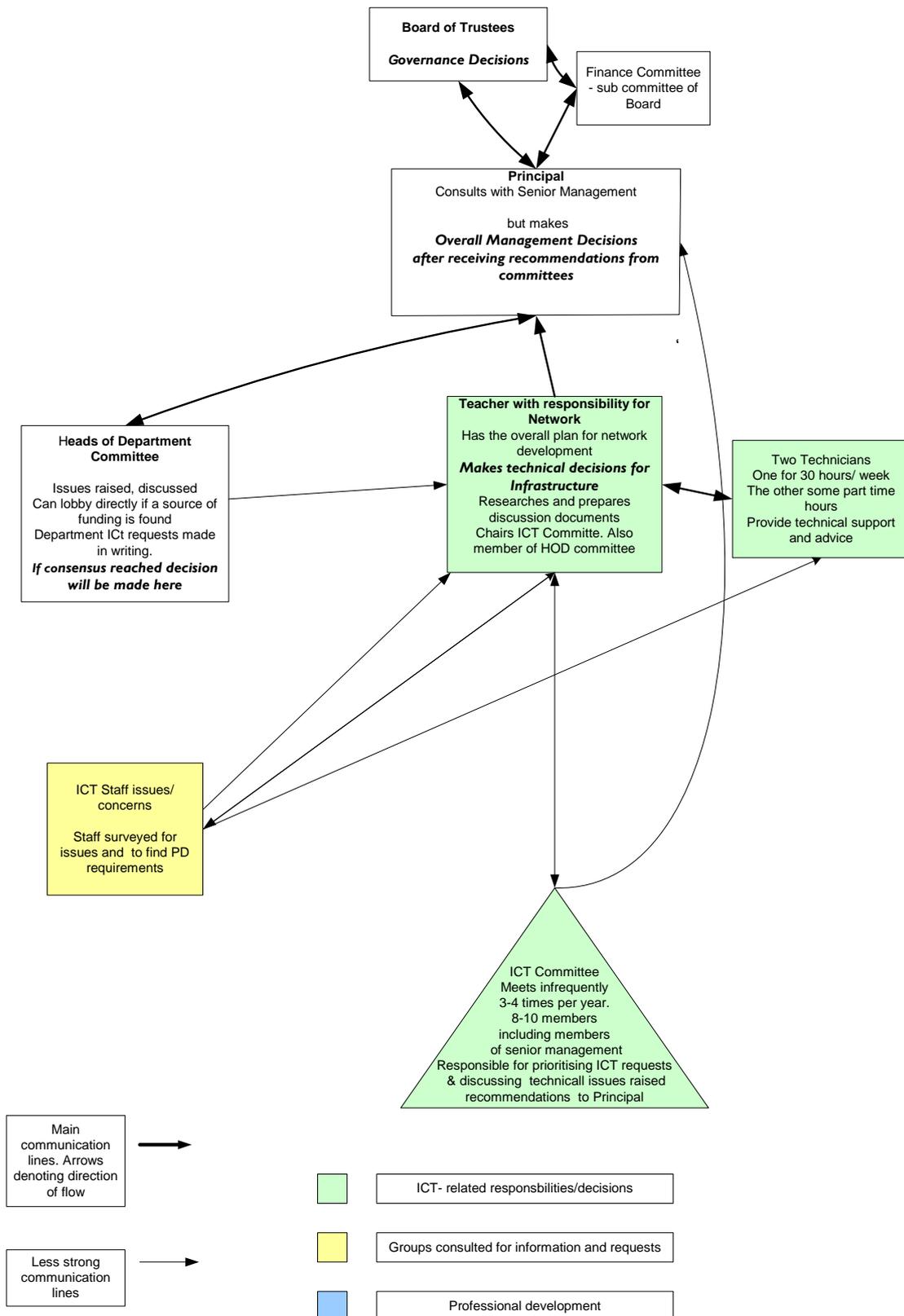
Although the network supervisor makes all the decisions relating to the network, departments submit to him an annual request for consideration. He puts all the requests into a collated 'random list' and takes this to the ICT committee which prioritizes the list. Because there is no overall technical plan linked to a strategic plan guiding the decision-making process, the committee encounters some difficulty in deciding who should get what from the requests. The network supervisor notes:

*that list is taken to our ICT committee and that's always the most difficult meeting of the year and we just effectively put them [the requests] in a rank order because it is very difficult to sort of say that one department's needs are greater than another we tend to come up with a rank order that is this year's, next year's, and maybe [NS: int.20-24].*

The main networking system is Novell Netware and although the laptops came into the school ready to link on to a Microsoft Windows networking system, the network supervisor could see no need to change networking systems. The only reason he would ever consider changing would be based on financial reasons. However, he considered that the amount of work and money required to change the network to Windows ® 2000 was too great. He explains his viewpoint:

*I believe strongly in Novell [Netware] as a platform. I think it is, very solid. The only possible justification would be cost because I do pay a substantial amount for a Novell licence every year.*

**Figure 4.4: Outline of ICT Decision-making and Information Flow in School C**



*It costs the school about \$4000. If I went to Windows I would have to start again from scratch and there might be some advantages – it would take more time than 2-3 of us working fulltime over the Christmas holidays to effect that change. As a teacher you can't work all your school holidays all the time and yet I often work very substantial parts of it [NS: int.128-137].*

Although, also a supporter of the decision to remain with Novell, Netware, the technician indicated that he was very busy each day supporting the network. He explains:

*I am here to make sure the network is running smoothly – the computers are working. I guess I do more the day-to-day fire fighting [T: int. 10-11].*

*If we have got a problem it is in the way we work. We do tend to sort of react to the latest problems first [T: int. 22-23].*

There has been some experimentation with putting older computers into classrooms so that there are between three or four present in each room. However, the network supervisor explains the problems associated with this decision:

*we have experimented over the years with having 3-4 older computers in the classrooms and it just doesn't seem to work. The teachers don't look after them. They are not used sensibly if they are used at all. It just doesn't seem to be an option. It should be, but it doesn't seem to be. Because they might be old Macs they may not be the same the teachers or the kids are familiar with, so accessing things seems difficult to them [NS: int.49-54].*

A number of pods of computers have been created by Heads of Department in their specific teaching area. This has been made possible, in some cases, by lobbying directly to the principal. She noted that it is quite possible for Heads of Department, who may have obtained some finances from somewhere, to come to her directly and seek approval for buying them. By lobbying, staff have a direct line to the principal, by-passing all other decision-making processes. In such circumstances the principal does check with the network supervisor, prior to giving approval, that the proposed addition of computers will fit into the existing network structure.

The principal sees computer access for students, somewhere in the school during out-of-class time, as very important. Because many students within the school do not have computer access at home, equity is an issue. Supervision of the computer areas during this time seems to be a problem. The principal comments:

*we have to have good computer access for the students somewhere in the school now they don't have internet access at lunchtime. In fact, they don't have access to the computers unless they can be supervised, except in the library [P: int.110-113].*

The issue of having access out-of-class time only in the library has meant that more computers are required in this area. The principal thought that with the introduction of 50 laptops into the school, computers from staff areas could be moved into the library for student use. However, this has created a problem. Initially, the principal raised the issue at the Heads of Department meeting. She outlines the problem:

*then we [principal and network supervisor] went back to the Heads of Department committee and said with the 50 laptops we really want to try and free up enough of the desk tops to put them [computers] into the library. If you have one and you know that it is not being used could you please tell us [P: int.134-136].*

This method was successful in gaining only one additional computer. The principal, together with the network supervisor, looked at the position of computers in the school and made a list of those computers that could be moved out. This information did not go anywhere else for further discussion or deliberation.

The network supervisor is responsible for the development of the intranet He explains:

*the school intranet has been designed and set up in consultation with me and, although there are improvements necessary, it provides a useful service for students and staff [NS: int.154-155].*

The intranet provides some information at the subject level, access to school databases and will shortly be used to communicate daily notices and news items.

The network supervisor's view of the network was 'that we develop our network as we need it' [NS: int. 114-115]. He describes his plans:

*load balancing is a real issue. Requirements for wiring. The objective is to wire every room. Wireless as a technology is great because of the flexibility but it is not high-speed technology. For example Classroom Manager<sup>24</sup> we are recommending that people don't run it on the wireless because it's just too slow. We have also had some issues with other Musac<sup>25</sup> packages on our system [NS: int.120-123].*

He is pleased with the progress made with the network and technical developments.

He goes on to say:

*my experience of over the 10 years or so that I have been managing the system here is that we have problems and sometimes they run for several months, but we always overcome them eventually. It is just a matter of running a long set of diagnoses and trying to come to some conclusions. I believe our system is very reliable indeed [NS: int. 124-127].*

#### **4.4.4 Ministry Draft Documents**

The network supervisor downloaded and read the Ministries *Information and Communications Technologies (ICT) Strategies for Schools 2002-2004* last year [2002], but commented that the document was not very useful. He explains:

*my feeling is that much of this document, as it relates to schools, is self-evident and in fact reflects what we have been trying to do here for some time, with slowly increasing success. The staff laptops are seen as a major move in the right direction in that they allow staff to develop their skills in ICT [NS: int. 148-153].*

The information supplied for the introduction of laptops was read very carefully. The Board of Trustees also read the information to make certain they were clear about what was involved. As the principal outlines:

*the Ministry documents have helped with the decision-making when we were looking at laptops. We read all the material really carefully and so did the Board, just to make sure we were aware of what we were getting into and cost and that sort of stuff [P: int. 204-206].*

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<sup>24</sup> Classroom Manager – a commercial administrative package for dealing with marks and reports.

<sup>25</sup> Musac – commercial pupil administration package used by most New Zealand schools.

#### 4.4.5 Professional Development

The school had applied for, and been successful in, obtaining Ministry funding for ICT Professional Development in 1999. The principal, at that time the deputy principal, was responsible for organizing the programme which was based on staff needs. Staff and departments were surveyed and the professional development programme was organized to meet their needs. That is the last time staff have been surveyed and there is no recent information about staff skill levels obtained to guide future professional development planning.

A special professional development programme was organized for the introduction of the laptops. The network supervisor and the technician ran these sessions with staff. The sessions lasted for an hour and, in addition to the training, staff were given an instruction booklet prepared by the network supervisor. Because the roll out of laptops was controlled, the professional development sessions were able to have a smaller number of staff attend. The trained staff were then able to act as mentors to other staff once they received their laptops.

The introduction of laptops and the initial professional development accompanying them has highlighted other issues that require further professional development. The principal notes:

*we have started to look at other professional development issues that are starting to come up. For some it's as simple as file management. The first couple of PD sessions that we ran, according to the network supervisor, didn't go very well because we had such a disparate group of people – it was like this huge multilevel classroom with people who had a range of different needs [P: int. 227-230].*

The network supervisor commented that he '*couldn't believe how totally un-computer literate so many of our staff were*' {NS: int. 92}.

The introduction of laptops, enabling staff to have much better access to computers, has shown variance in staff skill level. However, the principal considered that it was essential for staff to become more confident and better skilled. Clearly this is an issue that needs to be addressed by the school, beginning with an assessment of staff skill

level, then the development and organization of a comprehensive professional development programme around the required competencies. However, there was no indication that this was going to be the approach. In fact, the principal seemed to have a totally different view of how this process might be managed. She states

*we are just about to start looking at forcing the issue on using them [staff] much more for administration. We are looking at using the intranet for staff news, daily notices, and those sorts of things [P: int.230-233].*

As noted in Chapter 1, changes required by teachers to use new technologies will be potentially threatening for some, requiring careful leadership and sound professional development. It is, therefore, hoped that before staff are ‘forced’ into the use of the intranet and other administrative practices that some thought will be given to training staff in their use.

#### **4.4.6 A Recent Decision – Introduction of Laptops**

Initially the introduction of laptops was discussed at a Heads of Department meeting. The network supervisor then did all the ‘ground work’, which involved consulting the Ministry of Education’s laptop web site and preparing the information, including overall cost for the Board of Trustees’ Finance Committee. This information was discussed at an ICT committee meeting prior to being presented by the network supervisor (Chair of ICT committee) to the Board of Trustees. The Finance Sub-Committee of the Board of Trustees agreed to pay the additional third and also made the decision, because of limited cabling access in the school, to install wireless hubs.

##### **4.4.6.1 Strategic Planning**

No consideration of how laptops could be used by teachers to integrate ICT into teaching and learning programmes was made before the arrival of the laptops. It was acknowledged that teachers would have better access to a computer for their personal use and certainly it was the hope of the Ministry that by supplying laptops to teachers they would become more confident in their use and would then see ways of using them within their classrooms.

Although not considered within a teaching and learning plan there was one interesting development that has arisen as a result of the decision to put wireless hubs around the school for the laptops. Concern had been expressed for sometime about how to attract more able students to the school. The school management has seen the introduction of laptops and wireless connections as an opportunity to use the new technology to develop a Year 9 laptop class for their more-able students. They have piggy-backed on a decision that was made for a totally different reason and have seen the potential of packaging a different way of delivering the curriculum to more-able students. As the deputy principal explains, *'having made that decision opens up other possibilities that hadn't been thought of'* [DP: int.43-45].

The proposal for a group of able year 9 students to work within their different classes using laptops will be introduced at the beginning of 2005. The deputy principal sees this as an exciting way of being able to seamlessly use ICT skills for word processing and spread sheets within different curriculum areas. It will also enable students to develop research skills by using the Internet during class time. Although the decision to use laptops in this way has occurred accidentally it is nevertheless an excellent way to integrate computers and ICT into all the teaching and learning programmes undertaken by this class.

#### **4.4.6.2 Technical Planning**

During the Christmas holiday period 2002, before the release of laptops in the following year, the network supervisor and computer technician spent time looking at different issues. The technician describes the process:

*we were getting prepared for the laptops at the end of last year. We were looking at things like remote access; how we were going to set them up so that they could have logins and do all of the stuff they wanted to do at home and come to schools and connect – things like file synchronization.*

*we played around over Christmas. Got a lot of things the way we wanted them and wrote it all down. Basically just a big list we were going to have to change when the laptops arrived [T: int.64-68].*

Although the laptops arrived from the Ministry with Microsoft software installed because the school network was running Novell, Netware, a number of changes had to be made. The technician explains what was involved:

*we probably sat on them [laptops] for a couple of weeks until we got one built up working the way we wanted because they sort of came all set for a Microsoft network. We put Novell on and installed a few other applications that we use. We wanted to get one really good Ghost image [T: int. 45- 49].*

Once one computer was set up correctly this provided the image for the rest of the machines. Prior to the arrival of the laptops, a decision was made by the network supervisor not to release all the laptops on arrival but a few to selected staff so that the set-up and programs could be checked and altered if necessary. As the principal says:

*we had someone see what the problems were rather than have the whole staff frustrated. They just had to wait. But also it did mean that we had those early adopters I suppose in the department. The way it was done was the network supervisor's decision [P: int. 222-224].*

It took nearly six weeks for the actual rollout of all the staff laptops. Waiting was difficult for staff. The technician describes the situation:

*it was a bit frustrating for the staff because they could see their computer boxed in here with their names on them. The network supervisor just said we were going to get them [laptops] right and then we rolled them out [T: int.50-52].*

Even with all the prior planning, the influx of another 50 machines had an effect on the network. The network supervisor explains:

*there has been a little bit of an issue with the infrastructure and the laptops coming in. What has been more complicated, I think, has been fitting them sensibly to our network structure. They all have to be the same sub-net<sup>26</sup> for instance and so that has meant that we have had to do some fiddles in terms of the network. [NS: int.103-106].*

One other issue that is currently being worked through is the use of wireless and the Pupil Administration package – MUSAC. The principal states:

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<sup>26</sup> Sub-net refers to a separate part on the network and different protocols (communications) that has been established to enable the laptops to operate on the network.

*with the laptops our system kept crashing and so we have taken Quickfind [MUSAC] off everyone's laptops until we can slowly solve the problem [P: int.198].*

Another significant aspect in being able to operate a laptop at home and then connect to the network on returning to school is that the file between the laptop and the network needs to be synchronized. The network supervisor was confident that the synchronization folder had been set up in a suitable manner for staff. However, he commented that there had been some difficulty with training staff to use this correctly, since they seemed to be confused about which file to save and which to over-write.

#### **4.4.6.3 Integration of Laptops – Professional Development**

The need to technically set up the laptops enabled a slow release to staff, so that a small number of staff could be trained to use the laptops under the school system. These early adopters were then available to assist other staff once they received their laptops.

In addition, the network supervisor and technician ran a short course when the laptops were handed out to staff and also prepared an information booklet for staff use. The network supervisor describes what happened:

*all staff members have had two training sessions – unfortunately only an hour. The technician and I did the training and we have written a little booklet [NS: int. 80-82].*

However, training staff to understand and be able to synchronize their files met with great difficulty. He explains:

*the logic of synchronization is difficult because I mean you have got one file on your network and one file on your laptop and one of them is newer than the other but you have modified them both since the last time you synchronized. You are going to have to lose one of them I suppose. That gets quite hard for them [NS: int. 82-87].*

*I tried to do a file management – synchronization course for beginners a few weeks ago and I think most people got something out of it but for me it was a nightmare. There wasn't much of a range within this group – like most of them couldn't even make folders. They have all been using computers since 1992-3 [NS: int.90-93].*

These comments highlight two underlying issues. Firstly, there are a number of staff who have supposedly been using computers for some time and who are neither confident nor able to use them effectively. It would seem that ICT professional development for all staff needs to be addressed. Secondly, a complex process for file synchronization using folders has had to be incorporated because of the decision made to retain a Novell, Netware infrastructure. This complexity of the system is not only a concern for staff using this method, but also for the network supervisor who is responsible for ensuring staff can maintain accurate files when working on two systems.

#### **4.4.7 Summary**

There is a strong hierarchical arrangement within the school. The principal and senior management are at the top of the pyramid structure, with Heads of Department occupying the next tier. There are clear boundaries between the different levels and responsibilities within the school. With the formation of committees there appears to be a consultative structure set in place, but on closer examination, it is evident that within the committee structure there is also a hierarchical arrangement. Membership on the Heads of Department committee is as a result of the staff member's position and responsibility in the school. This committee, because it is made up of all the heads of curriculum departments, is a large and representative group of the staff. The principal views this committee as the main group for sounding out ideas and receiving advice on any issues that may be raised. If this group of staff reach consensus over a matter the principal is prepared, under these circumstances, to go with their decision. In all other situations the principal sees her role as the person responsible for making any management-based decisions, with the committees providing her with recommendations.

The next tier down in the committee hierarchy is occupied by three committees – the reporting, assessment and profiling committee, curriculum committee and teaching and learning (PD). The membership on these committees is voluntary and tends to be composed of staff who have an interest in a specific area. These four committees have a fixed meeting time, once every fortnight. The ICT committee is lower still in the

hierarchy of committees. Although made up of volunteers, the people on this committee tend to be staff who have a vested interest, either individually or from a departmental perspective, in any recommendations made by the group. Although the feature of a committee structure is to enable collegial decision-making, because the members on the ICT committee are making decisions based around their department needs it could be considered that the group behaves politically rather than collegially. The main role assigned to this group is to allocate, within a fixed budget, resources to different departments. The information is collected and collated by the network supervisor who plays a key role in all of the technically based decisions.

There is a separate teaching and learning committee (professional development) but this works in isolation of the ICT committee. In fact, any recommendations for ICT-based teaching and learning are raised initially through the Heads of Department Committee, since this is where the principal considers the expertise lies. Apparently, the only time that the ICT committee has been involved with ICT professional development organization has been when the laptops were introduced. The professional development programme for laptops uncovered a low computer skill level in many of the staff. Dede (1997) warns that without simultaneous developments in pedagogy and curriculum there will be few improvements seen in educational outcomes.

The development of the intranet as a teaching and learning and administration tool is underway and the network supervisor oversees its development and information about it. The development of this resource is an essential component in being able to integrate ICT into teaching and learning

There is no official written technical plan that guides the overall development of the network and there is no link made between technical support and teaching and learning requirements. Both operate in isolation of each other. Ringle and Updegrave (1998) warn that without a technical plan it is difficult to identify the technology development needed to support teaching and learning initiatives and that decisions appear to be ad hoc and based on immediate needs. This is apparent when it is possible for staff to lobby the principal directly. Although a brief technical plan was written three years ago, to qualify for Government funding, the plan has not been

updated. The network supervisor has had every intention of up-dating the plan but has not yet found the time. Both the network supervisor and the computer technician are very busy on a day-to-day maintenance level ensuring that the network continues to run reliably. The time factor appears to be one of the reasons why the change of the networking platform from Novell to Windows was not considered prior to the introduction of laptops. The decision not to change has, therefore, created extra work for the network supervisor and technicians in changing the laptops sent from the Ministry so that they can operate on a Novell network. The additional issues that arise when working with the Novell networking are evident in the additional layer required to synchronize files.

The Ministry documents were not viewed as being particularly helpful in the decision-making process since they followed what was considered to be happening already in the school. However, the Ministry's offer of laptops was seen by the network supervisor as being a good move to help up-skill staff. The limited skill level in some staff became evident when professional development was provided for the introduction of laptops. Clearly this is an area that requires attention, since, in order to integrate ICT into teaching and learning, staff need to feel competent and confident. The introduction of laptops and the technical decision made to use wireless has enabled an opportunity for the school to offer extended learning opportunities for more-able Year 9 students. This alignment between teaching and learning strategies and the use of laptops was not planned but occurred by chance. However, it should allow a truly integrated ICT approach to teaching and learning in 2005.

#### **4.5 Chapter Summary**

This chapter has analyzed the data collected by interviewing five members of each school, one of whom was the principal. Each case study began with background information about the school in order to set the scene for the decision-making processes. In each case study school, specific areas of the decision-making process were explored. These included the overall structure of the decision-making process, the strategic plan, focusing on integration of ICT into teaching and learning and the

technical plan to underpin teaching and learning requirements. Professional development programmes and how each school had introduced laptops under the Ministry of Education scheme were also discussed.

While this chapter has reported a within-case analysis, Chapter 5 turns to a cross-case analysis of the three case study schools.

## **CHAPTER 5: CROSS CASE ANALYSIS OF DATA FROM THREE SECONDARY SCHOOLS**

### **5.1 Introduction**

The previous chapter reported and analyzed data from each of three secondary schools selected for this study. The data were presented as a descriptive narrative of the decision-making process as it related to the development, integration and management of ICT thereby providing an explanatory picture of the overall processes occurring in each school. A within-case analysis was made by examining the structure of the decision-making process within each school and the key people involved in this process. The literature highlighted the importance of principals having knowledge and understanding of ICT direction so that they can maintain an active leadership role (Trotter, 1997) It was also noted in the literature that schools needed to develop a strategic plan that identified teaching and learning strategies for the integration of ICT and that this was underpinned with a technical plan (Cartwright, 2003; Duderstadt, cited in Ward and Hawkins, 2003; Ringle and Updegrave, 1998), so that teaching and learning determined technical developments. Professional development (Atkin, 1997; Stratford, 2000;) was also identified as a key feature for successful integration of ICT into teaching and learning programmes. These aspects provided a basis for the within-case analysis.

This chapter lifts the level of discussion from a descriptive account and within-case analysis into a cross-case analysis of the three secondary schools. Consideration will be given to the key concepts of the ICT decision-making process indicated by the data across the cases. Using the process of analytical induction, major contextual components are examined and analyzed for the light they throw on decision-making theory and approaches to ICT decision-making discussed earlier in the literature review.

## **5.2 Key Concepts Identified Across the Cases**

This section extracts key concepts that are apparent when a cross-case examination and analysis is made. The concepts discussed below are evident in each of the three case study schools.

### **5.1.1 Fragmented Planning –Lack of Coordination**

All the schools had some form of strategic plan, although school B's had lapsed because there was no one responsible on the staff for ensuring that a plan was developed. The strategic plan in schools A and C outlined teaching and learning as broad strategies. There were no clear goals established which specifically looked at ways of integrating ICT into teaching and learning. Although school B had established a focus for the school to become a 'Thinking School' this was done in isolation of the ICT decision-making process. It was evident from one of the interviews that clearly there was a hope that by making 'Thinking Schools' a professional development focus, the staff would make a link between this and begin to introduce ICT within their programmes. However, there was no identifiable planning process to ensure that this was going to occur. The only other example of integrating ICT into teaching and learning was indicated in interview data in school C. Because of technical decisions to enable the laptops to have wireless connections the opportunity was seen of using laptops with a class of able year 9 students. In this case the technical decision, instead of underpinning the strategic decisions as recommended in the literature, had in fact provided the impetus for this teaching and learning initiative.

The significance of a technical plan should have been clear to the schools since the Ministry had indicated the importance of this by attaching funding to the request for a strategic (including technical) plan. The technical plan in school A was broad, giving little specific direction so that it could be used annually with very little modification. School B had no school-based technical plan but relied on technical guidance given

by an outside computer company, while school C had no written technical plan. The plan was 'in the head of the technical manager' [Principal. C:int.86 ].

Ringle and Updegrave (1998) indicate that, without a clear strategic plan incorporating teaching and learning approaches and a separate technical plan to support these initiatives, the technical process can become orphaned from the reality of teaching and learning. Both activities – teaching and learning and technical network development become separate processes. Under these circumstances the chances of integrating ICT into teaching and learning programmes is hindered. A different situation occurred in school B. Although no planning took place and the direction taken by the school could have been considered accidental, the changes were based on the premise that the staff wanted to have external access and be able to use their laptops between home and school. The technical solution was made in response to a request for changes to the teaching and learning environment.

The responsibility to organize and run professional development (PD) for staff was initiated by a separate committee to the ICT committee. In each of the case study schools this task was assigned to the professional development committee. Two of the schools were involved in a Ministry contract for PD, while school C had been in the past. All schools noted a lack of staff skill and opportunities for professional development. None of the schools had ascertained the skill levels of staff nor produced a plan based on this information. Because there is no strategic plan that includes professional development, underpinned by a technical plan to support teaching and learning, professional development and technical developments are made independently. Both Atkin (1997) and Beyon (1993) warned that there is a real danger that technology, instead of teaching and learning, will drive the process. ICT integration, to be effective, should be a school-wide initiative.

Linked to the lack of coordination between the strategic plan, professional development and technical development was the lack of a coordinated approach to develop an intranet. Delivery of learning packages, student and staff information within the secure environment of an intranet is an efficient and safe means of providing information to the school community, internally from within the school and from external sites. In schools A and C the choice of networking made the development of a dynamic intranet difficult. School B was well placed technically to

develop an intranet, but lack of clearly defined school systems and goals resulted in no one being assigned to this task. Since the development and maintenance of a current intranet requires on-going commitment it is probably advisable that a person on the staff is given this responsibility with time to complete the work. School B had not delegated a person to this task, while it fell to the already busy technical managers in schools A and C.

The fragmented planning seen in the case study schools would seem to result from unclear leadership and direction. According to Barone (2001), principals need to ensure that teaching and learning goals drive the process and that technical developments support these decisions. The processes cannot be separated and left to develop independently as is the case in the three schools.

### **5.1.2 Leadership Abdication on Technical Issues**

All three principals delegated to another person the leadership of technical aspects of managing the network which involved decisions about the type of hardware and software established and how these would be set up on the school network. The literature (Schiller, 2000; Trotter, 1997; Ward and Hawkins, 2003) suggests that it is crucial the leader does not abdicate this role but is able to understand and participate in the overall decision-making process. Principals from case study schools A and C indicated that they relied totally on the expertise of their technical manager. Although both principals were users of technology and advocates of the use for administration, teaching and learning, neither was familiar with the basic technical aspects of the network nor the future direction of technology. The literature (Duderstadt, cited in Ward and Hawkins, 2003; Ward and Hawkins, 2003) points out that the leader cannot afford to isolate himself/herself from technical decisions within the organization and advises that leaders, while not needing to be aware of specialist technical knowledge, do need to be able to ask the right questions to ascertain that the decision pathway is correct and linked to what is required for administration and teaching and learning purposes. None of the school leaders in the case study schools kept up to date with technical changes, preferring to leave this to the 'resident expert'. In schools A and C

this 'expert' was a teacher who had gained some level of technical expertise over the years. Although the technical manager in school A did consult outside the immediate school, the company providing the advice was one that had been established as a result of working with schools. They did not bring a perspective from outside the school environment. In school B the technical 'expert' was an outside computer company working within the business community.

While the literature (Fleit, 2000; Hope, Kelley and Guyden, 2000; Riffel and Levin, 1997; Trotter, 1997) specifies that the principal or leader should be knowledgeable about technical developments in ICT and that they should read widely and consult outside education, this was not the case in any of the schools. By not having a basic technical understanding and an awareness of future technology development, principals were unable to play an active role in the decision-making process, which made strategic goal setting that incorporated ICT into teaching and learning difficult. Leadership for the decision-making process must come from the principal (Barone, 2001; Cooley and Reitz, 1997; Hope, Kelly and Guyden, 2000, Ross and Weill, 2002).

### **5.1.3 The Technical Teacher Guru**

In two of the case study schools, A and C, the principal delegated a trained teacher to the technical role of network manager because the principal believed that he or she had the necessary technical knowledge to operate the network. The position involved purchasing and setting up hardware and installing and operating software. By doing this, the principal placed this staff member in a high status, leadership position. Once in this position the technical manager began to make decisions in isolation about technical matters and there was no one on the staff nor in fact any forum that could allow a challenge to be made. If a challenge was made, the technical 'guru' explained in technical terms a plausible reason and the staff accepted that this must be the case [HoC School A. int.4]. This situation was evident in both schools A and C and exemplified by the folders being needed for laptop synchronization. Staff were trained

to use this system, although it was acknowledged by the network manager to be difficult. No one questioned why it had to be done in that way.

Neither of the technical network teachers (schools A and C), kept up to date by reading nor consulting outside the school environment. When they did consult it was always with other schools or at school conferences. Both described their schools as 'lead' schools, and implied that what was happening outside education was very different from what happens in schools. Because they did not consider what was happening outside education nor with Microsoft policy changes both technical managers made the decision to run desk top software that was no longer supported by Microsoft and elected to remain with a networking system of Novell Netware that makes it difficult to deliver the 'anytime anywhere' philosophy, referred to by the principal of school A and Ministry of Education. When the laptops arrived with the latest networking capabilities enabling 'anytime anywhere' delivery, both technical teachers made a seemingly retrograde decision to replace the software. This situation probably occurred for three reasons. Firstly, it was less stressful for them to remain in their own comfort zone. It was easier to solve issues that arose with seemingly more complicated ways of continuing with the existing system, than having to step into the unknown and make changes. Change was difficult for them and it seemed that they would do almost anything to avoid 'biting the bullet' as one interviewee said [TICTR: A int. 121-123]. Secondly, as long as the systems they designed were complicated and labour intensive, the network manager was kept busy. Because everyone on the staff saw the network manager as busy, he or she assumed an essential and important role in the eyes of the staff – that of keeping the network running. In addition, because the technical solutions put in place were complicated it required staff to be trained to use them. This was seen clearly in both schools A and C, where a complicated process for synchronization, required staff training and an understanding about current files and folders. Thirdly, in order to remain in their comfort zones and keep the status quo in the decision-making process, when seeking advice the teacher technical manager in school C consulted only other schools which isolated the school from the latest technical developments than if they had consulted outside schools. School A also tended to consult only with other schools. The computer company that was involved with providing information and assistance to this school was a company that worked only within the school environment. Riffel and Levin (1997) note that schools understanding of situations is shaped by narrow sources of information and that these

sources always tend to be other schools. It also appears that the teacher technical managers have fallen into two of the traps of decision making referred to by Hammond, Keeney and Raiffa (1998:144): the 'status quo trap', where decision-makers display a strong bias towards alternatives that perpetuate the same situation; and the 'confirming evidence trap', where subconsciously the decision-maker has already decided what to do before deciding why to do it. This leads to the decision-maker seeking information that supports his or her pre-existing view and influences the reliability of information obtained.

The establishment of a teacher technical manager, who continues to see the school through the eyes of a trained teacher, may create a dangerous precedent if schools wish to be able to communicate with the world outside education. Lai and Pratt (2002) stress that the work of the ICT coordinator has to be focused on providing curriculum support to teachers and that technical support should be supplied by a technician. Neither of these schools is well placed to be able to do this. Both these schools have been held back technically, but because of the lack of knowledge on the staff, lack of information given to staff so they can be more involved, lack of time to learn what is happening with the latest software and hardware launches, the school appears to be unaware of impending technical issues. The staff and principal seem contented with the system as it is, even with its problems, rather than take on a new set of problems of which they are unaware. In both schools A and C the technical managers have been removed from teaching and have a high status position. They are held in high esteem by all staff and the principal considers he or she is vital to the school since only the technical managers have the technical knowledge on which the principal can depend.

By comparison, school B did not have a teacher as a technical manager. This school used a computer technician as a liaison staff member between the school and a contracted computer company. The computer company provided technical advice and carried out all the technical work on the network in response to the request made by staff to have external access. It was their advice that provided the incentive to change the networking system from Novell to Microsoft and although the change did not occur smoothly in the school because of other issues, the decision to change provided this school with the technical capabilities designed to meet staff needs. The technical

advice to solve the school's teaching and learning requirements was based on technical information that had taken into consideration current changes occurring in software and hardware.

#### **5.1.4 Ad hoc Technical Decision-making**

Because of the lack of integrated strategic and technical planning and forward thinking all three schools tended to be forced into decisions in response to situations that arose, usually as a result of outside influences. Decisions were often made as an adjustment to take account of the latest problem or issue. This ad hoc method of decision-making is an inefficient use of time and resources. Because there is no overall planning and forward thinking, quick-fix decisions are made to solve the immediate problem. This situation was seen in the data when schools A and C made the 'quick fix' decision to purchase more licences. Within a very short time frame the next problem arose – that of laptops supplied by the Ministry running the Microsoft networking software arriving into the school. This was another decision point. The information from outside education indicated that in order for schools to be able to provide an 'anytime, anywhere delivery' Microsoft networking was probably the better choice. It was certainly the software chosen by the Ministry. Schools A and C remained with the status quo and added a layer of complexity in operating the laptops on the existing network. By comparison, case study school B, because it received outside and presumably up-to-date technical advice, when faced with the same issue took other technical matters, such as the impending introduction of laptops into consideration and moved their networking platform from Novell to Microsoft networking. This decision placed them in a good position when laptops arrived in the school

As with the analysis of planning, it is possible that a lack of leadership and direction by the principal allowed ad hoc decision-making to occur. Technical decisions must be linked to overall strategic, teaching and learning goals of the school. Failure to do this results in technical decisions being made in isolation from teaching and learning needs.

### **5.1.5 Establishing an Arbitrary Budget Figure for ICT**

Schools A and C set the budget and then sought Board approval while school B left the budget decision entirely up to the Board with no input from the school. The arbitrary figure that is established by all three schools is not based on an overall ICT plan. It appears to be a figure, as referred to by the principal of school A that is 'pulled out of a hat' [P: int.3]. The follow-on effect of setting a budget figure, with no overall strategic plan linked with technical developments, is that the allocation of resources to use the budget results in self-interest claims with little thought of the school-wide situation. Technical developments linked to a budget require a coordinated and planned approach for following years. There is neither plan nor thought given to maintenance and software lifecycles, both of which require money. This feature is shown in the data from all three schools. All schools were faced with old and unreliable machines suddenly reaching a point where unreliability became a critical issue for staff. A second issue was that the schools felt unable to move to using more modern desktop software because it would make most of their machines obsolete. With forward thinking and clear planning to establish a budget, these situations should have been accounted for before they became major issues.

It is apparent that none of the case study schools followed the advice given by Cartwright (2003) who noted that an overall strategic and technical plan should drive the budget, not the other way around. Not to do so turns the allocation of the budget into a political decision-making process. Instead of a clear, shared focus about the school's direction for ICT integration and development, decisions are made by representatives from each department trying to gain what they consider a fair share of the budget.

### **5.1.6 Contrived Committee Collegiality**

Hewitson (1992) noted that because administrators establish the processes and structures for decision-making, they ultimately determine how effective the decision-making process is. All schools were organized on a hierarchical arrangement and even

within this, the attempt to provide a democratic decision-making process through the establishment of committees, served only to provide a hierarchical arrangement of committees. Because of the role assigned to the ICT committees in all schools the committee was made up of staff volunteers with vested interests in the outcomes of the decisions. Often the membership of the committee was fluid with different people attending different meetings. Adding to the lack of continuity in the decision-making process was, that if minutes were taken, no record of action items nor timelines for implementation were recorded. In the case of school B, minutes were not referred to at the next meeting. In fact, often the records could not be located again. The committees met infrequently and then only to make superficial decisions based on the distribution of resources within a budget. None of the committees were able, nor required, to make any planning decisions relating to the development and integration of teaching and learning through professional development. A different group, the PD committee, was responsible for staff training and integration of ICT into teaching and learning. With no communication between this committee and the ICT committee, making a coordinated approach to ICT professional development was difficult.

The members on the ICT committee, either because they did not have the technical knowledge, or the knowledge had been withheld from the group, were not in any position to challenge technical decisions presented to them by the chair of the committee. The allocation of resources was made in isolation from all other decisions – both technical and strategic.

These points highlight an underlying feature of the committee structure used for ICT decisions. The literature indicates that the formation of a committee structure is a significant feature of collegial or democratic approaches to decision-making (Capper, 1994). None of the case study schools used a committee structure for either planning or the oversight of the plan. Such a committee would need to meet on a regular basis to function in this manner and be included in the school's overall decision-making pathway. The way in which the ICT committees are formed and their mode of operation indicates a 'contrived collegiality' (Hargreaves, 1994). In reality, collegiality is a thin veneer that superficially hides a political undercurrent operating within these groups, since the main task assigned by the principal is one of resource

allocation creating political tensions because committee members have a vested interest in the outcomes of the process (Cartwright, 2003).

### **5.1.7 The ‘We Know Best’ Culture**

The view expressed by the principals and technical managers in schools A and C was one of self-satisfaction. They considered the network system delivered what they wanted. Both schools had been involved in a professional development contract, described in Chapter 4, and were pleased with the progress made with teaching and learning. Two of the schools (A and C), repeatedly referred to themselves as ‘lead schools’. The technical managers in schools A and C, who had decided not to move networking from Novell Netware to Microsoft Windows networking, saw no need to make this change. Although they acknowledged that there were some problems, these were counteracted by the comment that to move would only introduce new problems and issues. Ignoring the technological developments and changes occurring outside schools and even those from the Ministry, who were supplying Microsoft software to schools at no cost, needed to be challenged. The inability to acknowledge that the school needed to consider other alternatives, take account of the changes and build these into an infrastructure that could support teaching and learning, was dismissed in the case of school C with the view that to change would be costly and time-consuming.

Looking at systems outside education was also dismissed with the observation that only those in their schools really knew what was required. This dismissive attitude to outside advice and help was seen clearly with the examination of the Ministry draft guideline documents. School B did not appear to have seen them while the principals and technical managers in schools A and C pushed them to one side because as far as they were concerned, the school was already doing all that was outlined in the documents.

Schools A and C appeared to have an insular approach to the direction of ICT technical developments and seemed reluctant to enlist advice from outside education.

The problem could have been created in part by the fact that schools are busy. The metaphor of the 'garbage can' (Cohen, March and Olsen, 1972; March, 1978) describes the chaotic and ever-changing school environment. This may be one of the reasons why principals may not have enough time to be aware of the direction of technology and when it seemed that there was a staff member who was technically capable, the problem was believed solved. School B provided a comparison with the other two schools. Although the principal was not involved in the leadership of ICT decisions, he made the decision to use a professional outside computing company. As noted in the literature, while it is considered important that the principal is involved in the decision-making processes, it is also essential that he or she looks at all of the issues and consults with experts outside education who can expand his or her knowledge (Gebhart, 2003). It should be acknowledged that while computer companies will keep up-to-date with technological advances, since the company's livelihood depends on commercial success, it is important to take into account the computer company may provide advice motivated by self-interest<sup>27</sup>. However, the computer company advising school B provided a technological solution to the teaching and learning issues of staff being able to access the network from outside the school. In this situation, teaching and learning needs were paramount.

### **5.1.8 School Expectations Modified by Their Own Delivery of ICT**

It is almost impossible to challenge technical decisions when one person, who is viewed as the expert by the principal and staff, makes them in the absence of a plan. The decisions made by this person determine how the system will operate. In the case of schools A and C, where relatively complicated solutions had been developed, this resulted in a more complex operating process for staff. In school A, staff had to remember to log on through two different systems and remember how to save their files between their laptops and the network. This required additional training. School C also had a complex system for file synchronization which many staff had difficulty understanding. Because staff are unaware that there are simpler ways of carrying out

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<sup>27</sup> Self-interest may involve providing solutions that require a continued involvement with the company rather than totally independent advice.

these complex processes, they accept the system provided and do not expect it to be any different. Staff appear to modify their expectations without question and accept current technical conditions established by a technical manager.

### **5.1.9 Student Accessibility to Computers**

All the case study schools struggled with being able to provide computer access for staff teaching in curriculum areas that were not computer based. Old typewriter rooms had been converted into computer laboratories. Computer-based subjects had priority over the computer laboratories making it difficult for other subject areas to have access to computers. All the schools had tried to solve this issue. In school A the principal made an autonomous decision that one of the laboratories would be freed to become a space that could be booked by other staff. School B had also made an attempt to create a room that could be booked. School C had placed old computers in the back of rooms and although this could be considered a positive move to enable better access for students, it failed because the computers were old, unreliable and didn't look or behave the same as the other computers in the school. Stratford (2000) warns that successful integration will only occur if the computer system is reliable. The principal from school C spoke of the difficulty of finding extra computers to put into the library to provide out-of-class access for students. School B had tried to establish pods of computers after the two deputy principals had observed this in an Australian school.

Access is an issue, but using old methods does not appear to solve the problem. Having a booked room of computers does not enable easy integration of computing into the curriculum. To do this, computers need to be accessible to students so that they can access the information at the critical time for learning. Presumably schools have approached a booked room model as a means of overcoming equity between departments. Developing pods of computers brings with it associated problems as discussed in school B. In particular, schools face difficulties with the physical building constraints for pod development. However, the initiative seen in School C of using laptops with wireless connections for groups of students should enable students

to use computers within the context of the classroom and integrate technology into the learning process.

Enabling student access to the Internet is also seen as a problem since this has to be done under supervision. If schools are to provide 'anytime-anywhere' delivery, as mentioned by the principal in school A, then Internet access for students at any time of the day and from home is essential. Instead of blocking the process, schools will need to use built-in technical securities that enable this to occur. In all the schools Internet access was possible only for students with staff supervision. Use of laptops, as about to be trialed by School C, would enable student access to the Internet via the wireless connection, under supervised classroom conditions.

Integration of computers into teaching and learning requires computers to be seen and used as a tool. The computers need to be readily accessible for students, both during class time and out of class time, and access to all programs and the Internet should not be prevented. Use of laptops may provide a solution. However, it is essential schools solve these issues technically rather than putting in physical blocking systems within the school.

Decisions about student access, positioning of computers and how to manage student access to the Internet are all issues that need to be considered in the planning process. Without an overall clear direction from the principal about how computers can be integrated into teaching and learning, supported by technical developments, computer development appears to occur in an ad hoc manner.

This section has identified nine key concepts that were evident when a cross-case examination and analysis was made between the three case study schools. The following section relates findings made in the case study schools to the decision-making models.

### 5.3 Relating the Findings to Decision-making Models

Chapter 2 outlined and explained five different decision-making models. These were bureaucratic and rational models, a political model, a democratic or collegial model and finally an ambiguity or ‘garbage can’ model. The point was made that, by studying a selection of decision-making models this might help provide a frame of reference for the ICT decision-making process as it operates in schools. It was also suggested key concepts might be identified, which could lead either to the development of a new model, or additions to the body of existing theory.

From an examination of the data from the three case study schools it is evident that there are features of the ICT decision-making which can be linked to all five models. Each of the schools is organized within a bureaucratic framework with the principal occupying the top position and the levels down from this point made up of the senior management team, heads of departments, and specialist committees. There are specific roles assigned to the different levels with clear communication pathways and decision-making structures in place. It is apparent that the committees operating at the lower levels of the hierarchy do not make decisions; rather they provide recommendations to the principal and/or senior management. The bureaucratically arranged systems within the schools formalize the processes and enable a more efficient mechanism for making decisions. Because the level within the bureaucratic framework depends on the position the staff member holds it is also possible that this decision-making structure, by designating a more powerful or status position within the hierarchy, confers a political position for this person within the organization. For example, only those staff who are heads of department can attend those meetings. Other staff with ‘lesser rank’ are excluded from this decision-making process. One of the faults of the bureaucratic model, highlighted in the literature (Williams and Blackstone, 1983), is the problem that arises when professional expertise is located near the base of the pyramid. This presents an issue for ICT decision-making that has been evident from the case study data. When ICT technical knowledge is located at a lower level in the organization the principal moves that person to a specialist position, that of technical manager, which bypasses all the other arrangements in the school and provides a direct reporting line to the principal. If the principal chooses not to become

familiar with technical issues, as seen in the case study schools, the knowledge held by the technical manager is powerful, making it difficult for him or her to be challenged by anyone within the school. Once the technical manager has been promoted into a higher position within the organization and given a time allowance to complete work, other staff with technical knowledge and understanding no longer seem to have a voice. This is seen in the data from school A where one of the staff, who was on the ICT committee, acknowledged that the network system was made up of a lot of different parts and difficult to use. He was very aware that the school needed to change the networking software, but there was no way this would happen until the need was recognized by the technical manager.

Because research has indicated that collaborative or collegial decision-making is more inclusive of staff (Capper,1984) allowing greater acceptance by staff of the decisions that have been reached, schools have attempted to establish a collegial decision-making process within an overall bureaucratic school arrangement. Committee structures have been set up that examine the main decision-making areas within the school – those of curriculum, assessment, professional development and ICT. All of the case study schools had a system of committees that were organized hierarchically. The more important committees had fixed membership determined by position, set meeting times and expected outcomes. For the lesser committees, and unfortunately in all of the case study schools, the ICT committee was relegated to this level. With the exception of the school technical manager and the Head of Computing, membership was voluntary, meeting times infrequent and recommendations limited to resource allocation. The ICT committee in all schools did not function in a collegial manner, but was politically motivated, driven by self-interest in the decision-making process.

The establishment of teacher technical managers within the schools, with the apparent technical aptitude required to make technical decisions, created a powerful position. The data indicated that technical managers, although appointed to the position initially because of their technical knowledge in ICT matters, tended to make autonomous or bureaucratic decisions, withholding information and controlling meetings. Such a position is difficult to challenge, enabling technical managers to make all the technical decisions within the school.

Although the technical managers in schools A and C appear to have followed a rational decision-making approach, because of the limited amount of information used in the process, the decisions are restricted by the technological parameters that continue to advance at a faster pace than the knowledge level of the people involved in making the decisions. However, since it is in the interests of the computer company to keep abreast of technological advances, the information provided to school B should not have been limited by a lack of technological knowledge. It was apparent from the data that the schools which used school-based technical managers (A and C), because they did not consult with anyone outside education itself, probably limited the amount of information on which to base their rational decision-making process. This would have had the effect of bounding decisions to the amount of current information they could call upon to make their decision.

Schools are chaotic places that appear in a state of organized disorder that seems to prevent linear, rational decisions being made. They seem to have little control over the nature or timing of problems. March and his colleagues (1972), in using the metaphor of a 'garbage can' described the anarchy and resulting ambiguity that occurs in educational decision-making. The 'garbage can' model acknowledges that decision-makers generate problems and solutions and that solving problems will require time and sometimes a chance alignment between a problem and a solution. Because there was no clear direction planned for the integration of ICT into teaching and learning in any of the case study schools, the technical plan operated in isolation. Use of computers for teaching and learning occurred, therefore, not because of planning but because of a chance alignment. This situation was apparent in case study school C [DP: int. 43-45], where there had been an issue for some time about how to extend top year nine students and attract higher caliber students into the school. The school had played with lots of different ideas for a number of years, but with limited success. This issue was put on hold. The next chance event that occurred was the introduction of laptops into the school and the board's decision to install wireless hubs. It provided the opportunity for laptops to be used anywhere in the school. The year 9-extension problem and the wireless solution came together so that a decision was made to offer a laptop extension class for the 2004 year 9 intake. The chance alignment of a problem and solution is also evident in the way in which school B approached the introduction of a 'Thinking School' focus. By providing professional development it

was hoped that that staff would make a link between this and the integration of ICT into teaching and learning programmes.

There are three characteristics of the 'garbage can' model. Firstly, problematic goals, where the organization appears to operate on a variety of inconsistent and ill-defined preferences. This has been observed in all of the case study schools, since without strategic and technical plans all the schools have unclear goals and ill-defined preferences. Secondly, unclear technology, where the organization does not understand what is occurring in the decision-making process and tends to operate on trial-and-error procedures. Making technical decisions based on a lack of current information results in a trial and error approach to solving network issues. This was evident in schools A and C where the technical managers spent time 'fiddling around' in an attempt to make an outdated system operate at an acceptable level. Finally, fluid participation which may occur when there are different individuals involved in the decision-making process, thereby reducing continuity in the overall process. Success of the decision-making process will also be affected by the amount of time and effort the members involved in the decision can devote to it. This situation is evident in the ICT committee structure where committee composition varies between meetings and because meetings are relatively infrequent the technical managers are probably making decisions in the interim period, leaving the committee personnel with no involvement.

In conclusion, the ICT decision-making process in the case study schools sits within overall bureaucratically organized school structures. The lack of a link between strategic plans for teaching and learning and technical plans to support these initiatives prevents cohesive school development and integration of ICT. Technical aspects are separated and responsibility in two of the schools was delegated to school-based technical managers. Only in school B, that enlists the advice and technical expertise from a recognized computer company, has technical progress within the school moved with technical advances occurring outside education. While it is not necessary for principals to be aware of fine technical details, it is essential that they are familiar with the direction in which technology is moving outside secondary schools. The three principals removed themselves from technical decisions by either

appointing a teacher on the staff to be technical manager (schools A and C), or by using a staff member to liaise with an external computer company (school B).

In the case study schools there are political aspects in the decision-making process, seen particularly in the manner in which budgets are allocated and resources distributed. This is evident in schools A and C where power to make decisions rests with one person – the technical manager. It is probably advantageous that decisions about ICT developments in schools should involve all the staff. This requires leadership from the principal, transparent strategic teaching and learning goals, supported by technical developments that keep pace with developments occurring outside education. It is probably not desirable for school principals to invest all their confidence in teachers who have been given the role of technical manager. As noted by Riffel and Levin (1997), school principals must be prepared to seek information outside the school system.

Two aspects of ICT decision-making set it apart from other decision-making processes in schools. Firstly, the level of expertise and knowledge required to make ICT decisions and secondly, the continual supply of money needed. While the ‘garbage can’ model describes the chaotic environment within secondary schools that affects the decision-making process, there is an attempt within the school system to establish a rationally based decision-making process. Because of the speed of technological change, rational decisions are bounded by the currency of the decision-maker’s knowledge. Since this determines the amount of information they are able to take into account when making decisions, school-based technical managers operate on a relatively narrow knowledge basis that rarely looks outside the school system for future directions, thereby restricting the decisions made. A decision made within this limited boundary then affects resulting decisions because technological advances have continued to move and the decisions that were once available are no longer viable. The effect of this is to isolate the school from future advances. By comparison, the computer company advising school B keeps up-to-date with technological advances and is able to make decisions based on a wider and more current source of information. While this provides schools with current technological solutions, as noted before, it is important that schools seek alternative views from external computer experts to reduce the potential for the company to provide solutions based

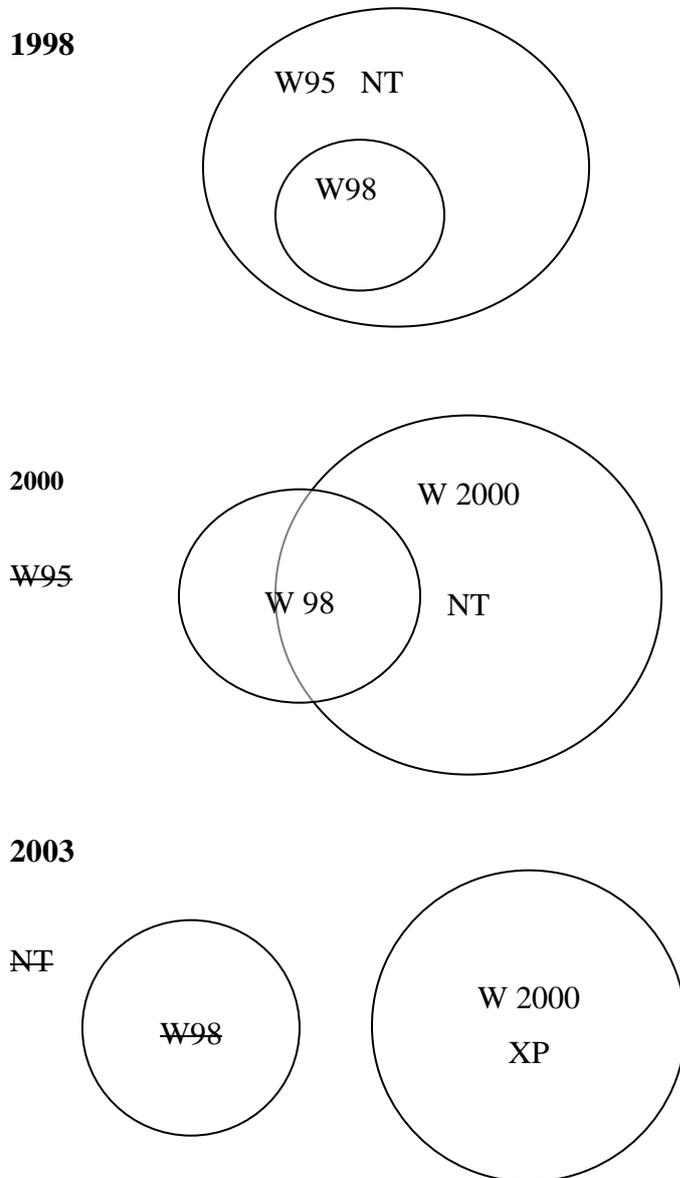
on commercial self-interest. However, although the computer company still operates within a bounded rational approach, the boundaries keep pace with technological advances. Figure 5.1 uses an example of technological advances in operating systems to specifically explain the effect of technological advances on the boundary of information used to make a rational ICT decision. In 1998 there were three operating systems available to the decision-makers – Windows ® 95, Windows ® NT and Windows ® 98. These are illustrated in Figure 5.1 as operating systems within boundaries of current use (shown within a circle on the Figure). All case study schools chose Windows ® 98. The figure shows, while this decision was made, there were two other possible choices that could have been considered. By 2000 the older system Windows ® 95 had been dropped by Microsoft (shown as crossed out on the Figure) and a new operating system, Windows ®2000 had been introduced (included in the circle or boundary for the decision-making). All case study schools still elected to remain with Window ® 98 and the figure shows that this system is starting to become the older system with less Microsoft support available (shown in the Figure with the circle containing Window ® 98 moving to one side). In 2003, Windows ® 98 and Windows ® NT are no longer supported (both are crossed out on the Figure and not part of the main circle). Windows ® 2000, which was present within the decision-making information available in 2000 is now the current operating system along with a new operating system - Windows ® XP. Schools A and C that elected to remain with Windows ® 98 have isolated themselves from the new operating systems, making integration of new hardware and software, such as seen in the laptop data, more problematic. School C has made the decision to move to Windows ® 2000, thereby keeping up with the latest technological capabilities.

#### **5.4 Summary**

In this chapter, using a process of analytical induction, major contextual components of ICT decision-making have been examined, analyzed and discussed. It has been shown that it is important for leaders to keep up-to-date with the direction in which technology is moving outside education. It is also important that leaders establish a strategic plan incorporating teaching and learning initiatives and that this plan is

underpinned with technical planning and supported by an appropriate budget. All three schools showed that this was not the case. The leaders had removed themselves from any technical developments; had not established an integrated strategic and technical plan and had allocated an arbitrary budget amount that was not tied to specific goals. Also there is a need for schools to obtain technical advice outside the school sector and that it is probably detrimental for schools to move a teacher within the school into a technical management position with sole charge of system changes. Information from the case study schools, which had teacher technical managers (A and C), indicated that there was an apparent unwillingness for the technical managers to keep abreast of current technical information, thereby reducing the choices available. Examination of the information from the schools in light of the decision-making models indicates that there is an attempt by the schools to have a rational approach for most ICT decision-making: that is, information is weighed up, assessed and the best choice made. It has already been discussed that the information pool that ICT decisions need to include moves rapidly because of advances in technology. If the people within a school charged with making decisions relating to ICT do not keep up-to-date with these advances, the pool of information from which they make their decision becomes restricted as in a bounded rational approach. Schools need to find the means to make rational rather than bounded rational decisions.

**Figure:5.1 The Effect of Rapid Advances in Technology on a Decision-making Process That Has the Key Concepts of a Bounded Rational Model**



## **CHAPTER 6: SUMMARY, DISCUSSION AND CONCLUSIONS**

### **6.1 Introduction**

This chapter revisits the research questions posed at the beginning of the study. A summary of the methods and techniques used to collect data to address these questions is also presented before leading into a distillation of the findings that have emerged from the data. Implications about the decision-making process, as it applies to the integration, development and management of ICT within secondary schools, are identified. The application of these, in relation to decision-making in general within schools, is also addressed. The chapter concludes by identifying other areas in decision-making where further research would be advantageous.

### **6.2 Summary of the Research Process**

The study aimed to explore the decision-making processes for the development, integration and management of Information and Communication Technology in secondary schools and to examine the influences that affect these processes.

In Chapter 1 introduced the study by describing issues facing self-managing secondary schools when making decisions relating to ICT development, integration and management. The literature highlighted three features that make ICT decision-making different from other decision-making processes occurring in schools. Firstly, technical advances taking place outside schools affect what happens in schools, making the decision-making process more difficult, since expertise and specialist knowledge are needed. Secondly, principals require a significant measure of understanding of technical advances and how these can be integrated into teaching and learning so that they can be more actively involved in the decision-making process. Thirdly, to keep pace with technology not only requires a constant supply of money that can be difficult for some schools, but also requires a responsive decision-making process that can result in speedy decisions based on current information. These three features create a different environment for ICT decision-making

compared with other decision-making processes. It was also apparent from the literature that it was essential for schools to have a strategic plan that set clear guidelines for integration of ICT into teaching and learning which needed to be underpinned and supported by a technical plan.

Chapter 2 moved on to discuss five generic decision-making models - bureaucratic and rational models, a political model, a democratic or collegial model and finally an ambiguity or 'garbage can' model, since these provided insight into what has happened in the past and may help explain possible future situations. It was argued that while most decision-makers in schools approach the process in a rational way, where information is considered and choices are made rationally, because technological advances occur at a fast pace, the ability for schools to make rational choices is restricted by a lack of knowledge. For this reason it was suggested that a bounded rational model might better explain how decision-makers reduce the amount of information considered when making a decision.

Chapter 3 outlined the research design. The study examined ICT decision-making processes in three case study schools. These were all co-educational, state secondary schools in a regional New Zealand city. Five open-ended interviews using a common topic basis were carried out at each school. The principal and technical managers in all three case study schools were interviewed. The principal chose the other interviewees who were staff members involved in the ICT decision-making process. The choice of open-ended interviews as the technique for collecting data for each case study was made since this enabled the respondents to 'tell their stories' of what they considered important decisions that had been made. Cross checks for accuracy within the descriptive narrative were made with the other school members interviewed. The interviews were taped and subsequently transcribed using an open and descriptive format. The summary from each interviewee was returned for verification and further comments, allowing a check to be made on the trustworthiness of the data. The summaries were returned to the researcher and provided the final data for analysis.

Chapter 4 presents data from each case study school which were analyzed separately with the main points being summarized for each school. This was followed by a cross-school analysis in Chapter 5 to identify common themes. During this analysis,

key ICT decision-making concepts were highlighted and from these, analytical generalizations about the ICT decision-making process and how it sat within the overall school decision-making process were developed. Frames of reference apparent in each of the five decision-making theories were discussed. It was evident that a collegial decision-making process, through the use of committees was a common feature in what were generally bureaucratically organized school structures. While decisions were seemingly approached in a rational manner, the nature of ICT decision-making, because of the knowledge required, meant that there was a tendency for particular people to emerge as powerful because of their knowledge. Although schools appear to establish a rational decision-making process when approaching ICT decisions in that they weigh up and consider possibilities, those schools which use teacher technical managers tend to follow a bounded rational decision-making approach because of the apparent inability of technical managers to keep up-to-date with the latest technical advances. The decision-making process seems to become restricted by the lack of up-to-date technical information considered. It would appear that unless the people making ICT decisions keep up-to-date with technological advances, the boundaries of rational decision-making are reduced and the school becomes technically isolated.

### **6.3 Relating the Models to the Practice of ICT Decision-making**

From each of the models discussed in chapter 2, it is possible to identify key concepts that explain aspects of decision-making structures and processes occurring within the case study schools. Many of the decision-making processes are affected by the complexity and confusion explained by the 'garbage can' model. This model provides a good description of the chaotic environment within a self-managing secondary school where there is often insufficient time to follow through decisions before the next issue arrives. In an attempt to establish a structure that gives order to the process, the case study schools were organized bureaucratically with levels created by position and specific duties, preventing duplication of duties and allowing better communication. Within education, there is a realization that decisions will have more chance of being put into practice if staff are involved in the process. For this reason,

the case study schools have established committee structures - one of the key aspects of the collegial decision-making model. Staff composition on committees and the role assigned to the committee determined how collegial the decision-making process was. If membership on the committee was a result of self-interest, there will be political overtones and therefore a contrived collegiality. Within the structures established for decision-making, the process for making decisions often appears rationally based since there is an attempt to gather relevant information and to examine different possibilities before arriving at a decision. As has been noted earlier, decision-makers genuinely attempt to make optimal decisions. It has also been explained that there are limitations to a rational approach to decision making. These are the difficulty in obtaining all of the relevant information prior to making a decision. Final decisions may be arrived at by a subjective and intuitive approach because of the views held by the individuals. In response to the inability to collect all information, bounded rational theory acknowledges that the decision-maker will simplify the model so that decisions are made within a restricted framework.

In all three schools ICT decision-making sits within overall school structures. The three schools used an ICT committee to work through ICT related issues. ICT decision-making requires knowledge, an ability to be able to think ahead and a preparedness to consult widely outside the secondary school environment. Most ICT decision-making has the appearance of being made rationally and collegially within a committee structure. However, if the people charged with making the decision do not keep up-to date, the choices available to them become restricted. For example, if a rational choice has been made not to up-grade machines, perhaps because of a lack of funding, the choice for the next type of software has been predetermined. Current technological information is required when solving an ICT issue. This requires those involved in the decision-making process to keep up-to-date and be prepared to seek and accept information from others outside schools. It is apparent from the literature (Riffel and Levin, 1997) that teachers within secondary schools usually consult with other schools rather than experts outside education; potentially restricting the amount of accurate information they receive. This situation was evident in school A and C. The problem can become more serious when the people making decisions under these circumstances are not aware of the full picture. This type of decision-making has many of the features of the bounded rational approach. If ICT decisions continue to be

made in this way, choices become more limited because of the speed of change occurring in technology, resulting in very restricted choices being available. Because decisions become limited by previous decisions, within a short space of time the secondary school will be unable to use current technology restricting choices for teaching and learning and preventing the school from communicating with the 'outside world'.

It is not easy to make decisions, but it becomes even more difficult when the information required to make a rational decision depends on both technical understanding and an ability to keep up with the direction in which technology is moving. In the chaotic environment of a secondary school, depicted and explained by the 'garbage can' model, finding the time for staff to become skilled and remain abreast of continuous technical changes is very difficult.

As discussed, there are features apparent in all of the five models within the three case study schools. The 'garbage can' model provides a description of the chaotic environment facing school leaders when making decisions. It is also evident that without careful consideration and involvement by the school leader, the people charged with making decisions can be placed in a powerful political position. The main difference highlighted in the case study schools is the effect of rapid advances in technology on the decision-making process. Because of the amount and currency of information required to make an ICT decision, it has been asserted that the decision-making approach is more closely aligned to the bounded rational model. If the leader does not seek current advice from outside the school, the boundaries of the rational decision may become restricted so that decisions will be unable to keep pace with technological advances occurring in the 'outside world'.

#### **6.4 Summary of Research Findings**

The research findings explain features of ICT decision-making processes that are components of overall school structures and processes.

The first research question sought to examine the decision-making processes that contribute to the development, management and integration of ICT within schools. Study findings are summarised in the following list.

- 1.1. School principals, as the overall leader of the school, have established school systems that are bureaucratically organized and when committee structures are established these sit within the existing hierarchy.
- 1.2. There has been an attempt by principals to establish collegial decision-making processes by using committees. However, in the three case study schools all committees suffered 'contrived collegiality' because of the committee position within overall school structures and membership on the committee.
- 1.3. The task of the ICT committee in all three schools was to distribute resources according to budgetary requirements. Committees did not have a role in the overall planning nor development of ICT. Decisions relating to the allocation of resources were self-interest or politically motivated, since committee members ensured that they or their departments got a fair share of the money.
- 1.4. There was no overall strategic plan for teaching and learning linked and underpinned by a technical plan in these schools. If plans were evident they operated independently of each other.
- 1.5. Because there was no coordinated strategic plan that incorporated specific aspects to integrate ICT into teaching and learning and because professional development committees operated independently of any new technical developments occurring in the school, a lack of necessary staff training to use new software and systems resulted.
- 1.6. It would appear that principals have not ensured that they are able to keep up-to-date with the direction in which technology is moving and seem to have abdicated technical details to other people who then lead the ICT decision-making process.
- 1.7. Those principals who appointed a teacher as technical manager to lead technical development have run the risk of creating a powerful position making it difficult for others to challenge and play a part in the decision-making process. The focus of an school IT coordinator should be the use of IT within teaching and learning programmes and not technical decisions.

- 1.8 Where the principal appointed a school based technical teacher, with a reduced teaching load to be able to do the job, there appeared to be some difficulty experienced by the school based technical teacher (School A) in keeping up-to-date with current technology because of a lack of time. Because technological changes continue to move forward at a rapid pace, previously made choices with limited information seemed to restrict later choices.
- 1.9 Employing a professional computer company for technical advice and work, should provide schools with current technological solutions. Because computer companies are vendors who sell the latest products the information they give to schools will be current since the company cannot afford to become technologically isolated. However, schools need to be mindful of possible self-interest by the company, In school B, the technical solutions were approached from the stance of what was required by the staff for teaching and learning. It is essential, that technical recommendations by an external company are made in response to teaching and learning requirements that have been clearly established by the school.
- 1.10 While most schools attempted to have a rational approach to ICT decision-making because of the amount of information required to make decisions the bounded model, outlined in Chapter 2, is a better representation of the process. Because technological changes occur constantly and rapidly, staff in schools have difficulty in keeping up-to-date. This has the effect of restricting the boundary or possibilities and subsequently reduces choices available later on.

The second research question sought information on influences that affect the process of ICT decision-making. The study findings are summarised in the following list.

- 2.1 There are unclear and restrictive decision-making practices occurring within the schools, observed in two of the schools (A and C), with the main focus for technical decisions resting with one person.
- 2.2 Because of the lack of an overall integrated plan, technical decisions were made in isolation and tended to drive the teaching and learning process, rather than the other way around.

- 2.3 Technical knowledge and expertise are essential. The difficulty, possibly because of a lack of time for people within schools to keep up-to-date was highlighted.
- 2.4 Using outside technical advice, as seen in school B, provided current technical information. This also enabled technical decisions to support teaching and learning requirements.

The study showed that schools operating without a strategic plan incorporating ICT into teaching and learning and underpinned with a technical plan, made ad hoc technical decisions and that teaching and learning initiatives were not the driving force behind the decision-making process. Schools did not appear able to respond to rapid changes in technology because of their lack of forward planning.

Decisions were “bounded” because the decision-makers within schools were busy, lacked technical expertise and gathered only information from other educational sources. Because of the speed of technological change, these schools became isolated and were unable to take advantage of new technological developments.

School principals did not take an active role in the decision-making process, preferring to delegate the technical leadership role to a teacher in the school or to an outside agency. Staff on ICT committees lacked professional development and were unable to extend or challenge decision-making boundaries.

## **6.5 Implications from the Findings**

From the data collected from each case study and from the cross-case analysis of the three schools, six implications have been identified which carry clear messages for the ICT decision-making process. These and problems needing attention are discussed in turn.

### **6.5.1 Schools Should Develop a Strategic Plan that is Underpinned With Technical Planning Requirements**

The first implication concerns the need for schools to develop a strategic plan that clearly identifies goals and strategies for integrating ICT into teaching and learning programmes. The strategic plan is then underpinned with technical requirements. The lack of cohesion and integration of teaching and learning with technical developments to support classroom requirements resulted from a lack of planning and was noted in all case study schools. Although the schools had a strategic plan that incorporated teaching and learning requirements, specific details as to how ICT would be used were not identified. Technical planning occurred in isolation from teaching and learning developments and professional development, including the up-skilling of teachers. Teaching and learning cannot become integrated into the teaching process without the holistic development of the three facets – teaching and learning, professional development of staff and a technical plan to support initiatives.

### **6.5.2 Systems Should Provide Technical Information and Professional Development for Principals**

The second implication concerns the provision of technical information and professional development for principals. None of the principals was familiar with any of the technical details of the school infrastructure. It has been shown in the literature that it is important for principals to have sufficient knowledge to be able to ask questions of technical people. Principals are busy with many demands on their time. It is essential that principals are provided with up-to-date and simplified technical information so that they are aware of the direction technology is moving. If this information is supported with professional development sessions for principals this may give them more insight into how technology can be used for teaching and learning.

### **6.5.3 Systems Should Recommend to Principals that they Consult External Technical Experts to Assist with Technical Decisions**

The third implication concerns the recommendation to principals that they consult external technical experts to assist with technical decisions. In all schools technical management was assigned to one person. In two of the schools (A and C), the technical manager was a trained teacher who had obtained his 'skill level' on the job and within the school environment. School B enlisted the advice and technical support from an external, professional computer company. When compared with the decisions made by the professional computer company the teacher technical managers made quite different decisions about similar problems. Whereas the teacher technical managers made status quo decisions, such as remaining with a networking requiring work around solutions to address issues apparent when the laptops were introduced, the computer company responded to teaching and learning issues, such as external access, by providing current technical solutions. This finding suggests that it is essential that the direction for technical developments be based on what is required, either in the classroom or administratively. It should be the task of the person with technical responsibilities to introduce technical solutions in the most efficient and user-friendly way. The main aim of the school should be to integrate ICT into the classroom, and teachers need to feel confident when using the system if this is to occur. Developing complex systems defeats the purpose and prevents people from trying. School B enlisted professional help from an outside computer company, which brought an external view into school B that appeared to be lacking in the other two schools. This situation seems vital since it is apparent that schools either choose not to, or have insufficient time to keep up-to-date with continuous technical developments.

The significance of these findings suggests that schools would be better to enlist professional outside technical advice and help rather than create a position for a teacher on the staff. This will ensure that an up-to-date view of technological changes from outside the school, based on teaching and learning needs, is considered when decisions are made. It is important that the advice sought by schools from commercial computer companies is technical advice to support teaching and learning needs and

that schools seek advice from more than one company to reduce the commercial self-interest that may influence advice.

#### **6.5.4 Principals Should Redefine the Role of the ICT Committee to Include Planning and Development of ICT within the School**

The fourth implication is concerned with the redefinition of the ICT committee to include planning and development of ICT within the school. An ICT committee was established in all three case study schools. However, membership on these committees was fluid; meetings were not scheduled on a regular basis and the main task allocated to the committee was resource allocation once the budget had been established resulting in decisions being driven by self-interest. In each school, the ICT committee was not linked to any of the other decision-making processes resulting in fragmented technical decisions not tied to teaching and learning needs.

Development of school-wide ICT strategies is essential. It would seem advisable for the ICT committee to have the role of coordinating ICT professional development and through this developing teaching and learning strategies appropriate to different curriculum areas. In addition to this the committee would have the role of developing and examining ICT policies and coordinating external technical assistance. Gathering together a group of staff members, who have an interest in developing school-wide ICT initiatives, would enable the formation of a truly collegial committee. Data from the study suggests that it is important for ICT initiatives to be handled through one main group rather than in the divided manner they were in the case study schools. When there is one group responsible for all ICT-related decisions development, management and integration will cease to be piece-meal.

#### **6.5.5 Principals Should Ensure that Staff Receive Regular Professional Development in ICT**

The fifth implication concerns ensuring that staff receive regular professional development in ICT. If computers are to be used as a tool for administrative purposes

and teaching and learning, teachers have to be competent in using them. The school must identify the necessary skills and ensure there are professional development programmes put in place to train staff. In one of the case study schools, the technical manager was very disapproving of the apparent lack of skill among the teachers. This is a school-wide issue that needs to be addressed.

Being aware of what computers can provide within the classroom is also another issue. Information about the latest features needs to infiltrate the school's way of thinking. Professional development programmes, in addition to up-skilling teachers, should also provide information about some of the latest technological and pedagogical developments. It would be advantageous to schools to invite people from outside education to speak to staff and show them where advances are occurring, or for people within schools to visit places such as polytechnics or universities. Without a view into the world outside secondary education, schools run the very real risk of isolating themselves and their students from reality.

#### **6.5.6 Schools Should Consider Student Access to Computers and the Best Way to Integrate ICT into Learning**

The sixth implication concerns consideration of student access to computers and the best way to integrate ICT into learning. With the physical set-up of computers and systems put in place to overcome the difficulty of Internet access, schools currently do not make it very easy to integrate ICT into teaching and learning. If the integration of computers is to occur seamlessly within lessons and if schools are to provide an 'anytime, anywhere' access to computers, a number of issues will need to be considered. Computers must be readily accessible. This will possibly require rethinking the booked room approach which takes learning out of context. Development of pods, attempted by two of the case study schools, also brings with it the need to consider physical constraints within existing schools; to find suitable areas for pods of computers and to solve security issues if machines are in an unsupervised area. Laptops for students and wireless connections, already being considered by case study school C, are a step towards better student access and a more truly integrated approach to the use of ICT in teaching and learning.

Delivering learning via an intranet creates a secure environment. It is vital that schools put time and resources into the development of this essential teaching and learning tool. Access to the Internet is also important and schools need to solve the security issues with a technical solution rather than physically blocking students with school systems.

## **6.6 Further Research Proposals**

A number of recommendations for further research are proposed that would extend this study and provide a more comprehensive picture of ICT decision-making than has been possible to date.

This study involved only a small sample of case study schools and it would be valuable to carry out a similar study with more secondary schools, since this would provide a more comprehensive picture of ICT decision-making processes.

The study questions did not highlight teaching and learning initiatives except in one school which had appeared to find a chance alignment between the laptops and a new teaching and learning opportunity for more able students. The Ministry has invested considerable funding to supply laptops to teachers to improve teaching and learning outcomes. A study which tracked initiatives, such as a laptop class, to examine the degree of integration of ICT into teaching and learning programmes and the overall effect on student learning, would provide insight into how successful teaching and learning becomes when ICT is integrated seamlessly into programmes.

The rudimentary development of intranets within the case study schools has been mentioned. Since the intranet is an important medium for providing teaching and learning resources in a secure, on-line environment, the development of this within schools is important. A study of how well advanced schools are and what issues and problems have arisen would provide useful insight into the decision-making process

of how schools have integrated an intranet delivery for teaching and learning resources.

It was evident from this study that the school culture affected the ability of staff members to look beyond secondary education for solutions to technical problems and for ideas about different ways of using ICT to enhance teaching and learning. A further study to investigate what is involved in the establishment of an ICT focused culture and the overall effect that it has on the ICT decision-making process would be useful since the current study has shown the need for schools to consult and obtain information about ICT from outside education.

It was suggested in this study that rapid and continuous changes in technology affected the ability of teachers, who were not able to keep up-to-date, to make decisions that would enable their school systems to remain current. This could result in bounded rational decisions being made that could subsequently restrict future ICT decisions. A further study examining the process by which schools collect information before making decisions would be useful. In particular, a study comparing ICT decisions that are affected by the pace of technology and other decisions occurring within schools would enable the effect of technology on the decision-making process to be examined in more detail.

## **APPENDICES**

### **3.1 Opening Questions Sent Prior to the Interview**

*Think back to any decisions that have been made in the school relating to ICT development, management and integration.*

- What were some of the decisions made recently in ICT?
- What issues arose and how were you alerted to these issues?
- Who are the people or groups involved in the decision-making process?
- Do you consider the decision was successful/ unsuccessful? Reasons?

## School Information

<b>School:</b>
----------------

<b>Roll Size</b>	
<b>Decile rating</b>	
<b>Approximate % of overall budget allocated to ICT development, management and integration</b>	
<b>Technical help obtained (internal source/external source)</b>	
<b>Staff in school involved in technical help</b>	
<b>Approx number of computers</b>	
<b>Approx distribution (pods/ suites classes)</b>	
<b>Network operating system</b>	
<b>Main suite of programs being delivered</b>	
<b>Intranet development</b>  <b>Use of intranet</b>	
<b>Internet access</b>	
<b>Policies established?</b>	
<b>Approx % of staff who have begun integration of ICT into their teaching</b>	

## 3.2

### **THE I.C.T. DECISION-MAKING PROCESSES IN SELF-MANAGING SECONDARY SCHOOLS.**

*The next information revolution is well under way – It is not a revolution in technology, machinery, techniques, software, or speed. It is a revolution in concepts... (Drucker, 1998)*

*Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them. ( Laurence Peter).*

#### **Research topic for Doctor of Education (EdD) Griffith University.**

It is proposed in this research topic to examine the decision-making process involved in the development of ICT within a self-managing secondary school.

The research questions being posed are:

- **How do self-managing secondary schools establish decision-making processes that contribute to the development, integration and management of information and communication technology (ICT) within their schools?**
- **What influences the decision-making process?**

There is no intention to look at what decisions have been made, but rather to focus on the decision-making process itself.

My proposal is based on using three case study schools and will require the following from each school involved:

Stage 1 – a semi-structured interview with the principal to generate data that gives an ‘authentic insight’ into the principal’s experiences of the ICT development and future directions

Stage 2 – semi-structured interviews with other people within the school who have responsibility for ICT development.

All interviews will be recorded and the interview data transcribed and given back to the interviewee to check accuracy and return.

All research findings will be given back to the principal for their comments.

From the data the decision-making model or models that best fit the framework of the decision-making processes and structures as they apply to ICT will be explained.

### **Ethical Issues.**

- Case study schools will assigned a letter symbol to provide anonymity
- Interviews will reveal a personal viewpoint. Confidentiality is assured. None of the information gained from the interview will be used for any other purpose than data collection and analysis for the research project. The information will not be shared with any other people, including those interviewed within the same school.
- Care will be taken to accurately transcribe the recorded interviews and the transcribed scripts will be shown to the interviewees for verification and approval before being used.
- All material will be regarded as confidential and stored securely.

Ethical clearance has been gained from Griffith University.

### **Potential Outcomes from the Research**

The results of the study, will contribute to an understanding of approaches to the decision-making role of the leader, particularly as it applies to ICT development – an

area of immediate and future significance. The study will be built on decision-making models and this will provide a rationale for the process, since without a frame of reference decisions can become arbitrary (Bush,1989). Study results will also provide insight into possible successful decision-making strategies and highlight potential problems and situations that should be avoided.

### 3.3

#### **Questions Used During the Interview**

How would you go about making decisions related to strategic issues within ICT (e.g. maintaining and upgrading the network infrastructure; security of the system; strategic planning to incorporate teaching and learning ; web resources and web based systems; portals into school)?

How do you go about your IT strategic planning – what would this involve (the process?)

How would you spend most of your time?

Do you take into consideration the Microsoft life cycle policy in your planning?

Other than financial decisions what other decisions are made with regard to ICT?

What influence have the Ministry of Education's documents had in helping you with your decision-making process?

Tell me about the introduction of laptops into the school.

### 3.4 [typed from field notes taken during the interview]

#### **Observation Notes for interview School A: 5 – ICT Coordinator**

Office is in the new administration block – quite a distance from the computer areas in the school.

Office situated close to the main management area of the school – status/buffered from any issues occurring in the computer labs and file server area?

Recent decision to accept the Ministry offer of laptops – come back to that in the interview.

Next part asked if there was a strategic/technical plan to guide development. Traced this back some distance – seems as if the plan is very open and doesn't require much modification from year to year. Information about what is required got from staff – seems that it is more a wish list than fitting in with an overall plan – check this.

Uses the terms curriculum and teaching and learning but not clear from what he is saying just how computers fit into this.

Very busy – business comes through in his conversation (also mentioned when I talked to the principal). Seems to limit what he can achieve – writing up the yearly plan a problem.

Committee – meets infrequently. Seems to be used to rubber stamp his plan – not involved in the actual planning process. Allocation of resources seems to be the main focus.

Asked about the Microsoft Policies – a flippant reply – only do what they think they can manage – don't think he considers the issues around this. Seem to be issues with obsolete hardware unable to support the newer programs – lack of forward planning?

Technical decisions – made by him – in discussion with outside technicians. Look at ways of making things happen – instead of using the current technology perhaps?

Aware that this creates extra work for him – having to image individual machines.

Gets information from the computer company in part and also from other schools. No time to attend the latest software launches and keep up with current information.

Intranet – available but not integrated. Separate system for web interface because running Novell networking.

Ministry documents – not really played much of a part in the decision-making. We were really there before the Ministry documents came out – not much help but did confirm that they were on the right track

### 3.5

Dear [principal school A]

Many thanks for taking time out your busy schedule to talk to me and to arrange for other members of your staff to speak with me as well. I enjoyed the experience.

I have enclosed the copy of your interview for you to look at.

Please feel free to alter the transcript in any way to reflect the true process. I have also attached another page at the back of the transcript for any additional comments you may wish to make – perhaps some thoughts that you have had since the interview that you would like to include. The actual transcript does not get included into the thesis. I may only take some quotes out to support a particular view.

The diagram is my interpretation from the interviews of the decision-making process and I would appreciate any thoughts you might have on this. Does it reflect what happens, do you think?

I have enclosed a chocolate bar to keep up the energy levels while you do this!

I would really appreciate the information all being returned to me in the stamped addressed envelope by **Thursday 29<sup>th</sup> May**. If you could also please include the school information sheet that I left with you that would be very helpful.

Once again many thanks for your input.

Best wishes

Christine Kokay

### 3.6 [copy of final data transcript after verification by interviewee]

#### Interview School B: 3 16<sup>th</sup> May 2003

*What are some of the decisions made recently?– how the problem has been identified and then dealt with?*

1 Probably the last real decision that was made by the ICT committee that I recall was,  
2 something that we really got our teeth into, was discussing what would we would do  
3 when we replaced the computers in A4, which happened over the last Christmas  
4 holidays. They were due for an upgrade and the ones next door in A5, well they are  
5 even older, and essentially we were going to end up with 30 old, but not but not  
6 obsolescent, computers and what would we do with them? And some of the decisions  
7 that we had to make were to either maybe get rid of them all together because they  
8 were too much bother, or set up a whole third room somewhere, or break them into  
9 pods and sort of scatter them around the school perhaps some in the library, or some  
0 down in the older school - D and I block or what. The decision had implications for  
10 wiring the older part of the school because it wasn't part of the network as such, and  
11 we decided that it was high time that it was. Of course part of the mix was the laptop  
12 scheme coming on stream over the holidays. Teachers would have their laptops and  
13 they would want to be able to plug into their classrooms down through the older part  
14 of the school. The decision was made regardless to get on with that networking. The  
15 issues of what to do with the 30 computers. I mean that was not quite so  
16 straightforward. Many people wanted a pod of them placed down in D block – the D  
17 block resource room, which we could see the sense of, but ultimately the technicians  
18 said that that probably wasn't a particularly practical idea – something to do with the  
19 distance it was from the network hub and the fact that the computers would not be  
20 very reliable or very fast. This was a technical decision in the end. There was a strong  
21 push to have computers in that part of the school to save the classes having to come  
22 up to A block in particular which is not always accessible.

*How are you alerted to issues?*

23 Information was sought from the staff, as I recall. We did ask for submissions – we  
24 have got 30 computers, who will want them; where should we place them? How  
25 should we handle this? The committee did get feedback from various people. That I  
26 think is where the big push from the Maths Department and Commerce Department,  
27 in particular, who are domiciled in D block – said ‘we would like a pod of 10 –12  
28 computers – or whatever computers we can fit in that block there so that they are  
29 accessible to kids. That to be honest had further implications of course because if you  
30 are going to put a pod of computers into what is now their storage-come office space  
31 then that had implications for the senior common room which is also part of D block.  
32 Part of the plan was to take over part of the common room and perhaps put the Year  
33 13 students somewhere else. Yeah there were ripples all the way down the line so to  
34 be honest that was also part of the mix – did we want to go there? In the end we put a  
35 pod – about a dozen computers I think into A2, which is close to the network hub The  
fact is it is two terms down the track and its not working all that well. The.  
36 computers are slow; they are not managing the new software well and I think people  
37 are a little bit reluctant to use them. The fact that it’s a discrete room, which doesn’t  
38 actually belong to anybody, means that its perhaps not being managed as well as it  
39 should be in terms of keeping the machines going and tidiness and what have you.  
40 So I suspect that there are issues there that are going to have to be reconsidered.

*Those issues – where would they come back to?*

41 They should come back to the ICT committee, but its possible that they may go straight  
to  
42 Management because we have discussed these issues, especially the ones to do with  
rooming.  
43 Directly to Management rather than the ICT committee. The ICT committee has not met  
44 since reasonably early on last term.

*sThe group is called by the Principal a Task Force – is this how you would see the group?*

45 It is certainly not an ongoing, every year type of committee. There was a particular  
issue  
46 when we were getting the computers into A4 and there were issues to be resolved  
there and so  
47 a task force would be a fairer term for it.

*How do representatives go on to the task force?*

48 Its certainly the people who are intimately involved so we would expect the Head of  
49 Computing to be on it; expect the computer technician to be there; the person involved  
with  
50 timetabling and the Musac system to be on it and other people were invited. It's an open  
51 invitation if you are interested in this issue then you might want to attend. That got a  
good-  
52 sized group of people who were interested. To be honest I am not quite sure what the  
future of  
53 that committee would be. It could well be that in terms of making the decision that it  
had to  
54 do last year it has done its job to be honest. Several things have happened in this school  
over  
55 the last couple of months, which have never been discussed at the committee. I mean  
they are  
56 technical things which the rest of us would say " Yes well OK if you techies say that's  
what  
57 needs to be done then get on and go and do it." Well I mean even the decision to not site  
the  
58 computers down in D block , they needed to be in A block – they were for network and  
59 technical reasons.

*Some of the more recent decisions of changing our network manager from Novell to  
Windows XP*

60 Yeah I mean that just seems to have happened. Apparently it was a good idea and I  
think this  
61 is where it would a good idea to talk to the computer technician because somewhere the  
62 decision was made "yes we need to do this" and its happened. It has never been  
discussed at  
63 Management as such which is interesting. Unless the Principal has discussed it with

them and  
64 said 'Yes get on and do it.' Lots of other things have happened as a result – changing  
our  
65 email system from Pegasus Mail to Outlook. We have been saying 'why can't we do  
this' for  
66 a long time. But we have had enormous problems with the computers over the last two  
or  
67 three weeks this term. The server has been down and been upgraded. I mean it has been  
very  
68 much an on going saga, but again, dare I say, none of this, well was perhaps it wasn't  
for-  
69 seen, but neither was the management of this work process discussed and considered  
'how  
70 can we actually manage this process?' 'what is going to happen?' What will be the  
impact  
71 on people trying to get their work done and what have you. These are important  
decisions  
72 because they seem to have come apart at the seams and to have taken far longer and  
been far  
73 more complex than they thought and led to a fair amount of anxiety, frustration and  
almost  
74 anger from the staff. It appears to be settling down now but again I feel that as a school  
we  
75 look rather stupid because a lot of, I think, fairly weighty decisions have never basically  
come  
76 past us. Obviously there are technical decisions being made out there somewhere – 'yes  
this is  
77 what you need to do – let's do it'

*You think that you need to be listening to and involved when technical decisions are being made?*

78 Obviously they have their own implications for a school such as rooming, impact  
on staff,  
79 getting the tasks done that need to be done, - for exams, for reports. Just this  
morning for

80 instance the computer technician announced, I mean it is a good announcement, we  
are  
81 changing our sort of internet dial up thing today, basically she says to an analogue  
system.  
82 OK, whatever that is and that will mean that we Jet Stream which means that we  
can dial up  
83 and work from home to do our reports- to do whatever. A great advance.  
Wonderful But  
84 again it is just part of that same process of doing stuff that is part of all the  
Windows XP  
package – which is OK, it is all good. We go along with it but again we haven't  
actually  
85 discussed anything.

*Apart from your computer technician do you have other advice coming in to help with the decisions?*

86 At the Task Force meetings we have had people from the firm who does all our work for us.

*How are you finding the new system?*

87 We are still getting used to it. It was extremely frustrating not having email for up to  
three  
88 weeks. Certainly with the new computers Musac is running much faster and more  
efficiently.  
89 It would flip out and fall apart with the old computers. I think it will be better. I mean  
the  
90 access from home I think will be a big thing, especially as report sessions come up.  
Really I  
91 think the whole thing is going through a quantum leap over the last couple of years as  
we get  
92 into all the electronic talking to NZQA. All the entries are done electronically. Results  
are

93 coming back electronically. Everything is on line and so you have got to do it and I  
mean it's  
94 only just come, well I suppose as a result of the NCEA. So you can't sit back and pine  
for the  
95 good old days. I can see the need for all the things that have happened in the school and  
96 probably the need for action, but you sort of wonder if there should have been a bit more  
97 consultation may have helped the process a little bit. To be able to see the steps – just to  
lay  
98 out the things that were going to have to happen.

*Is there an overall strategic plan for ICT?*

99 There was but we have probably worked through it already. I suspect that in this day  
and age  
100 we might be too scared to look too far down the track in terms of 5-year plans. I think a  
lot of  
101 the changes were probably brought about by the 27 new laptops in the school that were  
102 running Windows XP and Novell, I mean do they realize that Novell couldn't cope  
anymore.  
103 Do they realize that – I think you do a lot of these things you do one thing and it  
impacts on  
104 events down the line and I suspect even that the Techies don't know the impact of half  
of  
105 what they do to be honest. In as much as they go ahead and do something and they find  
there  
106 is an implication – the network hub, or using this program. I understand very vaguely,  
for  
107 instance that basically if it hasn't got Microsoft on it then Windows XP won't like it.  
That's  
108 why we have had to change from Pegasus to Outlook because basically Pegasus is  
109 incompatible. The computer technician was saying the other day that Musac itself is  
written  
110 for, works better on 95 or 98 and the current process is not fully XP compatible. She  
says that  
111 we are at the technical fore front. We are at the cutting edge. Well that is not always

the  
112 nicest place to be. I suppose that if you go so far down the track there are going to be  
further  
113 implications. I don't know if you can manage that. I don't know whether all those  
114 implications are known let alone considered and thought through. I may be wrong. I  
think it  
115 has been a steep learning curve for the computer technician. She is very  
knowledgeable, she  
116 is very good but I do worry about her capacity to be able to manage it all and keep it all  
117 going.

*If you were going to plan for this year and into the next who would be involved?*

118 It is something that I think we would use the task force for. Basically the Management  
Team  
119 are part of that task force and so that Management is there as well as others to thrash  
through  
120 the implications. I think that we would want to include that particular group. We have  
used  
121 them in the past when we changed from Macs to PC's. We had Macintosh machines  
here up  
122 until three or four years ago I suppose. When I first arrived here it was a Macintosh  
school.  
123 Eventually the PC's arrived. I mean all those things were managed. They were  
discussed and  
124 planned and it was only about 3-4 years ago that the final Macintoshes went out of the  
office  
125 area and the decision to go PC and then the decision to drop MacSchool and then take  
on  
126 Musac. Again all these were considered and planned. That was the way of the world  
and that  
127 was the way that it had to be.

*Do you see any differences in ICT decision making compared with other decision making  
processes in the school?*

128 Probably just the technical aspects. It is not as simple as just considering impact  
on the  
129 school. There are other unknown technical decisions that affect us. We might say  
we want to  
130 do this and this – ‘Oh no you can’t’ – or ‘it may not work so well’. Or ‘ we are  
not quite sure  
131 what will happen if we site something that far away from the network hub.’ You  
know those  
132 sorts of implications often curtail exactly what we would like to do. ‘I think these  
machines  
133 that are getting a bit old but they are still serviceable’ – and then you go ahead and  
do it and  
134 find they are not. Those sorts of things are I think a tad imponderable. You think  
you know  
135 what you are doing but its not always clear cut. Budget implications are always  
there. It  
136 depends how money you want to throw at it. At the end of the day it is a bottomless  
pit.

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