Case Study of the Cantatech and TOSItech
Distance Learning Projects

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Abstract

This qualitative case study of the Cantatech and TOSItech (Canterbury Technology and Top Of the South Island Technology) audio-graphic distance learning projects provides description of when, why and how both projects came into being. It also provides discussion of the issues and impacts connected to this particular use of information communications technology in rural New Zealand secondary schools. The study explores which elements were key to the design, to the operation, and to the continuation of the projects. Data were collected using a range of qualitative methods, including questionnaires and follow-up interviews with a range of participants from both projects, and employs reference to various relevant documents and literature.

Cantatech began in 1994 as CASAtech (Canterbury Area Schools Association Technology group). The name was later changed to Cantatech when membership was extended beyond just Area Schools to include other rural schools in the Canterbury district. The initial project was followed closely by TOSItech which began a year later in 1995. The inclusion of both projects in this study allows a little more insight into the innovation process: there are many ways in which the pattern for development was shared, but focusing on differences helps to suggest why Cantatech continues to operate almost a decade later while TOSItech ceased to exist in half of that time. The study may be of interest in particular to those involved in catering to the educational needs of secondary students in isolated rural areas. It also has strong links to the field of distance education, to the use of ICT in education, and to the study of educational change and innovation.
Chapter 1: Introduction

This is a study of two clusters of rural New Zealand secondary schools. It focuses on their groundbreaking attempts during the 1990s to introduce on-line learning to improve the learning opportunities of their senior students. In introducing this study, it is important to place it in the context of several relevant national and international literatures. This includes literature relating to distance education and open learning, studies specific to the secondary school (as opposed to tertiary level) experience, and more general literature dealing with the innovation/change process, especially as it applies to education.

In terms of distance education, there is relevance in literature that deals with this topic on the international stage as well as within New Zealand. Literature that defines and distinguishes between the terms ‘distance’, ‘correspondence’, ‘open’ and ‘flexible’ education or learning are relevant in promoting understanding of how these different terms have evolved and which are most relevant to Cantatech and TOSIttech. Much of the available literature is concerned specifically with tertiary distance education, but some also touches on the secondary level, usually for students located in isolated rural areas. As the latter aspect is the most relevant here, this will be treated separately.

The literature that relates specifically to the secondary school experience consists in part of studies relating to the secondary distance education overseas, including the concept of the ‘virtual’ school. There is also limited literature dealing specifically with Cantatech and TOSIttech. This includes some previous studies completed for academic purposes, some journal or newspaper articles, and any handbooks or documents published to facilitate or promote the projects themselves. Several visual texts/videos are included here. The literature in this collection is mainly concerned with one or the other of the projects with a small proportion making limited reference to both. The fact that there is such a limited amount of
literature in this collection could make the current study more significant in terms of what it might add to current knowledge and understanding about the projects.

Another significant literature collection is concerned with innovation and change in education. This provides models against which the development of the Cantatech and TOSIttech projects can be compared. There is a significant link between innovation in education and the application of new technologies. The use of new information technologies in particular is important to how and why the two projects under study here were able to operate. A further link with innovation can be established to writings about changes in learning theory, more specifically the shift from transmission to constructivist models of education.

In finding a place for this current study within the context of all the literature outlined above and sampled below, there is recognition that Cantatech and TOSIttech were examples of distance learning in practice, employing new technologies to introduce innovation and change, with an over-all purpose of seeking to improve educational opportunities for rural secondary students.

Distance education

The practice of distance learning or distance education is not a recent innovation; it has been in existence for many years. It has, however, always been dependent upon developments in technology.

The history of teaching at a distance begins 150 years ago. Distance education was not possible without the developments of technology, especially in transportation and communication, associated with the Industrial Revolution. Teaching at a distance is characterized by the separation of teacher and learner and of the learner from the learning group, with the interpersonal face-to-face communication of conventional education being replaced by an apersonal mode of communication mediated by technology. (Keegan, 1996, pp.7-8).
In the past, where students were separated by geography from their teacher and/or from other members of their class, the bridge to cross that distance tended to rely on postal services with instruction and student response relying wholly on the written word or print medium. This is supported by Rumble (2001, p.31) who identifies one of the earliest examples of distance education as the Pitman shorthand courses which began in 1840, taking advantage of the new, cheap, penny postal services. The delivery of such courses relied on written communications between teacher and learner which were delivered via the postal service, hence the term ‘correspondence’ education.

Distance education is generally regarded as related to geography, implying that the learner is physically distant from the teacher, and possibly from other class members, while instruction takes place. Rumble (1989, p.28) states that “distance education, in its pure form is the opposite of ‘contiguous’ education (in the sense of being adjacent to, in close proximity or in actual contact) where the contact or proximity is between the teacher and his or her students.” Rumble also suggests that there is a continuum on which educational programmes exist, reaching from the highly contiguous (more likely to occur in the conventional face-to-face classroom situation) to purely distance based (where the teacher and students never actually meet face-to-face).

When the Cantatech/TOSItchn delivery method was introduced it clearly belonged on the distance end of this continuum, and yet it was more contiguous than the Correspondence School delivery method which was available at the time. Students and teacher did not meet regularly face-to-face and yet they had regular audio-graphics conferences, allowing them to communicate more directly and immediately than the correspondence postal system could allow. The availability of a wider range of media, telecommunications in particular, increased the opportunities for contact between teacher and students, and among the students themselves.
A further distinction can be made between 'distance learning' and 'open learning', although there are again clear links between the two. Rumble points out that distance education identifies "the means by which education is achieved" while open education identifies "the objectives and character of the education process." (Rumble, 1989, p.30). Open learning (also sometimes referred to as 'flexible learning') aims to enable people to learn in a variety of ways and by a variety of means. It seeks "to make education more accessible to those who have been excluded from conventional forms of education." ("Telecommunications technology", author unknown, 1993).

There is a crossover here with distance education. Rumble (1989, p.31) supports this when he states that "distance education systems are generally regarded as open systems because they liberate students from the need to study in a set place at a set time." It is the effective use of information communications technology that provides the link. Distance (including correspondence) and open education are both concerned with "the basic challenge of the education process, that is, how to facilitate interaction between the teacher and students, and among students. Whenever the teacher and students are physically separated distance education must rely on technology to mediate the interaction between both parties." (Husu, 1996, p.37). The application of technology which "by its nature makes a particular system more or less open." (Rumble, 1989, p.31) is a key factor here.

During the 20th century, developments in information communications technology (ICT) opened a wider range of possible means for the transmission of learning: radio, television, tape recordings, videos, telephones, faxes and computer-based information technology such as electronic mail (email) and use of web-based communication via the Internet. The use of different medium has led to a distinction for some between "correspondence" print-based learning as separate from learning via more advanced forms of communications technology.
Distance education, itself a development from correspondence education, has become established over the last quarter century as a legitimate dimension of conventional course provision at all levels of formal education. (King, 1996, p.6).

In making this statement, King probably saw distance education as "a development from correspondence education" in the sense that the term 'correspondence education' does have a longer history than 'distance education.' Rumble (1989, p.28) sees "no inherent difference" between 'correspondence education' and 'distance education'.

Correspondence education continues to be used as a delivery method but does not include all the possibilities now offered by distance education. Cantatech and TOSIttech relied to some degree on print medium and the postal service. Teachers usually provided at least some hard-copy written texts to outline and, in some cases, support their course delivery. Students were also required to submit work for assessment via the postal service. In this sense, the course delivery was at least in part via 'correspondence'. However, as the print and postal delivery style was not the main focus, Cantatech and TOSIttech were seen to be offering quite a different approach to that available from the Correspondence School, which was the other distance education service on offer to secondary students in New Zealand in the early 1990's when Cantatech and TOSIttech began.

The Correspondence School of New Zealand (2003) has relied on postal delivery of written material since it opened in 1922. Bewley (1996, p.14) identifies 1922 as an "arbitrary start" point for distance education in New Zealand, both because that is when Correspondence School classes began and also because in the same year the first New Zealand public radio station began broadcasting. The two became intertwined in 1937 when the Correspondence School began using regular radio broadcasts to support course delivery (Correspondence School of New Zealand, 2003). At this point the narrow definition of 'correspondence' delivery was stretched beyond reliance solely on print media for course delivery.
This reflects the division between what Rumble (2001, p.32) has identified as the first and second phases in the technological history of distance education. He identifies the first phase as relying on printed course material and postal distribution and sees the next wave as involving the use of broadcasting to support course delivery. Radio was used extensively for this purpose by the 1940’s, in New Zealand as well as elsewhere, and television broadcasting was also employed from the late 1950’s, becoming well established internationally by the 1960’s. The third of Rumble’s identified phases was an era characterised by “the development of multimedia systems using text, video- and audio- technologies”. (Rumble, 2001, p.32). This extended from the late 1960’s through to the early 1980’s when the first signs of the fourth phase emerged, the era of “online or virtual education systems”. (Rumble, 2001, p.32).

The Cantatech and TOSITech projects fit into this fourth phase both chronologically and also in that they took advantage of the development and availability of telecommunications and computer technology, and of the opportunities that such developments provided for on-line communication. The delivery method for these projects was described as ‘audio-graphic’ in that teacher and students were able to communicate vocally (audio) via a telephone conference link and visually (graphic) via computer screens also linked as a teleconference. This second conference, also transmitted by phone line, allowed text and graphics to be viewed and edited simultaneously by all those taking part in the conference. At their inception, the projects did not make direct use of the Internet or frequent use (if any) of email; however, these telecommunication tools have since been included in the continued operation of Cantatech.

Much of the literature dealing with the experience of distance education is concerned with delivery of tertiary as opposed to secondary level courses. The published collection with the over-all title Routledge Studies in Distance Education includes Keegan’s (1996) Foundations of distance education, first published in 1986.
In his introduction, Keegan claims that the book was written “to give a first introduction to distance education” and that it “has also served as a text for university courses on distance education.” (Keegan, 1996, p.xi). The book explores issues such as attempts to describe and define the field of distance education and other terms associated with it. Keegan acknowledges the tertiary focus of this study and many others but also claims that “although it is true that a large percentage of students enrolled in distance education programmes worldwide are adults, from the point of view of the analyst and the theorist all positions established must be equally valid for children studying at a distance as for adults.” (Keegan, 1996, p.30).

Keegan provides discussion of the at times distinct but often overlapping terms that are frequently used in relation to distance education. Gaining an understanding of such terms can assist in appreciating just what the Cantatech and TOSItech projects were all about: distance education (as opposed to conventional face-to-face education) with existing educational organisations (the rural secondary schools which made up the Cantatech and TOSItech groups) influencing planning and preparation of learning materials and providing student support (distinguishing this from private study or a teach-yourself programme).

The use of technical media to unite teacher and learner and the provision of two-way communication also apply to Cantatech and TOSItech but the final aspect of Keegan’s (1996, p.50), definition of distance learning is perhaps less readily applicable. He details the “quasi-permanent absence of the learning group … with the possibility of occasional meetings either face-to-face or by electronic means.” (Keegan, 1996, p.50). In that the Cantatech and TOSItech classes met electronically on a regular weekly basis, with at least one face-to-face meeting during the year, this last characteristic is only partly matched. The meetings were deliberately planned and occurred on a regular basis rather than being simply “possible” or “occasional”. Overall, however Keegan’s definition of distance education generally applies to the projects under study here.
Desmond Keegan, along with Keith Harry and Magnus John, was also involved in editing a later text in the *Routledge Studies in Distance Education* series, titled *Distance education: new perspectives*. (Harry, John & Keegan, 1993). One of the claims made in the general introduction to this book is that distance education “is now a normal form of education for those in employment, for homemakers and for those who choose not to go to schools or universities for the purpose of learning.” (Harry, John & Keegan, 1993, p.1).

This description does not include the group of students who studied via Cantatech and TOSItech, as these students were not completely outside conventional education but were enrolled in rural secondary schools. These students became involved in distance education to extend their existing learning opportunities rather than as a complete alternative to conventional education. The fact that this group was not included in the description is a reflection of the publication date of the book. In 1993 audio-visual distance learning for secondary school students had just begun to have application in the rural secondary school context, such as in South Australia, but this was more than likely so new in 1993 that its existence was not common knowledge. The idea was just emerging as a possibility for secondary students here in New Zealand in 1993.

There are other examples of literature for which the focus is apparently on tertiary education but which present ideas that are more widely applicable to distance learning projects at the secondary level as well. For instance, *Critical Reflections on Distance Education*, (1989) edited by Terry Evans and Daryl Nation, focuses largely on tertiary case studies but provides models which can be considered in the light of the Cantatech/TOSItech experience. Specifically, the model for programme development (King, 1989, p.108) which attempts to make explicit “the critical tasks, problems and relationships which exist in programme development in distance education.” (King, 1989, p.109). From a retrospective viewpoint, it is possible to see how the issues and stages represented here could be applied to the development of
Cantatech/TOSIttech although there is no real evidence that there was a conscious effort to follow such development model at the time.

The focus of this current study however, was not simply on distance learning in general, nor on tertiary level applications, but more specifically on two particular examples of distance learning projects, concerned with the learning needs of rural secondary level students. Employing technology for flexible learning has been one way of responding to the needs of students in isolated rural areas. Receiving tuition from a distance, whether via the New Zealand Correspondence School, the Open Polytechnic, or through the audio-graphic links provided by the Cantatech and TOSIttech projects, has widened the possibilities for many students living in remote areas, particularly for those students in senior years of secondary schooling.

Secondary schools

A key literature for this study is that dealing specifically with the secondary school distance education experience. The rural context of the schools involved in Cantatech and TOSIttech is a key factor in consideration of the reasons why the projects occurred when and where they did. While tertiary institutions such as universities and polytechnics based in main urban centres were exploring new delivery techniques for reasons of their own, small rural schools had their own particular incentives for pursuing the opportunities that the same distance learning technologies could offer their students.

Rural schools have always been places in which a considerable measure of flexibility has been required and this is particularly important at the present time. To be effective in a small school in a rural area teachers have often had to teach beyond their area of expertise. Students in rural areas have frequently had to find innovative ways of accessing non-local educational and vocational opportunities because of the lack of local employment. It is not surprising then, that as New Zealand education enters the information age, many rural schools are at the forefront of developments in the application of information and communication technologies and the creation of flexible
learning environments. One prominent outcome has been the development of rural school networking. (Moffatt & Stevens, 1996, p.1).

Investigating an alternative method of delivery for teaching and learning such as this is relevant not just to the needs of isolated rural schools but to learners everywhere. An innovative alternative form of delivery can arise, as in this case, from geographical isolation, but can also be a way of overcoming physical and social barriers to attending regular school classes such as for people whose movement is restricted by physical handicap or by commitments such as child-care. Alternative means by which learning can take place has importance for anyone who is not best served by the traditional option, in other words, by physically attending face-to-face classes in a fixed-location classroom at a fixed time.

As will later be indicated in relation to innovation and change, there are many who believe that the educational traditions of most schools do not best serve current needs. Recent theories as to how learning best occurs have pointed to the need to break the artificial restrictions of location (classroom boxes), age (having to fit with a social cohort of learners) and, to some degree, timetable (requiring attendance four times per week at a particular time and place). The concept of the ‘virtual school’ is relevant here in that these projects represented very early steps in this direction although there are also some significant differences between what has happened within these projects and what takes place in the Virtual High School. (Rutkowski, 1999, p.74).

Tiffen and Rajasingham argue that while small schools struggle to offer a range of subjects, “telelearning makes it possible to offer a variety of courses that no conventional school could match” (Tiffen and Rajasingham, 1995, p.4). However, most references to secondary schools were buried in general discussion of the authors’ vision of the possibilities a virtual class might offer in terms of breaking some of the restrictions of the conventional classroom situation. This was seen more often in a tertiary context.
By contrast, publications which relate to the Virtual High School are directly concerned with secondary level education. In what has been described as “a bold and far-reaching experiment” (Berman and Tinker, 1997, p.52), the Virtual High School was established in October 1996 and began offering courses in September 1997. “For the 1998-99 school year, 33 high schools from 11 states (were) offering netcourses in the Virtual High School.” (Rutkowski, 1999, p.74). There are both similarities and differences between the Virtual High School and the Cantatech/TOSItch experience.

Included in the similarities, apart from the secondary age level of the students, is the fact that participating students are currently enrolled in conventional schools and take most of their courses in a face-to-face delivery context. These networks “aren’t trying to replace traditional schools”. (Carr and Young, 1999, p.55). Rather they are seeking to supplement or extend the educational opportunities on offer.

The on-line courses tend to be ones that the schools are unable to offer because roll numbers within the schools would be too low to make this economic. By combining numbers from various contributing schools, a class becomes feasible. This “significantly expands curricular offerings” (Rutkowski, 1999, p.74), thus making remaining at the current school a more attractive proposition. Further similarities are that the participating schools provide the technology and the teachers. Also, becoming involved in this form of delivery places the participants, students and teachers, in a technology rich learning experience which can have positive spin-offs beyond the specific course of study.

There are ways, however, in which the Virtual High School experience would be significantly different to Cantatech/TOSItch. The size of the network is perhaps the most obvious difference, both in terms of the number of schools and students involved and in regard to the geographic area across which they are located. The school’s website (http://www.govhs.org/Pages/AboutUs-Home) states that in 2003 the school offered 125 courses to 183 member schools across 21 American states as
well as having involvement from Brazil, Dominican Republic, Malaysia, Peru, South Korea, Trinidad, Uruguay, Venezuela, and Japan.

   By contrast, the Cantatech website (http://www.cantatech.school.nz/) states that “In 2003 we have about 95 students from 12 schools from Picton in the north to Tuatapere in the south, Hokitika in the west to Akaroa in the east.” There are seventeen on-line courses available to these students. The differences implied by this divergence in scale include the increased extent of resources that the larger network has at its disposal. On the plus side for the smaller networks, the students still have the possibility of meeting face to face at least once a year as the physical distance between schools is not too prohibitive.

   A more significant difference between these two on-line secondary schooling distance education projects relates to the issue of synchronous/asynchronous delivery. The Virtual High School, like many other virtual schools and including the majority at tertiary level, is Internet based and operates in an asynchronous context. It does not require the participants to all be present on line at that same time. This is not true of the Cantatech/TOSIttech delivery model which was based on weekly on-line classes, specifically timetabled, so that the class members (teacher and students) could communicate in real time.

   Even though Cantatech has moved to Web-based NetMeetings for the graphics component of delivery (as opposed to using a phone-line mediated graphics bridge to create a conference link between all class participants), there is still a specific time each week when all class members meet on-line and via phone conference. This difference in delivery has implications for the learning style required and provides a potential contrast between the Virtual High School and Cantatech/TOSIttech. This study, however, is not concerned with such an in-depth comparison although being aware of other examples of distance learning projects involving secondary students helps to place these particular distance learning clusters in a broader context.
In addition to overseas studies of secondary school experience, there are also some literature, published and un-published, which deals more specifically with Cantatech and TOSIttech. This includes unpublished studies completed for academic purposes such as those by McNicol (1998) and Scott (1996). Both of these involved some evaluation of the perceived effectiveness of the audio-graphics delivery techniques employed by Cantatech. Grainger's (1999) study related to the TOSIttech experience and was had more to do with reflecting on the spin-off effects that involvement in on-line course had for the conventional classroom. The focus of each of these studies, while they may overlap with this one, do not totally replicate what is explored here.

Other sources of information about Cantatech include two videos produced by the Video Production Unit, Christchurch College of Education for the purpose of informing the viewer about the project involved. While limited in their scope to a fairly superficial view rather than in-depth analysis, these visual texts are useful in providing some background to the project and in offering the additional understanding that can be provided by the visual relay of information. The Cantatech Distance Education Handbook (1997) also offered some more factual details about how the project operated at that point in time as did the MacKinnon (1994) evaluation of the first year of course delivery, and an article from the New Zealand Education Gazette (Velde, 1999). TOSIttech received similar coverage from a article in New Zealand Science Monthly (Dobbs and Coburn, 1996).

The fact that this is a fairly limited collection perhaps means that the contribution which this study could make is more valuable in terms of adding further insight and understanding to the knowledge about the two projects. Gathering data about these projects offers increased understanding about the path to the future for education. The relevance is not only to rural secondary schools, such as those involved in the projects, but to schools and education in general. As Moffatt and Stevens stated in one of the few texts which relates to both Cantatech and TOSIttech, “the current development of networking by some rural schools in New Zealand is
providing a model for teaching, learning and the delivery of the curriculum that all schools are likely to have to consider in some way in the future.” (Moffatt & Stevens, 1996, p.5).

**Innovation**

The Cantatech (Canterbury Technology) and TOSItech (Top Of The South Island Technology) projects hold a particular place within the technological revolution’s impact on distance learning, especially here in New Zealand. At inception, they were innovative in how they employed developments in technology to create a new type of learning community. Each of these projects created a network of rural schools, allowing students at one or more of these schools to pick up courses that were delivered via audio- graphic technology from a teacher based at a different school in the network group.

The new direction taken by these projects, the nature of the innovation they introduced, makes them worthy of study. They provide an early glimpse of one possible future for education in action. Such a future vision is one potential application for this research in the sense that, as Schofield (1990) suggests, these projects provide suggestions of “what could be”.

I would like to argue that qualitative research in education can be used not only to study what is and what may be but also to explore possible visions of what could be. By studying what could be, I mean locating situations that we know or expect to be ideal or exceptional on some a priori basis and then studying them to see what is actually going on there. (Schofield, 1990, p.84).

Cantatech in particular (and TOSItech as a close successor) has become established as “exceptional” (Schofield, 1990, p.84) in the history of New Zealand secondary schools use of distance education. The ‘Cantatech model’ is often referred to in describing the nature of later networks, TOSItech included, and much can be learned from understanding how it operated. As Lockwood (2001, p. 1) has stated: “The challenge facing us is to learn from the experience of others, to encourage and
evaluate educational innovation, so that all of us can achieve our full potential.” Understanding more about the Cantatech/TOSItech experience could offer greater chances of success in the introduction of other related educational innovations. One starting point for this understanding is the context from which the innovative ideas arose.

The Cantatech and TOSItech projects provide practical examples of innovation in education and the patterns of their development could help to increase understanding of the process of change in education. There is a wealth of literature relating to this field, and increasing importance is placed on the need for change in schools as well as on the need to understand the change process.

Extending educational change matters for getting existing approaches to educational change to work more effectively in more places, and for deepening our understandings of and sensitivity to whose interests are at stake in educational change. Who benefits and who loses? How do these interests and how we address them affect what kinds of changes we pursue? What challenges does all this pose for the change process itself? (Hargreaves, 1998, p.281).

The complexity of the change process has been explored by various writers, including Hargreaves who also stated that one of the major challenges of educational change today is "how to define and manage change in a politically contested and multidimensional environment." (Hargreaves, 1998, p.283). In relation to the multidimensional nature of educational change, Hargreaves has said that: "while the change literature (and change management practices) tend to focus on two or three of these dimensions only—especially cultural, structural and strategic ones—there are many more which demand equivalent attention: especially moral, political and emotional ones." (ibid, 1998, p.283). It is possible that description of the Cantatech and TOSItech projects could increase understanding of some of these dimensions of change.
Michael Fullan, the author of a number of texts relating to change in education, has also described innovation as "multidimensional'. In *The New Meaning of Educational Change* he states:

There are at least three components or dimensions at stake in implementing any new program or policy: (1) the possible use of new or revised *materials* (instructional resources such as curriculum materials or technologies), (2) the possible use of new *teaching approaches* (i.e., new teaching strategies or activities), and (3) the possible alteration of *beliefs* (e.g., pedagogical assumptions and theories underlying particular new policies or programs). ... Change has to *occur in practice* along the three dimensions in order for it to have a chance of affecting the outcome. (Fullan, 2001, p.39).

In considering whether Cantatech and TOSItech fit with Fullan's theories, it could be argued that the "*materials*" were the technologies required for this new means of audio-graphic delivery; the "*teaching approaches*" relates to the changes in delivery style required for teaching on-line; and the "*beliefs*" could apply to the new pedagogy which emerged as a result of discovering what worked for successful on-line delivery and, as an extension, could often be translated into successful practice in the regular classroom. The projects in operation were very much about putting change into practice. Whether this was sufficient to have a chance of "affecting the outcome" as Fullan theorised deserves closer consideration.

In the same text, Fullan identifies three phases in the change process that can also arguably be seen reflected in the Cantatech and TOSItech projects, moving from the early design stage to implementation and beyond.

Most researchers now see three broad phases to the change process. Phase I—variously labelled initiation, mobilization or adoption—consists of the process that leads up to and includes a decision to adopt or proceed with a change. Phase II—implementation or initial use (usually the first two or three years of use)—involves the first experiences of attempting to put an idea or reforms into practice. Phase III—called continuation, incorporation, routinization or institutionalization—refers to whether the change gets
built in as an on-going part of the system or disappears by way of a decision to discard or through attrition (see Berman & McLaughlan, 1977; Hubermann & Miles, 1984). (Fullan, 2001, p.50-51).

Fullan's description of initiation as the stage at which "specific education changes are introduced because they are desirable according to certain educational values and meet a given need better than existing practices" (Fullan, 2001, p.53) fits with the reasons given for Cantatech's and TOSItech's introduction. The projects aimed to provide better educational opportunities for senior students and to do so in a manner that improved on what was currently available through existing correspondence delivery.

At the implementation phase, Fullan recognises that: "Intrinsic dilemmas in the change process, coupled with the intractability of some factors and the uniqueness of individual settings, make successful change a highly complex and subtle social process." (ibid, p71). Those who implemented the Cantatech and TOSItech projects were continually faced with such dilemmas, trying to establish a new delivery method within often highly traditional existing structures while working with restricted local resources and expectations.

The final stage, which Fullan describes as "continuation", relates to the issue identified as ‘sustainability’ in this current study. When Fullan speaks of how: "Problems of continuation, even in the face of initial successful implementation, persist to this day" (ibid, p89), there is strong relevance to the reasons why TOSItech no longer operates and to the on-going issues faced by Cantatech.

Fullan’s theories about innovation and change are not the only available viewpoint on this process. Rogers, for instance, offers a model for the diffusion of innovation, a process by which “(1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system.” (Rogers, 2003, p.11) This model could also be applied to the introduction of audio-graphic
distance learning through the Cantatech and TOSItech school networks to teachers and students attending the member schools. Rogers (2003) has much more to say about each of these elements in the diffusion of innovations, and much of this could be applied or compared to the Cantatech/TOSItech experience. For instance, Rogers (2003, p.170) provides a model of five stages for the innovation-decision process passing from (1) first knowledge of the innovation, to (2) forming an attitude about it, to (3) the decision to adopt or reject the innovation, then to (4) implementing the new idea and finally to (5) confirmation of the decision.

This model has some similarities to Fullan’s (2001, p.50) three phases of the change process although the Rogers model is more extended, with the early stages in particular being more differentiated. Fullan’s Phase I—variously labelled initiation, mobilization or adoption—appears to cover the same ground as the first three phases of the Rogers model, as it “consists of the process that leads up to and includes a decision to adopt or proceed with a change.” (Fullan, 2001, p.50). Fullan’s Phase II: implementation or initial use, and Phase III: continuation, incorporation, routinisation or institutionalisation, appear to correspond more readily to Rogers’ third and fourth stages of innovation. In both models, the final phase or stage includes the potential of discontinuance. This stage or phase is relevant when considering the major difference between Cantatech and TOSItech: the fact that Cantatech continues to operate while TOSItech folded after five years.

It is important to realise that the use of models such as those provided by Fullan or Rogers are “a useful means of simplifying a complex reality, so as to provide a basis for understanding human behaviour change and for introducing an innovation.” (Rogers, 2003, p.195). They should be regarded as a “social construction” (ibid, 2003, p.195) which is probably more easily observed in retrospect than a path or process which was consciously followed at the time. The models have been referred to in this study to illustrate the change process that the Cantatech and TOSItech school were involved in. Using such models provides the opportunity to
compare these examples of innovation and change with one another and with other similar projects, identifying potentially common elements or points of difference.

The questions to be asked about all of this should lead to a clearer description of why and how the projects were first set up, how the systems actually worked in practice, how participants in the projects regarded the experience, and what implications this could have for education in the future. There are links here to Dr. Peter Ellyard’s ideas about education in the 21st century, the notion that “the future is not some place we are going to but one we are creating, the paths to it are not found but made, and the making of those pathways changes both the maker and the destination.” (Ellyard, 1992, transcript: not paginated). In considering why the particular paths of Cantatech and TOSItech were forged it is also interesting to consider whether their approach was “problem centred”, aiming for “a future where present problems are lessened or absent”, or rather “mission directed, setting out to create a positive future.” (Ellyard, 1992, transcript: not paginated).

Applying Ellyard’s (1992) ideas to the changes that these projects brought to teaching and learning helps reflection about the reasons or circumstances that drove the changes in the first place. The “problem centred” or “mission directed” concepts encourage consideration of whether the new ideas were introduced primarily as a solution to observed problems—such as the fact that if senior students’ could not access adequate course options then they might not stay at that school—or as part of a vision for desirable improvements to educational delivery. In terms of Ellyard’s (1992) notions about “paths to the future”, it is possible that the innovations put into practice through Cantatech and TOSItech did begin to forge a new path, create new educational perspectives that would perhaps have not even been considered without these steps in a new direction.

Reference to Ellyard’s ideas provides the Cantatech and TOSItech projects with a context for considering how education could meet the needs of the future through change and innovation. Such changes do not just include the introduction of
new technologies as a tool in the education process. They also include changes in the pedagogy of education, in beliefs about how teaching and learning can best operate or occur. Cantatech and TOSIttech also contribute to this discussion. They demonstrate how, once new technology enables the method of delivery to be different, it also influences changes in teaching strategy.

The notion that learning theory changes were needed developed over the later decades of the twentieth century, including the 1990’s during which Cantatech and TOSIttech emerged. In 1999 Julia Atkin stated that “over the past thirty years we have deepened and extended our collective understanding about the nature of human learning, about the nature and range of human intelligences and we are developing educational practices that support and enhance learning.” (Atkin, 1999, p.1). While Atkin is based in Australia, awareness of such issues was current in New Zealand at this time also, as the following quote indicates.

Schools must become learner centred, not timetable or teacher or class centred, but centred on each individual’s learning needs, talents and aspirations for the future. (This means) shifting traditional concepts of ownership and dependency away from the system, the school and teachers to the learner. (Hood, 1998, p. 130).

The Cantatech/TOSIttech model, in breaking away from the idea of a class needing the physical boundaries of a classroom and having to exist in the same geographic place, also began to break down the restrictions of learning by age cohort. Although adults are welcome in regular subject classes, it is arguably easier for an adult learner to join a class of this nature where they do not have to physically enter a room and feel immediately an outsider because of age. The more flexible timetable is also an advantage for these adult learners and probably for all class members in that, apart from the weekly on-line sessions where instruction and feedback has a fixed opportunity, the rest of the study can be completed at the time which best suits each learner. There is also opportunity for community use of the distance learning facilities outside normal school hours, an option which could help to fund the on-line costs.
The increasing use of computer technology in education, not only for distance learning purposes, has a chronology parallel to this development of learning theory and the use of such technology has been associated with the development of more learning-centred environments. (Lai, 1992, p.10). By 1996, it was recognised that the “recent advances in information and communication technology have opened up exciting possibilities for teaching and learning.” (Lai, 1996, p.vii). One of the possibilities Lai identified at this point was the linking up of computers electronically in different locations. Cantatech and TOSITech were both making use of such computer links at that time.

Lai saw the use of computer networks as having “the potential to create a peer-supported learning community. This community is characterised by a student-centred approach to learning, with the learner engaged in situated, collaborative as well as cross-cultural learning activities.” (Lai, 1996, p.4). Whether this was reflected in Cantatech and TOSITech may emerge through the discussion of the impact of these projects on teaching and learning in Chapter 5 of this study. Teachers and students who participated in contributing data to this study certainly made comments about the different style of teaching and learning required during study by this method. Whether this change reflects Lai’s description of student centred learning will be explored later.

Bates (1995, p.44) provides a summary of different kinds of learning including behaviourism, cognitive theories, and humanistic psychology. His concern with these theories is in relation to selecting technologies for delivering distance education courses and he claims that “the need to make a conscious choice of learning theory is a profoundly practical issue with respect to the selection of technologies for teaching.” (Bates, 1995, p.46). Exploring the Cantatech/TOSITech experience through this study may provide some indication of what part learning theory played in terms of what approach worked and what did not. The learning theory discussion is
particularly relevant when comparing the transmission model of learning with a more constructivist approach. This connection is further detailed in Chapter 5 of this study.

In terms of the study that follows this introduction, the key research questions should make it possible to explore the impetus behind these projects, to understand how they operated and to appreciate the impact they had. In so doing, it may also be possible to increase our awareness of the issues associated with educational innovation and change in relation to technology as well as, to some degree the pedagogy of teaching and learning.
Chapter 2: Research Methodology

Research questions

The case study of these two audio-graphic distance learning projects was constructed around the following four key research questions:

1. What led to the design and introduction of these projects (i.e. Cantatech and TOSIttech)?

2. What resources did they rely on and how did they operate?

3. What impact did they have in terms of teachers and learners?

4. In what sense were the projects, or their impact, sustainable?

The questions have some basis in chronology, particularly in terms of the order in which they are presented. The first three questions are generally backward looking. The first deals with events/issues/elements that were present before the projects began; the second seeks to discover the things that had to be in place in order for the projects to operate; the third question focuses on the effects of their operation. The final question is more concerned with the projects in a present or even a future context in that it is asking about the lasting impact that the projects may have had on teachers and learners.

Question 1

In asking what led to the design and introduction of the projects, the aim has been to look for a range of factors that may have paved the way. The expectation was that this could be in a general sense, creating a situation or environment in which such an approach to teaching and learning could be regarded as both possible and acceptable. In addition, the question could also produce answers that were more direct in terms of locating precursors or early models, showing a very direct link to the
creation of these projects. In formulating the question there was the possibility that direct triggers might be discovered as well as general patterns of development.

**Question 2**

The question about resources was also intended to be broad in interpretation so that it could cover a range of possibilities, from finance and equipment to personnel and support services. The answers about methods of operation could then also include details about the infrastructure of management that needed to be in place as well as the hands-on operation of equipment during actual class delivery. It seemed likely that the range of participants who were sent questionnaires might have different things to offer in their responses to this question, depending on whether they had designed the project, administered or managed it, taught via this delivery method, or been a student receiving lessons that way.

**Question 3**

Inquiring about impacts on teachers and learners was intended as a way of both measuring the extent of any impact and of identifying exactly what changes the projects brought to teachers and learners. This question can be related to pedagogy and again, the identity of participants could have a strong bearing on the information which they provided. There may be the expectation, for instance, that a student would not have the broader view of pedagogical theory but could describe specific ways in which learning via audio-graphic delivery was different from other class situations they had experienced. The question also allowed the possibility of participants with a deeper understanding of educational theories to apply this perspective to their answers.

**Question 4**

The final question aims to explore the sustainability of the projects, either in terms of continuing to exist in their original form or in terms of spin-off effects that they may have had and which may have lasted longer than the projects themselves. It reflects, “a central concern with whether a policy or programme implemented in a
particular place achieved its goals or produced desirable effects.” (Gomm, Hammersley & Foster, 2000, p.99). This was the question that often needed to be teased out in the interview, which, in most cases, followed completion of the questionnaire. It also has a strong link to the first and second questions. In understanding what led to the design and introduction of the projects, it is relevant to consider whether these factors are still in place in order to question sustainability. It is also relevant to ask whether the resources they relied on, as identified in the answer to question two, continued to be available as, again, this would have a strong bearing on the sustained operation of the projects. Measuring the less direct impacts of the projects and the degree to which they were sustainable required more specific questions in the interview. For example, questions as to whether the skills that may have been developed during involvement in the project were transferable and of use beyond the point where the participant had been involved in the project. This aspect of the research was concerned with “whether the policy or programme studied has worked in the case investigated but also with whether it would work elsewhere.” (Gomm, Hammersley & Foster, 2000, p.99).

The broad general nature of all the questions was intended to allow and encourage answers beyond the researcher’s preconceived expectations. Having been directly involved in at least one of the projects under study, it is inevitable that there would be some prior expectations about what the participants would say. Making the research questions (and the questionnaire questions) very open ended was done deliberately with the intention of allowing for any unexpected responses to emerge. The questions in the questionnaire (see Appendix 2) relate either directly to the four key research questions, such as question 12 which asks about any long term or sustainable changes, or else are the result of breaking the general question down a little further, such as questions 10 and 11 which ask about benefits and difficulties of teaching and learning via audio- graphic delivery and are designed to provide information about the impact of this delivery method.
Research procedure

The overall procedure for this research was to conduct a largely retrospective case study of the Cantatech and TOSItech projects. Methods were mainly qualitative including study of documents, use of open-ended questionnaires, and interviews. It reflects Mitchell’s (2000) description of a case study which stated that “In its most basic form a case study may refer to the fundamental descriptive material an observer has assembled by whatever means available about some particular phenomenon or set of events.” (Mitchell, 2000, p.168). The study also links to Mitchell’s use of the label “configurative-idiographic studies”, one of the five ways he identifies of using case study material. Configurative-idiographic studies, he states, are studies:

…in which the material is largely descriptive and reflects the particular concatenation of circumstances surrounding the events in a way which, while they may provide insights into the relationships among the component elements in the case, do not easily lead to direct theoretical interpretations. (Mitchell, 2000, p.172).

The study intends to exhibit all the characteristics of qualitative research as identified by Maykut and Morehouse (1994, p.43) in that it includes:

1. An exploratory and descriptive focus—exploring and describing the Cantatech and TOSItech projects.
2. Emergent design—allowing room for new leads to be followed in the course of the study such as possible changes to sample size.
3. A purposive sample—not a random sample but one aimed at providing full understanding of these projects from various relevant perspectives.
4. Data collection in the natural setting—no artificial experiments created, subjects visited in their own setting where possible.
5. Emphasis on ‘human-as-instrument’—researcher as the collector of data and the culler of meaning from it.
6. **Qualitative (Multiple) methods of data collection**—collection of relevant documents, open-ended questionnaire, in-depth interviews audio-taped and transcribed.

7. **Early and on-going inductive data analysis**—analysis begun once any data had been collected e.g. documents, completed questionnaires, which may provide leads which could affect the focus of inquiry.

8. **A case study approach to reporting research outcomes**—report will be characterised by rich description, including excerpts from actual data. Readers will be able to determine their own applications for the findings.

**An exploratory and descriptive focus**

Hammersley, Gomm and Foster (2000, p.250) expressed the belief that “it is important to draw a distinction between case study work that is designed to describe the features of a particular set of cases, or to explain what occurred in those cases, on the one hand, and research that is concerned with developing and testing theories on the other.” There is no single hypothesis which this study sets out to prove or disprove. As Bogdan and Biklen have stated in *Qualitative Research for Education*:

> Qualitative researchers avoid going into a study with hypotheses to test or specific questions to answer. ... The study itself structures the research, not preconceived ideas or any precise research design. Their work is inductive. (Bogdan & Biklen, 1998, p.49).

The aim of this study was to explore and describe Cantatech and TOSItech, using the key questions as a guide to seek and share understanding of both these distance learning projects. The use of the case study could be “for adding to existing experience and humanistic understanding. Its characteristics match the ‘readiness’ people have for added experience.” (Stake, 1978, p.24).

**Emergent design**

Although research questions were stated from the outset, it was still quite possible that the narrative of this double case study would produce other questions or
answers. With the understanding that case study method “may help in the forming of questions rather than in the finding of answers” (Donmoyer, 1990, p.32), it is acknowledged that the process shaped the final product of this research.

In the course of the study, the key questions remained essentially the same but the interview process clearly fitted the ‘emergent design’ description. Answers given to some questions in the earlier interviews led to a desire to check, in later interviews, if other participants shared similar beliefs or experiences. An example of this, in relation to the key question about impact on teachers and learners, is a comment made in one of the early interviews about the need for a particular style of questioning to encourage productive learning on-line. During follow-up interviews, if participants did not mention questioning initially, they were asked if they felt that questioning style was in any way important or different to the style which might be employed in a face to face classroom. The earlier interviews clearly provided threads of thought that could be followed and, to some degree, measured in terms of shared strength, as the data collection progressed.

A purposive sample

The purpose of the sample was to include a range of opinion from a variety of stakeholder perspectives. Data collection included contributions from those involved in the original vision/design teams, the administrators of each project, teachers delivering courses on-line, and students who have studied via this medium. Initial ideas about sample size were aimed at ensuring there were sufficient participants to compose a good range of perspectives. Including at least two participants from each project for each of the categories identified above was geared to this purpose. Sample selection was suggested in the research proposal as follows:

<table>
<thead>
<tr>
<th>SAMPLE GROUP</th>
<th>CANTATECH</th>
<th>TOSITECH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original design team</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Administrators</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teachers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Students</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

FIGURE 1
It was seen as possible that, as the research progressed, this sample size might be extended, particularly if some people preferred not to move on to the interview stage as outlined below. It did not appear necessary to collect data from every school involved in the projects although effort was made to include schools that had a leading role as well as those which may have joined after the project was set up. Again, the intention was to gather a range of views. It was also possible that some crossover would emerge with some people fitting into more than one category e.g. design team and administrator, or administrator and teacher. In short, the numbers above were not fixed. The ultimate reason for the size of the sample was the need to include an adequate range of views to obtain a clear description of both projects rather than to achieve some appropriate total number of participants.

The makeup of the actual sample for data collection was as follows:

**FIGURE 2**

<table>
<thead>
<tr>
<th>SAMPLE GROUP</th>
<th>CANTATECH</th>
<th>TOSITECH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Questionnaire</td>
<td>Interview</td>
</tr>
<tr>
<td>Original design team</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Administrators</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teachers</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Students</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

The changes to the proposed sample again reflect the 'emergent design' idea mentioned above. The increased number of participants was the result of two things: firstly, as the table suggests, several participants chose to only complete the written questionnaire and not to take part in the follow-up interview. This, in at least one case, led to the decision to contact another person in that sample group who might be willing to do the interview as well in order to extend the range of data collected. The second reason for increased numbers was that some of those people interviewed in turn recommended other people whom they believed would be able to provide further information or an additional viewpoint. Where there did appear to be some gaps in the data provided, these recommendations were followed up.
While all of the participants indicated in the sample table above completed questionnaires, a number of them did not do the follow-up interviews. The reasons for this varied. In the case of one of the teachers from each project, there seemed to be little more that would be gained from an interview beyond what had been recorded by them in the questionnaire. Two students indicated that they did not want to take part in an interview, but both had answered the questionnaire in full so the lack of a follow-up interview was not seen as a real problem. One teacher was unable to be contacted for the interview, despite efforts over an extended period of time.

In terms of other potential participants who were approached, one person declined to take part while two others stated a willingness to be involved but never actually returned the questionnaires, again despite repeated efforts to facilitate this. There simply came a point in data collection where a cut-off point had to be declared so that the research could progress to the next stage.

The final list of participants included two design team members who were from outside the member schools but were in a position to help with the research needed to come up with the project design. One member of the design team was also a Principal and another was also an administrator and an on-line teacher. There were six participants in the data collection who had been Principals of member schools at some point. At the time of data collection, three of these Principals had since moved into advisory service rolls, two of which were specifically related to ICT. Of the remaining three Principals, one had moved to become Principal at another school within the network group, a second had moved to a Principal’s position in a North Island school and was no longer involved in this sort of project, and the third was still involved in the project but as a part-time on-line teacher rather than as Principal.

In terms of the teachers who participated in the data collection, one (who was also a Principal) taught on-line for both Cantatech and TOSITtech. Another on-line teacher was also a key design team member and acted as an administrator of the
project within his school. Similarly, another teacher also carried administration responsibilities and has been involved right through the life of the project, including at the time of data collection. Of the six teachers who participated, three were still teaching on-line at the time of data collection. Five students contributed, three from one project and two from the other. One of these participants was a current student while another had been involved as an adult student.

**Data collection in the natural setting**

The data collection can be described as ‘natural’ in that there was no attempt to set up experiments or control groups to compare this form of teaching and learning delivery with the regular classroom. Although data was not collected from direct observation, apart from the researcher’s own experience, it was largely obtained from the feedback of participants who had been, or still were, directly involved in the projects under study.

Participants who contributed to the data collection had varying degrees of involvement in the projects, from contributing on an ideas level to the design process, to grass roots participation as a teacher or learner. Chronology also created a variety of participants in that some had been involved some time ago, possibly at the very early stages of either project, and had to dredge memory to respond to questions, while others were still actively participating in the Cantatech project. Some participants had indirect knowledge of one project and more direct involvement in the other. One participant was directly involved in the two projects, providing useful comparison of the early stages of both, and filling a gap to some extent when not all participants were able to be interviewed.

**Emphasis on ‘human-as-instrument’**

As a teacher at Collingwood Area School, at one time a lead school in the TOSIttech group, I have had some direct experience in the field, teaching Bursary English on-line in 1997 and attending a number of TOSIttech meetings where various aspects of administration were discussed. This experience has given me some
background understanding of the project and also provided me with some contacts when it came to accessing data. Stake (1995, p.49) claimed: “a considerable proportion of all data is impressionistic, picked up informally as the researcher first becomes acquainted with the case.” Even before I had thought of completing this research I had begun collecting data from the point of my first involvement with TOSIttech. This involvement creates a posture of “indwelling” (Maykut & Morehouse, 1994, p.39) which is appropriate to qualitative research.

Qualitative research requires mediative or reflective thinking rather than calculative thinking. It is based on a posture toward knowledge which is inclusive and indwelling, rather than exclusive and distancing. (Maykut & Morehouse, 1994, p.39)

While this position allows me some advantage in that I already have an understanding of what the projects were about, and already have contact with quite a number of those people who should be able to provide me with information, I also needed to be wary of some disadvantages. I had to be careful of coming to presupposed conclusions, and make an effort to examine data with the degree of objectivity that would perhaps allow unexpected patterns or conclusions to emerge. One way to guard against personal prejudice was to enlist help in analysing the data, to have some other suitable person also coding interview transcripts to see if they picked up on any alternative perspectives to those I had been able to establish.

**Qualitative (Multiple) methods of data collection**

While some contacts had already been made by phone, email or face-to-face, the intention was to approach potential contributors via a letter to request their involvement, including a consent form to be completed and returned. This was, in the end, mainly done by email. The next step was a questionnaire, which asked mainly open-ended questions about the informant’s involvement in Cantatech, TOSIttech or both. “The purpose for the most part is not to get simple yes and no answers but description of an episode, a linkage, an explanation.” (Stake, 1995, p.65).
One of the final questions asked if the participant was willing to take part in a follow-up interview, either face to face or by telephone, depending on which could be arranged. (All interviews were in fact conducted by phone.) This allowed for development of stories about personal involvement and experience in these projects and provided the opportunity to follow up on any information presented via the questionnaires. Three of the fourteen interviews were conducted in October/November of 2001 with the remaining eleven taking place between late January and early May, 2002. The interviews took from twenty to forty minutes, depending on how much the interviewee had to say, and were generally conducted mid-evening, a time that seemed to be most commonly convenient.

According to Yin (1994, p.85): “Interviews are an essential source of case study evidence because most case studies are about human affairs.” Many of the participants were happy to talk about their experience of being involved in these projects. Where there was a willingness to be interviewed, the original written responses on the questionnaire could be less detailed and serve more as indicators or memory-joggers for the interview. Some participants treated the questionnaire in this manner, writing very brief notes that were then referred to during the interview. Questions for the interviews were prepared on the basis of questionnaire responses.

The basic format of the interview schedule was as follows:
1. Test of recording equipment (recording of the name of the participant about to be interviewed plus date and time, done immediately before the phone call was made).
2. Introduction of interviewer and subject.
3. Description of the purpose and structure of this study.
4. Reassurance of confidentiality and anonymity if required.
5. Questions based on previous responses to questionnaire.
6. Closing questions offering opportunity for final comments about the subject matter and about the interview/research methods.
7. Thanks and clarification about next steps in the research process including when there will be any further contact.

The information provided by participants during interviews could often be crosschecked against data provided either by other interviews or by relevant documents. This was a good way of supporting or cross-checking the data provided, because, as Yin suggests, "interviews should always be considered verbal reports only. As such they are subject to the common problems of bias, poor recall and poor or inaccurate articulation. Again, a reasonable approach is to corroborate interview data with information from other sources. (Yin, 1994, p.85).

Any relevant documents for which informants were able to provide release such as original proposals, minutes of meetings, or course outlines, were also included in the study. Existing documents were useful to confirm factual details such as dates and the sequence in which events occurred. These documents, some of which have not been officially published, included Lydia MacKinnon's (1994) Evaluation of an Audiographics Exploratory Study; Trevor Scott’s (1996) Audiographics Evaluation; Cam McNicol’s (1998) Viability and Effective Teaching Strategies for Audiographics Distance Learning; the Cantatech Distance Education Handbook (1997); and Geoff Scrimgeour’s (1995) Information Technology Proposal.

Early and on-going inductive data analysis

The interviews were recorded and transcribed so that the information from both questionnaires and interviews could be analysed in writing. Analysis of all or any of the data was frame-worked by the search for answers to the main research questions outlined earlier, with the possibility that other issues might also become apparent during the process.

Coding techniques were used to establish patterns or contrasts in the responses. Specifically, fluorescent highlighter pens were used to indicate parts of the transcripts and of the written answers on the questionnaires that provided answers to
specific research questions. A different colour pen was used for each of the four key research questions. Once these relevant extracts had been located, they could be referred to both individually or collectively to provide answers and identify any patterns.

A co-coding exercise was applied to check that preconceptions built up by prior knowledge were not having undue influence on the interpretation of this data. Three questionnaires and their follow-up interview transcripts were given to another person who has had some experience in thesis typing/editing. She was given the four key questions for this research and four different coloured highlighters, and was asked to use the process above, marking with yellow, for instance, the extracts which she believed were relevant to the question about design and introduction of the projects. All of the sections that she marked were among those I had identified as relevant. The only difference was that the areas I had marked sometimes tended to be a little broader than hers, including parts of the text both slightly before and a little beyond the parts she had marked.

Having reviewed all the relevant texts (documents, questionnaires, transcripts), notes were then made on what appeared to be the most relevant information in relation to each of the research questions. During the writing up of this analysis, I have constantly referred back to the texts, either in hard copy or electronically if they were stored on my computer system. This referral process has been to ensure that the data supports my statements and also, at times, to find relevant extracts which I can quote as evidence. A further check has been to have ‘significant others’ such as my research supervisors and some participants read drafts of the report at various stages of the writing process. The feedback provided by participants in this context fits with Stake’s (1995, p.115) definition of “member checking”, used to review material for “accuracy and palatability.”
A case study approach to reporting research outcomes

The report, which follows here, aims largely to describe Cantatech and TOSIttech, and to explore the reasons for their origins and the impact that they may have had on teachers and learners. The use of relevant quotes and direct references to statements made in the questionnaires and interviews is intended to provide personalized snapshots of what it has been like to be involved in these groundbreaking projects. While there is discussion included in the report relating to the key questions upon which the study is based, there is also opportunity for readers to reach their own conclusions about some aspects of the projects, particularly when seen from the perspective of each reader's own personal experience or interests. This fits with the idea that: "People make sense of text in relation to their own past experiences, their beliefs and expectations, and their present needs and aspirations." (Clark, 1990, p.338).

In gaining some understanding of these projects, the reader is then free to apply the findings to other research or project development as they see fit. This reflects Wolcott's notion of letting readers see for themselves:

I make a conscious effort to include primary data in my final accounts, not only to give readers an idea of what my data are like but to give access to the data themselves. In striking the delicate balance between providing too much detail and too little, I would rather err on the side of too much; conversely, between over-analysing and under-analysing data, I would rather say too little. (Wolcott, 1990, p.129).

Ethical considerations

The key ethical implications of this research were firstly the reassurance of confidentiality where it was required. While the content of this study is not likely to be too sensitive, in the initial letter of introduction (see Appendix 1) contributors were promised anonymity and reassured that they could withdraw from the study at any time. They have also been offered the opportunity to read any references to the data that they have provided before it is published. This reflects what Yin describes as "a major way of improving the quality of case studies and ensuring their construct
validity (which is) to have the draft cases reviewed by those who have been the subjects of the study.” (Yin, 1994, p.145). Effort was also made to make contributors aware of a sense of value in whatever they had to say, to convey to them the worth of this project and therefore each contribution to it. Some of the documents that were loaned to me are obviously unique and therefore precious, and have been cared for as such and returned to the original owners/care-takers when their contribution to this study was complete.
Chapter 3: The origins of Cantatech & TOSItech

The first of the key questions for this research was: What led to the design and introduction of these projects? This is possibly in keeping with what Fullan (2001, p.50) identifies as Phase I of the change process which is "variously labelled initiation, mobilization or adoption (and) consists of the process that leads up to and includes a decision to adopt or proceed with a change." There are also indications here of Rogers (2003, p.170) first three stages in the innovation–decision process. Included are (1) first knowledge of the innovation, (2) forming an attitude about it, and (3) the decision to adopt or reject the innovation. Both of these models assist the descriptive focus of this study, providing perspectives from which to view these early stages.

The factors which inspired and instigated the design of the Cantatech and TOSItech projects included: pressure on rural schools to provide a range of curriculum options for their senior students; dissatisfaction with the current solution to the options issue; the example that had been set elsewhere of possible solutions to such problems; the development of new communications technology which made innovations in delivery possible; the presence of people who were ready to promote the change, to see the possibilities and to act as change agents; and the availability of funding. Each of these factors is discussed in further detail below. Gaining an appreciation of these factors can further help in distinguishing whether the changes introduced were “problem centred”, aiming for “a future where present problems are lessened or absent”, or rather “mission directed, setting out to create a positive future.” (Ellyard, 1992, transcript: not paginated). Again, applying such terms is a descriptive tool that helps to paint a clearer picture of why these innovative projects came about.

Pressure to Provide Options

Rural secondary schools have always struggled to provide their students with rich curriculum choices, particularly at the senior level. Small numbers of students
generate low levels of staffing; with fewer staff, the school is able to offer fewer subject options. Senior students who may wish to study one of the Social Sciences for instance, or a foreign language, or a subject such as Agriculture, can often miss out on having their needs or preferences met. It can also send signals to younger pupils that their course options may not be met in the future. This may lead to further erosion as students look at other schooling choices, boarding school for instance. Some students will look at moving elsewhere as early as Year 9, the beginning of the secondary school years, to ensure continuity right through. This further reduces the school roll, hence reducing the staffing entitlement and therefore the course options even further.

The challenge of breaking this cycle is not new to rural schools and the importance of breaking the cycle was recognised by participants in this study. In responding to the fourth question of the questionnaire (see Appendix 2) about reasons for involvement in the project, one response was “Principal of a school needing to diversify senior options to retain senior secondary students at school.” Student responses came from a similar perspective, such as “I was involved with the project because there were only a very limited number of subjects that were able to be offered being taught by teachers (in a face-to-face classroom situation)” or, from another student, “there was a lack of students doing the same subjects (that this student wanted to do) so that providing teaching in the normal way was not feasible.” The problem-solving drive of these responses reflect Ellyard’s (1992, transcript, not paginated) description of a “problem centred” response.

During the 1990s further pressure was added with changes to the Ministry of Education’s staffing formula, a review recommended by a Ministerial Reference Group early in 1995 and known as the MRG changes. The changes were promoted as a way to create a more “level playing field” in terms of staffing in all secondary schools, but the effect on small rural schools was to further reduce the staffing levels and thus to make providing a range of senior options still more difficult. It was even making it difficult to run the mainstream subjects. An April 1995 letter from an Area School Principal to the Minister of Education stated:
We have the same curriculum demands of big schools i.e. the need to introduce new curriculum with less staff to spread the load. ... Anomalies such as unusually small form classes (e.g. in 1995 we have a Form 5 of 11 students), place additional strain upon rural schools. ... Under the new MRG staffing we would not be able to staff Form 5 of 1995 for even 25 hours per week let alone provide options. (Letter sent to the Minister of Education 12th April 1995).

Although both CASAtech and TOSItech were already in operation by 1995, the MRG changes to staffing highlight the kind of issues that face small rural schools. The existence of such issues may not occur to those with experience only of larger urban secondary schools. It was MRG which encouraged other schools to join the CASAtech group, schools such as Darfield High School, Ellesmere, Mackenzie and Mt Hutt Colleges. While all clearly rural-based and relatively small, none of these schools were Area Schools so hence the name of the group changed to Cantatech (a Canterbury group as opposed to Canterbury Area Schools Association group).

The issue which had been and still was one of providing for the learning needs of students began to also look like a survival crisis for some rural schools. In the words of one Principal participating in this study: “As early as 1992 it was evident that small schools could not provide a full curriculum for students. If staff losses were to be avoided and students’ needs met then it was imperative that something had to happen.” If these schools could not meet the students’ needs then the students and their families would look elsewhere. If the roll dropped below a certain point then the schools themselves, or at least the secondary components of some Area Schools, were at risk of closure.

**Questioning the Current Solution**

For the schools involved in Cantatech or TOSItech, the way to keep students at their local school in the past, if they wished to study options unavailable there, was to enrol some students for Correspondence School courses. This was common practice, and, at the time of writing, still is in some areas. Rural schools, because of
their geographic isolation, are rarely able to set up the kind of arrangement with neighbouring schools possible in a town or city where there can be some interchange of students for senior options, for instance: one school offering Bursary Calculus while the other offers Classics with students attending classes at a neighbouring school on an almost daily basis.

Enrolling for Correspondence School courses allows single students to pursue study in an area which could be a major strength or passion for them but is not shared by any other students at their school and therefore is not taught live. Whether or not there is staff in the school capable of teaching that subject is often irrelevant as running classes can be simply not viable for small numbers; the staffing hours are usually needed elsewhere. Highly specialized staffing skills, such as the ability to teach Bursary Calculus or French, can, in a sense, go to waste if that teacher is needed to deliver lessons in another subject to larger classes.

The Correspondence School instruction style has been largely print based (although this is in the process of change now), with the students studying from printed ‘sets’ of material, largely written with some visual elements and, in some cases, an oral element provided by cassette tapes or the occasional video tape. Students are expected to work through sets on their own, receiving new sets when previous ones are returned for marking. The gap between material being sent in for marking and the student receiving it back, and therefore gaining some feedback on what they have done, has usually been more than a week, at times even several weeks. By contrast, one student participating in this study said that the Cantatech delivery “offers subjects to students in isolated schools with more contact with their teacher and class than the Correspondence School.”

In the past, if students struck a problem, they could possibly have contact with their tutors either by phoning them at the Correspondence School, or maybe by sending a fax. This process often seemed very daunting to students however, as it was not always easy to make the call, to access the toll phone or the fax machine, or to
actually reach the person they wanted to contact at the Correspondence School. One student told me how “with the Correspondence School, it was quite difficult, I think, to get in contact with your teacher. The only way I ever did was by writing notes and attaching them to my Correspondence course sets. We communicated by mail which took quite a long time.”

There was a perception at that time that the Correspondence courses, as expressed by one teacher, “lagged behind a bit perhaps” in terms of up-to-date content. (The Correspondence School has since undergone a considerable re-vamp to ensure that this is not the case now). However, the main issue of dissatisfaction seems to have been the time factor. One design team participant explained how the audio-graphic delivery system, as it was set up, “offered much more of an immediacy, both because there was a regular synchronous contact”, and because the Cantatech and TOSItch systems included “meetings, that they had at least once a year where they actually saw and met the other kids in the class.” Students studying single courses at a senior level from the Correspondence School very rarely had the opportunity to meet their teacher face to face let alone to meet other students taking the same course.

There was no real sense of being in a class. The audio-graphic delivery was perceived by a design team participant to be "much more immediate and not as remote and sort of isolating as the Correspondence School model.” This notion of creating an improved situation fits with Ellyard's (1992, transcript, not paginated) “problem centred” approach to the future, aiming to lessen or remove present problems

Studying alone requires a high degree of self-motivation to stay on top of the workload and keep the momentum going. It lacks the regular presence of a teacher or other class members who would keep reminding the student where they should be up to, or provide them with quite immediate feedback about progress. All of this meant that many students were not happy about the Correspondence School solution to their options dilemma. One student “thought it (Cantatech) sounded better than correspondence because you actually can talk to the teacher.” Another student participant said that she had been told that audio-graphic delivery “was better than
correspondence which was good because I had had an unsuccessful experience with correspondence prior to this.”

If the students were not happy, then neither were their parents. There had to be a better way. As expressed by a design team member: “The driving reason behind Cantatech was, initially, to enable students to be able to get the subjects they required in a rural setting and to be able to do it with a more user-friendly approach than the Correspondence School was giving.” Although this is still, to some degree, a problem centred approach, there is also a suggestion here of the search for change being “mission directed, setting out to create a positive future.” (Ellyard, 1992, transcript: not paginated).

Examples from Elsewhere

Before CASAtech came into existence, there were examples already in place that could model the use of audio-graphic delivery in teaching and learning. Use in New Zealand was largely through the tertiary sector but there was also a model for secondary school use in action in South Australia.

There were already some forms of electronic distance learning happening in New Zealand in the early 1990s. Some of those who worked in rural schools at the time mention contacts with tertiary institutions such as Telford, Tai Poutini at Greymouth, or Waikari Polytechnic in Rotorua. Phone conferences, and even in some cases computer links, were providing courses that senior secondary students could pick up from other locations. It appears however that these courses were all tertiary/polytechnic based and largely if not entirely funded by these institutions. One TOSITech Principal said that before that project had been set up, “we had had a network centred on Tai Poutini Polytech for two to three years. This had been moderately successful with all the costs carried by the Polytech.” While access to such courses made real the possibility of picking up options for some that way, it did not meet all the specific needs. There was no secondary school curriculum based system of audio-graphic delivery operating in New Zealand at this time.
The South Australian model seems to have had a strong impact on what took place here. The kinds of small rural school issues that were being faced in New Zealand were also being confronted elsewhere and the similarities between Australia and New Zealand meant that the solutions that worked there would have a likelihood of similar success here. Carol Moffatt, later the head of the Ministry of Education’s ICT division, was the Principal of Oxford Area School in the early 1990’s and explained how she “read extensively about on-line education and knew that some work was already going on in Australia.” She places considerable value on what this example had to offer. Her information “came from reading, from contacts at the College of Education”. She also took the opportunity to visit and observe in person. “Derek (Wenmoth) had heard about a group in South Australia, in the far north of South Australia. ... I visited them in '93 and I think they had been going for 18 months, two years then at that stage.”

This visit appears to have been very valuable in terms of making a possible solution seem much more feasible. The opportunity to see such a programme in operation and to glean advice from those with hands-on experience made a significant contribution to the first stages of CASAtech (later to become Cantatech). According to Carol: “The guys in South Australia were very generous. They gave us a whole range of ways they’d gone about things. And because they’d done that early thinking, that helped us. They gave me some good do’s and don’ts. I only spent a day there but I learnt a lot in a very quick time and it gave me a great deal of confidence then to carry on with it.” While Carol Moffatt’s original drive appears to have been "problem centred" (Ellyard, 1992, transcript: not paginated), the opportunity to see the South Australian schools’ audio graphic system in practice arguably shifted her vision for the future to one that was more "mission directed, setting out to create a positive future." (Ellyard, 1992, transcript: not paginated) She had seen a possible future already in action.
Development of Information Technologies

The information technology revolution was well underway by the 1990s and the providers of the new technology were keen to promote it. The Telecom Education Foundation had been set up in New Zealand largely for this purpose, and software providers were beginning to develop packages for use in this context. By the time these distance learning projects were first proposed, it was technologically possible to provide the bridges to link computer and phone systems and so create graphic and audio conference situations, connecting a teacher with students at various other geographic locations. If this technology had not been available, the proposition would not have been feasible, and the provision of the technology encouraged the introduction of change. This impact has been widely recognised, as the following quote indicates.

Technological advances create tension between what traditional education systems offer and what new online teaching methods can offer. External pressures are being exerted on traditional education systems forcing change on time-honoured scholastic practices. As a result, progenies, the natural offspring of technology innovations and traditional education practices, are reshaping education. (Glahn & Gen, 2002, p.777).

The early systems and computer programmes (Vis-à-vis was the first software used by CASAtech and TOSIttech) were often quite fragile and prone to break-down, but the existence of such services at all opened the gateway to learning by audio-graphic delivery as opposed to primarily print-based methods. It was still very much at a groundbreaking stage but the tools were available to at least turn the first sod. This would allow for cultivation and growth to follow. The "progenies" of CASAtech and TOSIttech were germinated.

Key Personnel

Key personnel were commonly identified as a crucial element for these projects, as will be explored further when dealing with the key question that relates to the importance of particular resources. Such people are a key element of innovation,
as has been identified by others such as Lockwood, as expressed in the following quote.

Many who have reported on research and development in DL have identified the key role of innovators or champions; those who have perceived a need, an application and alternative way of teaching and communicating and who have strived to realise it.
(Lockwood, 2001, p.9)

The initial key personnel for Cantatech and TOSltech appear to fall into several categories: advisors from outside the schools in terms of both pedagogy and technology; leaders from within the Area Schools’ Association; and on-the-spot teachers who were willing to take on the new ideas and actually work them.

In terms of outside advisors, Derek Wenmoth and Tony Mander from the Christchurch College of Education were mentioned, offering considerable support in terms of research and information about what was happening elsewhere in the world. Carol Moffatt’s visit to the schools in South Australia was undertaken as a result of receiving such information. Ken Stevens from Victoria University, and others involved in the Distance Learning Association of New Zealand (DEANZ) also contributed. One teacher I interviewed recalled hearing Ken Stevens speak at an Area School Conference in the early nineties and said that “his message was, in a sense, it was visionary and I thought that that was worth aiming for. What I didn’t realise because of my naivety about what the technology could do, I think his vision was ahead of what the technology was capable of (doing).” At the time, however, it was the inspiration, the vision provided by such people that was important. It is on this level that the projects were clearly "mission directed, setting out to create a positive future." (Ellyard, 1992, transcript, not paginated).

Technical advice came from people like Laurence Zwimpfer at Telecom. In his role as business futures manager for Telecom New Zealand, Laurence Zwimpfer supported the Tri-Centre Telelearning project at Victoria University from 1990 to 1992 and was responsible for establishing the New Zealand Telelearning Network in
1992. Telecom New Zealand’s stated aim for this network was to provide a “cost-effective application of telecommunications technology to enhance learning.” Zwimpfer was well placed and very willing to provide important support for the original CASAtech proposal. The availability of other support services such as Business and Industrial Electronic Consultants in Wellington (who supplied the original CASAtech equipment) and the EDCOM network was also crucial to finding the path to successful operation of the projects.

Leadership from within the Area Schools’ Association centred on Carol Moffatt, then the Principal of Oxford Area School. Participants in this study have spoken of “the sort of stunning visionary leadership from people like Carol” (one Principal’s comment) as essential to the whole project. Her desire to find better solutions to the issues of offering a richer curriculum to senior students, her willingness to talk to others, to go and see what was happening elsewhere, and then her commitment to bringing her vision back and convincing others of its viability were all incredibly important. Carol herself has spoken of how, when an initial application for funds was turned down, she refused to give in. The way she has described this (below), while also relevant to the funding factor that will be discussed next, provides a clear illustration of the leadership style that ensured that initial difficulties and discouragements would be overcome.

To get the money was a big hassle in itself because I went in and I thought I’d explained very carefully to, it was the Trustbank Trust at that stage, the Community Trust. And I thought I’d explained very carefully what we were trying to do and they nodded wisely and everything and so I put the grant (application) in and I got turned down and, of course, I was just so upset. So I actually rang the secretary for the Trust and said: “Did you really understand what it was?” and he said, “Well, no, actually, we didn’t”.

So I got an appointment with him the next day. I carted my television and a video recorder upstairs, cos we’d had a bit of video clip done. I carted my overhead projector, sat opposite him and gave him this show. You know in ’93 what the technology was like. And at the end of it when he actually saw what was happening and he started to really understand, he said to me would I talk to the board in a couple of weeks time and I said
yes, I would. He said: “You’ll only have about seven or eight minutes,” and I said: “Two minutes will do fine.” So anyway, to cut a long story short I got thirty-five minutes and got the money two days later. (Interview with Carol Moffatt, Oct 2001).

It was this type of commitment to the vision that made others willing to follow Carol’s lead, to take the time to listen and understand, and then to contribute their own time and effort to making the project work. The other Canterbury Area School Principals soon came on board. The degree to which her role was important extends also to TOSItech as several of those interviewed about that project recount hearing Carol speak about CASAtech at the Area Schools’ Conference in 1994. This was one of their earliest introductions to the possibilities that this form of distance learning could offer.

The last essential leadership component was teachers who were willing to give it a go, to take the first classes, plan the first programmes that were delivered audio-graphically. Again, later discussion of the resources needed to operate these projects will outline the qualities that were important here in terms of teacher skills and attitudes. But the whole thing would not have got off the ground, let alone continued to operate, if some teachers had not been willing to follow the leadership and believe in the vision enough to turn it into reality. These teachers, and many of the Principals, tended to have a "problem centred" (Ellyard, 1992, transcript, not paginated) perspective, driven to become involved in audio-graphic distance learning out of a desire to reduce or remove problems currently facing their senior students and their schools.

The early on-line teachers who provided data for this study claimed little prior knowledge of any pedagogical theories that could be related to the delivery method. They were not "mission directed" (Ellyard, 1992, transcript, not paginated) in the way that some of those who created the original vision arguably were. If the practising teachers did buy into that broader vision, it was because they could see it resolving immediate problems relating to providing better course options for senior students.
However, a number of these pioneer teachers, who had limited initial direction and training themselves became, in the words of one Principal, “outstanding on-line teachers” and were then able to pass on their experience to other practitioners who came on board later.

Funding

The availability of sufficient funding to buy equipment and set up systems of operation and support was the final element that allowed the projects to operate. Some of the funding came from the Ministry of Education and was gained by way of application to a fund that had been set up to encourage innovative use for technology. In terms of CASAtech, an initial application to this fund was not successful but, after some reshaping, there was an agreement for backing from the Ministry.

The original proposal was put forward in an application for funding as part of the Technology Project of the March 13 Gazette (1993) to which many secondary schools subscribed; the group’s application reached the shortlist but was unsuccessful thereafter. An alternative perspective, very specific to Area Schools, was proposed, and the Ministry acceded to the request for funds for an exploratory study in the use of technology for distance learning. (MacKinnon, 1994, p.6).

The TOSItech proposal also benefited from the innovative proposals fund in 1994, quite probably cashing in on the example already set by CASAtech.

The political climate was seen to have some bearing on the availability of government funds. This reflects Hargreave's (1998, p.283) expression of the need to recognise political dimensions to change and supports Stake’s (1995, p.17) statement that “issues are not simple and clean, but intricately wired to political, social, historical, and especially personal contexts.” One design team participant in this study stated a belief that the “Education for Enterprise conference that Jim Bolger had and the Consultel Report that came out after it provided the climate within which it was possible to seek that funding”. The Consultel Report (Buckrell et al, 1992) identified three new technologies which could be investigated “in terms of their application to
distance education: teleconferencing, broadcast television, and computer mediated communications.” (Stevens & Tate, 1993, p.321). The report also stated that “while the low level technologies of print and mail still had an important role to play, the ‘third generation of technology’ was starting to change the nature of education and allow telelearning to become the core enterprise of education in New Zealand.” (Campbell, 1997, p.21) These recommendations made it much more likely that the initial CASAtech and TOSItech proposals would have a chance of attracting government funds.

Several other participants commented that the Ministry funding had come from changes to staffing which had impacted negatively on many small rural schools. To quote one administrator: “I always thought that really we should have had it in the first place.” Instead the money was available as discretionary funding for innovative proposals. The proposals for both the CASAtech and TOSItech networks were seen as deserving of this funding. They proposed to make use of new technologies to expand the learning opportunities of groups of rural students.

Lydia MacKinnon’s Evaluation of an Audiographics Exploratory Study (1994. p.8) details just what was bought with the Ministry grant for each CASAtech school: a HP Laserjet 41 printer, flatbed scanner Ilcx, scanner driver, light pen, Vis-à-vis communications management software, and a restricted amount of training and maintenance. The report also lists other equipment which was “sourced elsewhere.” These sources included, in the case of CASAtech, the Canterbury Trustbank Community Trust (which paid for computer equipment) and Telecom New Zealand (which provided help with bridging equipment).

It is important to note that while participants recognized funding as a necessary element in setting up these projects, it was also seen as “secondary”. Several participants, members of the design teams as well as administrators and teachers, expressed the belief that once the project had “people to drive it” who were “totally committed to it”, then “you’ll find the funding if you need to.” On-going
funding, however, was a separate issue which several teachers and Principals admitted “became more important”, particularly for TOSItech, and will be discussed further in response to the key questions about resources and about sustainability.

Discussion

Answering the question What led to the design and introduction of these projects? has centred on understanding a series of factors.

The pressure on rural schools to provide a range of curriculum options for their senior students appears to have been a prime driving force, both from the perspective of student needs, the desire to provide them with a richer curriculum, and from a staffing perspective, seeking to avoid the unacceptable situation identified by a Principal of “having three classes with one teacher” in order to offer students the courses they required. Seeking to provide an acceptable range of curriculum options, and thus do a better job of meeting the educational needs of senior students, was also a way of escaping the spiral that could lead to loss of students, loss of funding, loss of staff, and the ultimate threat of school closure. Responding to these problems, seeking to reduce or eliminate them, fits with Ellyard’s (1992, transcript: not paginated) notion of a "problem centred" approach to the future of education. Recognition of the need to solve a significant problem came from students as well as Principals administrators and teachers involved in the projects.

This search for improvement reflects Hargreave's (1998, p.283) "moral" dimension to the change process: the sense of responsibility for promoting positive outcomes. Fullan (1997, p.231) also speaks of the importance of: "being hopeful and taking action" in order to create positive change in education. The sense that there could be a better way and that it was worth striving for was an essential initial element to introducing these innovative projects. Rogers (2003, p.172) poses the question as to whether the need for change precedes the knowledge of a new idea or “does such knowledge of an innovation create the need for the new idea?” (Rogers,
2003, p.172) It appears from this study that the need existed first and this, in turn drove the search for new ideas or solutions.

In close connection with this was the dissatisfaction with the then current solution to the options issue: the print based distance education available from the Correspondence School. The print-based Correspondence courses relied mainly on postal delivery and consequently time delays could be quite protracted. The audio-graphics option seemed more attractive because it offered contact with the teacher and other class members on at least a weekly basis. In Rumble's (1989, p.28) terms, it promised to be more 'contiguous', to promise a higher degree of interaction. It is of interest to note that in the intervening decade, from the inception of Cantatech/TOSIttech to the present, the Correspondence School has made considerable changes, making better use of new communications technology, to address this perceived failing in the service they offered.

Principals, teachers, administrators, and some students involved in this study expressed preference for more immediate delivery. At least one student, however, did state that she liked the print-based Correspondence system better than the class she received on-line; she felt the Correspondence sets provided her with a clearer sequential structure of learning than she felt was presented by her on-line teacher. This appears to reflect as much the delivery style of that particular teacher as the delivery style offered by the audio-graphic medium. How the medium influenced teaching and learning styles will be discussed later (see Chapter 5). Other students, who stated admiration for the skills of their on-line teachers, clearly preferred audio-graphics to Correspondence as it gave them more opportunity for interaction and feedback from their teacher and, at times from their fellow classmates.

The delivery medium for these projects was still, to some extent correspondence or print-based in that the students were provided with some hard-copy written material and, in turn, submitted work and communicated with their teacher via postal services. However, the main method for course delivery was audio
(phone conferencing for speaking and listening, receiving and transmitting oral information) and graphic (computer conferencing to transmit text and other visual communications such as diagrams, maps and graphs). This places the projects in Rumble’s (2001, p.32) fourth phase in the technological development of distance education, taking advantage of the development and availability of telecommunications and computer technology.

The existence of examples of audio-graphics in use in education in the early 1990’s provided important indications of the approach to take. Knowledge of these examples was generally limited to the participants who had either been part of the design team, especially in terms of the Cantatech project, or had been the Principal or a teacher at a school that was already making use of audio-graphic links to Polytechnics to provide more course options for senior students. Examples used as reference points for the design of CASAtech included tertiary institutions within New Zealand beginning to use audio-graphic delivery for some courses, the South Australian secondary schools’ model, and, for TOS1tech, the existence of CASAtech. In the same manner, the Cantatech model has provided an example to subsequent projects also aiming to improve the lot of rural secondary school education.

This knowledge of examples from elsewhere has been described by Rogers (2003, p.173) as “awareness knowledge, information that an innovation exists. Awareness knowledge may motivate an individual to seek a second and third type of knowledge: ‘how-to’ knowledge and principles knowledge.” The search for and the sharing of these different types of knowledge contributed to the origins of Cantatech and TOS1tech. The knowledge-gathering process—Carol Moffatt’s consultation with outside experts such as Derek Wenmoth, Tony Mander and Ken Stevens, her visit to the South Australian schools, and then her sharing and promotion of the idea through the Area Schools’ Association—does appear to fit Fullan’s (2001, p.50) Phase I of the change process. Obtaining knowledge about this kind of innovation helped to initiate the projects and to mobilise enough schools to adopt the idea so that the change could proceed.
A further signpost to possibility was the development of new communications technology, hardware and software, which could provide the framework for both audio and graphic delivery. Without this technological development, the idea of using audio-graphic delivery may not have even been considered let alone been translated into practice. Glaun and Gen (2002, p.777) have spoken of how technological advances have created tension between traditional education systems and new online teaching methods and claim that the resulting "progenies, the natural offspring of technology innovations and traditional education practices, are reshaping education." Cantatech and TOSIttech could be seen as examples of such progenies. Moffatt and Stevens (1996, p.1) made the claim that it is not surprising that rural schools, such as those involved in the Cantatech and TOSIttech groups, should be at the forefront of such innovations in educational delivery. The circumstances of their location have produced a history of developing flexible responses to the challenge of extending the educational opportunities of their students.

People who were ready to promote the change, to see the possibilities and to act on them, were a further key factor in the inception of these projects. Almost everyone who took part in this study identified the importance of people with "enthusiasm" and "vision", who could act as "change agents". These people included Principals of the schools concerned as well as specialist advisors in technology and pedagogy who may have come from outside the project group schools. Without such people to propose the changes and to convince others that the outcome would be successful, the next steps would never have been taken. These people were more "mission directed" than "problem centred" according to Ellyard's (1992, transcript: not paginated) description in that they were deliberately "setting out to create a positive future."

Rogers (2003, p.414) describes a champion as "a charismatic individual who throws his or her weight behind an innovation, thus overcoming indifference or resistance that the new idea may provoke in an organization." Carol Moffatt's role in
the inception of CASA/Cantatech and, as a spin-off, TOSItech also, seems to fit this description. This is borne out by her determination to obtain the funding for the project, even when the proposal was initially rejected, and the impression she clearly had on those who heard her speak at the 1994 Area Schools’ Conference.

Finally, the availability of funding was regarded as an important contributor to the initiation phase. Participants who belonged to the design teams, who were Principals, administrators, or teachers, were all aware of this issue. The presence of necessary funds was an indication of a crucial level of commitment. This is true whether the commitment came from external funding sources, prepared to back the projects, or from people within the projects who believed in the value of these changes so strongly that they were determined to seek the means to the end. Several participants in this study pointed out that funding is almost secondary in that if the commitment and enthusiasm are there, the money will be located. This proactive stance reflects Ellyard’s (1992, transcript: not paginated) idea that “the future is not some place we are going to but one we are creating, the paths to it are not found but made, and the making of those pathways changes both the maker and the destination.” An appreciation of this description helps us to understand the kind of commitment that led to the design and introduction of these projects.

While the initiation phase was necessary, the projects did not exist on the basis of this stage alone. "Put another way, the moment that initiating begins is the moment that the stage is being set for implementation and continuation." (Fullan, 2001, p.53).
Chapter 4: How the projects operated

The second key question asked: What resources did these projects rely on and how did they operate? To continue the possible link with Fullan's description of the phases in the change process, this question, (along with the third question which relates to impacts,) perhaps fits with Phase II of the change process covering the "implementation or initial use (usually the first two or three years of use) (and) involves the first experiences of attempting to put an idea or reforms into practice." (Fullan, 2001, p.50).

In relation to the stages that Rogers (2003, p.170) identified in the innovation-decision process, asking what resources the projects relied on relates to stage 4, at which the new idea is implemented. The chronological label would suggest that this fourth stage is reached once the first three stages are achieved (first knowledge of the innovation, forming an attitude about it, and the decision to adopt it). However, it should be recognised that there is some overlap between these stages, with knowledge, attitudes and decisions all undergoing a continual process of review and development.

The aim of this chapter is to describe just how the original vision was put into practice, including what was needed to translate ideas into on-the-ground operation. The data collected suggests that the required resources and systems of operation can be grouped under the following headings: finance; equipment; personnel; and support systems.

Finance

Financial backing is generally regarded as crucial to the operation of innovative projects such as those studied here. From some points of view: "The provision of adequate funds and resources is not only vital to any innovative task but needs to be agreed at the highest level of the organisation." (Lockwood, 2001, p.3). While funding from the Ministry of Education and elsewhere obviously helped to
instigate the design and introduction of Cantatech and TOSITech, views about the on-going importance of finance varied. Those who came from a perspective of strong commitment to what the projects could offer in terms of learning opportunities believed that this vision “transcends the funding; you’ll find the funding if you need to.” This particular view was expressed by one member of the original CASAtech design team. Although administrators recognized that accessing the funds was as an issue, making comments such as: “to get the money was a big hassle in itself”, which came from one Principal, it was still seen by some as a means to an end. If one source proved difficult, a new approach or a new source would often be located.

As was outlined in the previous chapter, in the case of CASAtech, an application was placed with the Trustbank Community Trust and was initially turned down. Carol Moffatt explained how she then contacted the Trust and the result was funding which covered the costs of computer equipment for the original group of CASAtech schools to use in the audio-graphic course delivery. Funds from the Ministry grant covered expenses such as the software and peripheral equipment (printers, scanners etc) and some limited training. TOSITech acquired similar set-up funds from the Ministry.

While the initial Ministry funds were granted specifically for setting up these projects, later grants intended to help relieve problems caused by isolation were not specifically tagged. Some schools, particularly within the TOSITech group, then chose to spend the money in other ways. This is one of the ascribed reasons for TOSITech ceasing to operate but will be discussed further in answering the later question about sustainability of the projects.

The other aspect of finance that was important to the operation of the projects was the funding model set up. This was how costs were distributed among the schools that were part of the group. The model differed between the two projects. In terms of the Cantatech model, each school was charged a join-up fee and the pool of money created was then used to cover the costs of delivering all courses. The more students
participating in the project from one particular school meant that the more economical this join-up cost was for that school. This is perhaps a reason why one student perceived that: “if it was available to be taught by Cantatech then you had to do it by Cantatech. Correspondence School was the last resort.”

If a school provided a teacher for an on-line course, a Cantatech Principal explained that they received “the equivalent of three hours salary at the top of the basic scale for each course taught. Usually two courses delivered to other schools was equal to the joining fee.” Rather than an opportunity to make money, this Principal stated that: “we always saw it as a co-operative venture, rural schools helping each other out, and even if we were not getting great returns in terms of students taught, we might need it more the following year.”

The TOSItech model was based on a per course cost. If a school wanted to receive a particular course by audio-graphic delivery, no matter if it was for one student or as many as five, the cost was the same. This could be counter-balanced by delivering subjects from the school; teachers providing courses gained funding credit for the school at which they were based. This, of course, made it more financially attractive for some schools to participate. A Principal of a school where two or three teachers regularly delivered courses on-line admitted that: “because we were providing, it made it a bit easier for us.” Schools that had no input in terms of providing on-line courses did not always look on the arrangement so favourably. As one administrator commented: “It struck me that they were going for too simple a system. They were charging too much from the receiving schools, and ignoring some of the benefits to the providing schools.” This issue was highlighted once the original set-up grant ran out and course costs could no longer be subsidized; not all schools recognised sufficient benefits in the projects to justify meeting the costs from the school’s general bulk fund. There is further discussion of this in the chapter relating to the question of sustainability.
Conversely, where a school may have only wished to pick up one course, the higher join-up fee of the Cantatech model (as opposed to a lower per course cost) was not justifiable. In the early stages of the CASA/Cantatech project, if a school from outside the group wished to connect for a single subject a Cantatech administrator explained how “we used to sell them a subject at a very cheap rate. Or if they took a subject in then they gave a subject out which would cancel the cost out.” This does not appear to have been the case in more recent years and, again, the implications will be referred to in answering the question about sustainability.

The costs of implementing the projects included not only direct costs such as those for hardware, software and line usage charges, but also many indirect costs which Gwen Gawith (1998) has argued are “ultimately more significant” for any telecommunications based learning. The indirect costs mainly centre on the use of time: time to practise the technology, to rethink and redesign programmes, to ensure students’ technological skills are adequate, to monitor and guide student learning, to organize access to technologies, to allow for contingencies such as technological failure, and to evaluate the quality of learning taking place. (Gawith, 1998, p.5). Most of these hidden costs relate to staffing and will be explored again later in the discussion about support systems and the time allowances provided for on-line teaching.

**Equipment**

As these projects were based on audio-graphic delivery, key equipment was needed to enable this communication to take place. Each school was set up with the same, or very similar, equipment so that systems were compatible.

Each school had at least one computer which was capable of running the software required for creating conferences and transferring graphics, usually via pre-prepared slides. It was important that the basic system was reasonably reliable and not slow to the point of frustration so, in many cases, new machines had to be purchased. Some schools managed to have more than one computer able to access the graphics.
conference; this was particularly helpful where there were more than three or four students from one site taking part in the same on-line lesson. One teacher talked about having as many as seven students on-line from one site where there were three computers to be shared among the seven students.

The computers at each site needed to be located in a position that was suited to the conference situation, reasonably private and sound proof. This was not always easy to arrange. In the case of one school, the Principal noted: “we were struggling to find a decent place to put them and we had them in this little room which was... okay, but pretty pokey. It had a leak in the ceiling which no one seemed to be able to fix over the decades. That was only a minor part, but it didn’t have any natural light. It was a book room basically.” In some cases the audio-graphics equipment was in an existing computer room or IT suite. If this was the case, care needed to be taken that, if the machine was used for other purposes, the audio-graphics conferencing programmes were not compromised and could be readily accessed and operated when required. Shared rooms also at times raised the issue of sound interference and other distractions.

Accessible technical help also appears to have been an issue in deciding where to locate the conference computer/s. Ideally there would be someone within easy access who could help to trouble shoot when required. This was not always simple as that person may have been busy with another class elsewhere. A student described how “we’d have to go running to them to come and fix things if we couldn’t get it sorted out and that would always take time.”

The graphic (on-screen) aspect of the lessons or “conferences” required the installation of appropriate software, initially Via-a-vis, later both projects changed to Farsite, and eventually Cantatech changed to a web-based programme, Netmeeting. The teacher created a conference at a set time, pre-arranged for each course. The computer had a modem allowing access to a tele-link bridge. Once the conference
was created, participants from other locations could log on via their own computers and modems, using pre-arranged password codes.

In terms of the audio, each school was equipped with a Polycom, a sophisticated type of speakerphone that did not rely on a handset and could be used by a small group of people. Everyone in the group, providing they were seated close enough to the Polycom, could both hear what was being said from the speaker and have their own contributions/questions/comments picked up by the in-built receiver/microphone.

The phone link was in the form of a conference call, transmitted via an audio bridge provided by Telecom. This meant that once participants had dialled a specific number at a set time and entered a numerical password, they were linked to all the other sites involved in that lesson: to the teacher delivering the class as well as to all the other students at other schools taking part. Early days, these conference links were at times not very stable and the expression “falling off the bridge” was often used to indicate that connection with one or more schools had been lost. The fact was that the schools being linked were almost all in remote rural areas where the phone lines were not as reliable as in urban centres—electric fences were at times blamed for disruptions.

Having voice as well as visual links meant that if one failed, the other could be used to pass on a message. As one student explained: “If the computer went down then you could still talk to the teacher and say ‘we’ve been disconnected’ and usually we would try and log back on again.” This would mean delays because “it was quite often taking them five or ten minutes to get back on-line again which would sort of disrupt the class ‘cos the teacher wouldn’t really want to keep going without that other school there”. On most occasions “you usually managed to get it back up running” however, and the “glitches” became less frequent as equipment and programmes became more stable and the expertise of practitioners increased.
The Polycoms themselves had controls to increase or decrease volume as well as a mute button, mentioned by both teachers and students. This facility allowed each site to cut the outward broadcast of sound while still allowing in-coming transmission. The positive aspect of this was that it could be used to stop any extraneous noise being broadcast, such as the sound of people moving around in the room or close by. It could also allow some private group discussion where there was more than one student at a site before contributing ideas to the conference. However, it was also mentioned in a negative context, where students identified their peers as, at times, “being quite un-cooperative” and indulging in off-task behaviour which the teacher could neither see nor hear.

Other peripheral equipment included graphics tablets and light pens that could be used to draw free hand on the shared screen when adding to diagrams for instance, for selecting options or for circling or underlining. Most of these functions could also be performed using the computer mouse but some people preferred to use the pen. Ready access to a printer was important at times, mainly to print out hard copies of work completed on screen. Sometimes it was necessary to know how to capture and save particular slides or screen images so that printing could be done later.

Another common piece of equipment was a fax machine. This was frequently used as a means of making contact between students and teachers outside the set conference times but was normally located in the school’s main office so was not readily available to students. As one student explained: “You had to wait till the office ladies were able to send it for you and if you handed it over to them they might not be able to send it straight away, and then you could get a reply back and they might not get the reply to you for a while and the teacher who sent it to you might not reply to you for ages.” It is likely that the fax has now been largely superseded by the use of email, but email was not in common use at the time when these projects were first set up.
A scanner has also been a useful tool for capturing or transmitting data, often used by teachers in preparing slides for on-line lessons. This could allow for the content presented to students to be more immediate and topical than textbooks may have provided. One teacher recalls using "quite a bit of stuff that I culled out of magazines and newspapers." Students could also use the scanner to display work on screen, such as graphic design drawings that had been completed by hand.

**Personnel**

Earlier discussion about the importance of having "the right people" available mainly related to having people who were, to some degree, visionary, who could look beyond the usual solutions and be prepared to try something different. These people remained important in getting the projects up and running but they also needed the back-up of groundbreaking practitioners. These were the teachers who were prepared to take on the new delivery methods offered by audio-graphics, despite the fact that there was very little by way of training or prior experience to guide the way.

Not all of us can be champions and there is a lot the early majority and late majority (Rogers, 1995) can contribute to teaching and learning. Indeed if an innovation is to be successful it is vital that these two groups are not only involved but committed if the innovation or change is to be sustained and if it is to reach a critical mass and be self sustaining. (Lockwood, 2001, p.9).

Technical ability was one personnel skill which did have a significant influence on the success or otherwise of audio-graphic lessons. Those involved in the lessons, teachers and students, did tend to fare better if they had some technical expertise, or at least a willingness to learn how to problem solve in the on-line situation. One student, in telling me about a teacher whose on-line lessons were not so successful, explained that this particular teacher “struggled with the technology as well” and “got a bit frustrated” when “you might get disconnected or the phone line would be a bit scratchy and you couldn’t hear.” Although, as was stated earlier, there were some “bugs” or “glitches” in the early systems that needed to be dealt with, becoming “quite flustered” did not help to create a productive learning environment.
Those who became adept at audio-graphic delivery were the people who soon extended their skills to cope with whatever situations might arise. Such personnel were a key resource for the operation of Cantatech and TOSItech.

Many of these early practitioners would have fitted Bigum and Kenway's (1998, p378-386) definition of "boosters" whom they identify as being "unequivocal promoters of new information technologies in education." "Boosters" are one of the four broad camps which Bigum and Kenway identify in the field of information and communications technologies in education. They also talk of "anti-schoolers" who, in light of what ICT appears to offer education, see schools as "past their sell-by date." A third group are the "critics" who "are sceptical of many of the claims advanced for using the new information and communication technologies in education. While not totally opposed to the use of new communications media in education, they urge caution and draw on socio-cultural analyses of technological change to support their views." The fourth group are the "doomsters" who are "unqualified opponents of the new information and communication technologies."

It is highly likely that the Cantatech and TOSItech schools have had personnel who belonged to all of these groups. Although there were no “doomsters” among the participants who contributed data to this study, it is quite possible that there were other staff at the member schools who had no interest at all in the projects and who even saw them as a potential threat. From my own experience, I am aware that there were some people who, at the time, believed that teaching on-line could under-mine the employment of regular class teachers. This view was neither born out nor shared by any of the participants to this study who were mainly “boosters”, enthusiastic about the opportunities the projects offered.

There were also some responses typical of “critics”, such as from one student who did not experience success studying via this method. This critical viewpoint was also expressed by at least two other participants, one principal and one administrator, who had been part of TOSItech but chose to opt out. Their criticism however was not
really of the technology itself nor the possibilities it could offer to education. Rather, they were critical of the administration structure of the project and of the limited support systems and funding. One teacher still delivering on-line at the time of data gathering also expressed some criticism about the time allowance available for preparing on-line classes. Such concerns be discussed further in Chapter 6 which discusses sustainability. The "anti-schooler" attitude was less obvious though there were perhaps some suggestions of this in those who were keen to see the projects lead to the development of a "virtual school".

The fact that not all teachers have the skills or temperament suited to the audio-graphic style of delivery is illustrated by the comment made by one Principal: "We had a couple of teachers within three months of starting who just pulled out, who felt that it wasn’t for them." Apart from the required confidence with technology, dropping out appears to have had something to do with the need to make a change in delivery style. A "knowledge oriented and transmission model" of teaching where "students have gathered to receive information and acquire skills determined and imparted by an authority figure—the teacher" (King, 1996, p.9) may have seemed adequate in a regular classroom, but would not work well once the element of distance was included. Hence the comment from one administrator: "I don’t think every teacher was delivering in the right medium." Some were unable or unwilling to make the pedagogical shift. "One of the strongest threats that can be presented to individual teachers is the prospect that they be moved from the central position in the management of others’ learning." (King, 1996, p.3).

The ability to be highly organised was also valued by most participants, both in terms of the teachers and the students. The changes that this brought to teachers and learners will be discussed in more detail in Chapter 5 which responds to the next key research question.
Support Systems

While there would have been some awareness of the need for support systems when the projects were first introduced, it is fair to say that the true nature of what support was needed emerged as the first classes went on-line. The first teachers received very little training but, as the ‘guinea pigs’, they were able to establish what kind of training was needed both for themselves and for those who came on-board later.

In recognition of the need to create a sense of rapport between students and teachers, and among the students themselves, introductory days were held early in the year where on-line classes could meet face to face. Some teachers were also able to arrange an occasional visit to students in their own schools during the course of the year. Speaking from my own experience, the two-day introductory session included the chance to meet the students I was to teach, to get to know them a little and to discuss with them the expectations of the course of study on which we were embarking. This was a useful icebreaker, as from that point on I would only have voice or written contact with these students. I also recall photographs being taken of all those involved but for some reason I never received copies of these. Photographs of students would have been helpful in clarifying who was at the other end of the line.

The introductory days also involved some special sessions for students alone where they were made aware of the particular challenges of on-line learning and given some advice on how to deal with the issues that might arise. Teachers also had their own sessions which, from my memory, involved a demonstration of on-line delivery and some limited advice about how to go about preparing to teach this way. While other training days, such as those run for Cantatech, may well have included more pedagogical discussion about the style of learning that this delivery was introducing, I do not recall that being a significant component of my training. In many ways I felt that I was, as one student stated was her impression of her early teachers, “thrown in the deep end”. Fortunately I did have a reasonably experienced
on-line teacher also based in the same school as me so I was able to seek advice and
guidance when I felt the need.

The Christchurch College of Education did set up training courses for on-line
teaching as part of their teacher-training programme, which was probably quite useful
to teachers still at the training stage. Not many of those already based in Cantatech or
TOSIttech schools had easy access to the College to pick up these courses while they
were teaching. Some distance education courses are now available via distance
education delivery. Students do not have to attend College classes on a weekly basis,
making the courses more accessible to those in need of such training. The importance
of this training is significant.

It cannot be assumed that staff will have the necessary skills to confidently create an
exciting and challenging on-line learning environment. When outside their familiar in-
class environment, they need support for more than just the technical issues. (Campbell,

The opportunity to train and extend one’s skills for this type of delivery could
be expected to come from the time allowance granted to on-line teachers in addition
to the time they actually spent on-line. This time allowance however was quite
limited and there has been considerable discussion about this issue, both at the
meetings I attended for TOSIttech and in a number of the participant responses that I
collected for this study. Most on-line teachers felt that the support they were given in
terms of time for preparation was inadequate. A teacher currently delivering on-line
said: “I find that for the classes that I teach now in terms of the hours that I am paid
for I would still be putting in twice that amount of time.” The next key question
relating to the impact on teachers and learners will include some discussion about the
intense nature of the on-line classes and the high degree of organisation required to
ensure their success.

Another comment made by a teacher about time expressed the need for
“maybe if not more preparation time, maybe more contact with the students.” This
appears to have particularly related to "the difficulty of getting and organizing the kids to do practical work" which was seen as "pretty well impossible (for kids) without having the teacher there." One teacher's solution to this was to "try once or twice a year to go around my schools and have a day's practical work with the kids." This teacher also felt that: "If I had more contact with the kids, you may be able to designate one period as a practical period." He mentioned the increase made for on-line class time from 45 minutes to one hour per week as a welcome improvement. Video conferencing has been suggested as a solution to the practical work dilemma also but there is no evidence of it being used by either of these projects.

Technical aid was high on the support priority list, particularly for those practitioners whose skills were limited at the outset. Classes were, according to at least one teacher, "very dependent on technology to function correctly" and if the person taking or attending the class was not high in technical skills then they needed to have someone to call on for help. The comment made by one student that "working on a computer would have been quite difficult without all the support structures that are there" was also shared in essence by other students and teachers. As another student recalled: "there was usually one person who was the IT teacher at school who we'd have to go running to, to come and fix things and so on if we couldn't get it sorted out." In small schools such as those involved in the projects, it was unlikely that the "fix-it person" could always be readily available; more than likely they would be engaged in other teaching or administration duties when classes were on-line.

These sorts of difficulties diminished to some degree as the equipment and programmes became more reliable and technical skills became more established, and as practitioners became, according to one teacher, "more comfortable with delivery and able to respond to problems as they arise." But it appears likely that the need for technical support would still be seen as relatively important. One teacher currently delivering on-line stated that: "the most persistent problem has been the hardware related problem. The phone line seems to have variation at times, who's getting a clean line and you know, last week is a good example when a couple of schools lost
the connection and it leads to frustration trying to reconnect, so that is a distraction.” Technical support is clearly seen as a key component to successful operation.

The search for appropriate technology for telelearning aims to develop a seamless on-line relationship between teacher and student as well as between students themselves, within which knowledge can be constructed. (Stevens, 2001, p.47).

A more over-reaching support was that offered by administrators, people within the schools who would see that systems ran smoothly. A Principal commented that “that sort of thing happened big-time”, the presence of people who were “prepared to chase around after the administration type things”. The person with this responsibility could be someone in a senior administrative role or, just as likely, the teacher who over-saw either information technology or distance courses in general, including students taking Correspondence school courses. An important function of this role was in terms of liaison. This person was the contact point for any issues to do with Cantatech/TOSIttech inside or outside the school. This was a role that a teacher stated: “needed patience and good PR skills. It was involving other schools; they all worked at a different rate and they all had different agendas.”

Administrators from other schools would make contact on issues to do with timetabling or exams; teachers delivering courses would contact this person with concerns about particular students, issues such as attendance or involvement in classes or overdue work; students within the school would seek their administrator if they were having issues about the course they were taking on-line, “supporting their work, talking them through things.” How well this function was performed obviously varied from school to school as one student stated that there was a teacher “we were s’posed to liase through, I think, but we didn’t really use her. We just went direct to the Cantatech teacher and checked with her. Yeah, I think there was a teacher but I don’t really remember her being that much involved.”
There was on-going debate at the administrative level about “uniformity or consistency between one course and another.” This comment applied to the production of course booklets, as well as to having a “high level of expectation of frequency of work submitted, those sort of things.” This was all part of the early learning curve needed to set up such a new venture. According to a Principal: “Inevitably when you’ve got a new thing and lots of different teachers doing different things, working from different institutions, it was going to be quite hard to get that (uniformity).”

From a student’s point of view, an important part of the support system was the printed material or back-up booklets that they received in relation to their course. While these booklets did not need to be as detailed as the course booklets provided by the Correspondence School, some people saw the Correspondence School as a kind of model. One participant, speaking about the early days of CASAtech said that: “way back we actually approached the Correspondence School to see if we could use some of their resources as a basis for what we did, and the political will of the day was such that we couldn’t get access to it unless we enrolled the kids with the Correspondence School.” Another administrator commented that: “you’ve got to make sure that the courses we deliver are as good as or better than the Correspondence School. The reason for that is that parents have to feel confident that what their children are getting is a quality product.”

Most of what was produced early on needed to have what an administrator called “idiosyncrasies and all the ambiguities and what have you ironed out.” On-line teachers varied in the print material which they produced to send out to students, ranging from full course booklets which contained extra reading and work exercises to a few pages that simply gave an over-view outline of the course, perhaps including a brief synopsis and/or due dates for assessments. Some teachers also required students to have a relevant textbook, or more than one, which could then be used for set tasks and further reading. A Principal expressed concern about “the editorial quality of the distance learning stuff, the printed stuff that was sent out, the
supporting materials if you like. It became very clear that that demanded a much higher standard of editorial skill and care than classroom practice requires.” The participant who made this comment and was involved in the very early stages, also noted that: “the standards varied quite a bit initially and it was clearly nowhere near the standard in most cases of; say, the Correspondence School. Some of the courses seemed to rise to that standard and even surpassed it for all I know but it took a little while for that to happen.”

Several students mentioned the value of some sort of printed material, either textbooks or course booklets, which provided them with the continuity between weekly on-line sessions. “It definitely helped your understanding just because of the way that it was just one lesson” and, in terms of preparing for the next class, “if you had knowledge beforehand it really made it a lot easier.” A “really good” on-line teacher was described as one who “had really well planned classes and sent the information in plenty of time,” this from a student who had also studied via the Correspondence School. The same student also spoke of on-line classes where the organisation was lacking and information was not available and explained that, in those circumstances, she felt that “at least with Correspondence, though you didn’t have the teacher contact once a week, everything was so well structured, you had your sets all set out and you had all your materials there and you knew what you had to do each week.”

In the early days, when the link through the modem was very fragile, the back-up booklets were referred to by a teacher as “vital”. If the link “went down you would just be audio and without the books kids would be out of focus” so “the print also gave them (the students) a security blanket.” A teacher who produced such booklets in the early years described them as “less wordy” than those from the Correspondence School because of the backup of weekly contact. “You knew that if they got stuck they’d only be stuck for a week, maximum and then you could get back to them.”
Another teacher currently delivering on-line said about his class: “they’ve got a text book and a commercially produced work book.” This was in addition to the material available on the web site where “their week’s work is set out for them, what they have to do, what practicals they have.” With Cantatech’s shift to web-based graphic delivery it appears that the need to distribute hard-copy print information to all students has been reduced. Again, this may vary from teacher to teacher.

Discussion

The question *What resources did these projects rely on and how did they operate?* is an attempt to understand the aspects necessary for the projects to operate on a daily basis. This is the stage at which all the early ideas and vision are put into concrete practice. It precedes and blends into the stage where the effects of these changes in practice can be felt. As was stated at the beginning of this chapter, the stages of first knowledge of the innovation, forming an attitude about it, deciding to adopt it and then implementing the change, all overlap and inter-merge.

More often than not, the implementation phase of an education reform initiative is an amorphous period between the time when a limited number of risk taking teachers in a school have adopted and practised an innovation and a time when the reform fizzes and loses steam, frequently to be replaced by a new initiative. (Adelman & Panton Walking-Eagle, 1997, p.99).

The first important operational aspect was the funds required and how they were managed. Some would argue that without financial commitment, innovative projects such as these would never get off the ground, essential equipment and services could not be provided. However, others believe that the funding issue is secondary in that if commitment is there, the money will be found. In general, difficulties with funding were mostly identified by participants who had been at schools where it was decided that cost made continued involvement unfeasible. Those who remained committed, even when they admitted that funding was an issue, still saw it as a surmountable problem.
In terms of fund management, different models were used by the Cantatech and TOSItech projects, the former appearing to be more co-operative than the latter, perhaps setting a stronger foundation for future operation. At least one design team participant pointed to this difference as a key reason for the Cantatech's continued operation and the demise of TOSItech. Another past Principal of a TOSItech school stated that the funding model for that project was a key reason for his school's eventual withdrawal. Awareness of this will lend itself to understanding later sustainability issues.

Most information about funding issues came from participants who were at the administration level of the projects, although at least one student, looking back from a current position studying at university, expressed awareness of the high cost of operation. This particular student may have had special awareness of the cost issue because he was forced to shift to Correspondence course delivery in his final year at school (after two years of audio-graphics) because the school felt they could no longer afford to be part of the TOSItech project.

Some concern has also been expressed elsewhere about the costs of projects like this. In an article titled “Distance Education: what cost the carrier?” that appeared in the NET magazine in 1995, Derek Wenmoth talked about the need to develop “a long term national strategy which will ensure cost effective access to telecommunications networks for schools anywhere in New Zealand.” (Wenmoth, 1995, p.55) Wenmoth expressed a belief that responsibility for this should be shared by the government, in terms of developing policy and ensuring equity of access, and telecommunications companies who should recognise that it is in their own interests to promote telecommunications use at school level.

Often when the funding issue is discussed in texts concerned with distance education, the perspective is from tertiary level. Such as Gwen Gawith's (1998, p.5-11) article, *The real cost of telelearning: a case study*. The case study used in Gawith’s article discusses the provision of a multi-site distance learning in-service
course for teachers. The relevance to the current Cantatech/TOSItech study is that
gawith points out not only the obvious direct costs of telecommunication projects but
also the indirect more hidden costs such as the teacher time required to up-skill with
the technology and then to pass on these skills to students and the time needed to
rethink and design programmes for on-line delivery.

Discussion of resources also needs to consider equipment, what was needed
and how it was used. This refers largely to the ICT hardware and software necessary
for audio-graphic communication. Most of the details about equipment came from
existing documents with back up from administrators and teachers. Systems needed to
be network compatible between all schools. Choice of equipment was further
governed by what was available at the time and by what schools could afford. A basic
set-up included computer plus appropriate software, printer, scanner, fax machine and
Polycom. The mode of operation was determined by the equipment and through
practice. Equipment was an on-going issue, from the perspective of maintenance as
well as from a continual need to consider what more recent technological innovations
were available and whether it was worth up dating.

Personnel were a further important resource and this description has aimed to
identify who participated in the projects and how they contributed. Teachers who
delivered on-line initially were those willing to take on the new challenge. There were
varying levels of relevant skills, such as technical expertise as well as teaching style
and the ability to adapt and problem solve, and it soon became apparent which
teachers would be successful delivering on-line. Students were well aware of who
delivered well and who did not; comments were made about both during interviews.
Several Principals also commented on the skills of some teachers they had observed
delivering on-line. Some teachers opted out of audio-graphic delivery either because
they were not confident about using the technology or because their teaching style,
which may have been adequate in a normal classroom, did not easily adapt to on-line
classes.
The term “champions” (Rogers, 2003, p.414) was used to describe the key personnel involved in the initial phase of these projects. Rogers also describes a series of adopter categories which include (1) innovators, (2) early adopters, (3) early majority, (4) later majority and (5) laggards. (Rogers, 2003, p.283). At the implementation stage described in this chapter, “champions” still had a role in sustaining the momentum for change/innovation and often also matched the description of “innovators” in their willingness to be venturesome and to import the new ideas into their own school communities. In implementing the projects they were also joined by “early adopters”, local teachers who put the stamp of approval on the new delivery idea by putting it into practical application.

The final element identified as important in operating the Cantatech and TOSIttech projects was support systems, what existed and how they worked. The training available to teachers and students was quite limited initially, in part because the whole thing was so new. Opportunities have improved with time as early practitioners have been able to pass on the benefits of their experience, and training courses are now more readily available. Introductory days at the start of each school year helped to improve communication and practice. Technical support has been highly valued; there is an ongoing need for this despite more stable equipment and improved technical skills among participants. In-school administrators have also had an important function in helping things to run smoothly for both teachers and students. Finally, the print-based back up of course booklet has also provided valued support to the on-line delivery.

Both the teachers and the students who provided data for this study felt that the support systems had limitations, especially in the early stages when it was unclear exactly what was needed. Most, however, saw improvements over time. One exception to this were the comments from one teacher who still felt that the provision of time to plan, prepare and assess for each class was still inadequate. As was indicated earlier, the existence of such concerns connects with the Chapter 6 discussion of sustainability.
The importance of providing support systems for both teachers and learners involved in distance education has been explored by a number of writers, including Campbell (1996), Collis (1996), Johnston (1999), and Lai (2001). Although much of the literature that these texts represent is, again, primarily concerned with tertiary education, the comments are still relevant here. In general, the literature dealing with this issue has recognised the need to develop “innovative approaches to the support of remote students” (Collis, 1996, p.416) as well as good opportunities for on-line teachers to “learn and explore in a supported environment” (Campbell, 1996, p.145) in order to ensure successful distance delivery.

While some awareness of the need for such support may have been present when the Cantatech and TOSIttech projects were first set up, the on-line experience in practice clearly developed increased appreciation of such needs. By 1997 for instance, the Cantatech Handbook had a clear message about the importance of the site supervisor’s role in supporting student learning and teacher delivery of courses, regarding it as “an integral part of the successful and effective delivery of distance education through Cantatech.” (Cantatech, 1997, p.12).

There is a follow-on to identifying the resources and routines required for these projects to operate, and that is to examine the impacts that the process of implementation had on teachers and learners. That will be the focus of the next chapter.
Chapter 5: Impact on teachers and learners

The third key question about these distance learning projects was concerned with: What impact did they have in terms of teachers and learners? As with the previous chapter, this could arguably fit with Fullan’s (2001, p.50) Phase II of the change process covering the "implementation or initial use (usually the first two or three years of use) (and) involves the first experiences of attempting to put an idea or reforms into practice." Here we are more concerned with the later stages of this process however, and begin to link closely to Fullan’s third phase of "continuation".

Consideration of impact could also fit with Rogers (2003, p.170) fourth stage in the “innovation-decision process”. According to Rogers’ description, “implementation involves overt behaviour change as the new idea is actually put into practice.” (Rogers, 2003, p.179). However, it is probably more appropriate to the key question at the heart of this chapter to consider here what Rogers describes as the “consequences of innovation.” (Rogers, 2003, p.30). He identifies “consequences” as “the changes that occur to an individual or to a social system as a result of the adoption or rejection of an innovation.” Rogers then goes on to identify three classifications of consequences: desirable versus undesirable, direct versus indirect, and anticipated versus unanticipated. (Rogers, 2003, p.31). In the last section of this chapter, once the impacts on teachers and learners have been identified, there will be some attempt to match the impacts to Rogers’ classifications.

A logical way to approach the answer to the question of impact is to break it into two main areas: the impact for teachers and the impact for learners. This division is in the sense of ‘teaching’ being the delivery and ‘learning’ being the reception mode of the two-sided process of education. However, the data gathered from both teachers and learners did tend to cross over. Teachers had comments to make not only about the impact on their own teaching style and approach but also on how their on-line students had to adapt to the new delivery or how the students appeared to learn
best. Conversely, students also had comments to make about their teachers’ delivery methods as well as discussing their own adjustments to audio-graphic learning.

Many of the areas of impact were in fact common to both teachers and learners so the response to this question combines the impact on both teachers and learners under the following headings: changes to staffing and timetable, the intense nature of on-line sessions, the need for thorough preparation, oral communication skills, questioning skills, creating rapport, pedagogical shifts, technological skills, and transference of enhanced skills.

**Changes to staffing and timetable**

For most schools there was a general impact that involvement in Cantatech or TOSITech had on teaching, perhaps better described as staffing in this context. It related to how the staff based at a school might be best used, both in terms of economy for the school and in terms of job satisfaction for individual staff members. Two quotes from participant responses illustrate this. The first example from a Principal states: “It also made teachers more economic. So in other words if you had somebody who wanted to teach 6th form history and you had two people up there at your school who wanted it, then it was obviously uneconomic per pupil. But if you could spread that teaching to five at Twizel and three at Akaroa then suddenly their skills and expertise were very valuable. It improved their job too.” The last part of this comment refers to the opportunity that was often created for teachers to deliver a specialist senior subject, possibly one which had been the primary focus of that teacher’s own tertiary study and one which, in a very small school, they may rarely get the opportunity to teach.

Another Principal stated that involvement in the audio-graphics project had been good “because I can offer part-timers some, or more, hours, and thus retain their services for the school. The fiscal side of this arrangement is neutral; the money we are paid covers the salary. But it is worth doing to keep staff in the school, or to make their position more viable.”
Timetabling was also affected by a school’s involvement in Cantatech or TOSIttech. On-line classes only required one timetable slot per week as opposed to an average of four classes in that subject face-to-face. In terms of meeting the students’ needs, one teacher stated that the single timetabled period of fixed commitment per week “allowed us to provide subjects that students really wanted but without taking them away from other classes that they needed to be with because the time frame was different.” This allowed students a bit more freedom in terms of making choices about what they wanted or needed to focus on. A flow-on effect of this relates to learning style, which is dealt with in more detail below.

The intense nature of the on-line sessions

Many participants in this study commented on the intense nature of the on-line sessions. The comments, which came from teachers and students, included the following: “it was very concentrated delivery, with high pressure during the on-line session”; “it was a short lesson with a lot of content so you really had to concentrate hard”; and “I guarantee you, every time you went off-line you went ‘Whew!’ I guess ‘cos it was so intense.”

This intensity seems to have been a product of the fact that classes were only once a week. That less frequent occurrence of classes created other issues for learners. If, for any reason, a student missed an on-line session, they felt this could create “distinct disadvantages” especially if “the teachers aren’t putting out piles and piles of written work”, just brief summary notes, “and the rest of it’s been delivered on-line. So if you start to miss your lessons, it means you’ve got big gaps between the paper and the next week.” This is true of normal classes where absence can create problems and the need to catch up, but a whole on-line week missed became more significant at least in perception if not in reality of work missed.

From the teacher’s perspective, the intensity of the on-line class also reflected the amount of time needing to be spent between classes ensuring that things would go
smoothly. As has been mentioned earlier, this was a ‘hidden cost’ of the delivery method. Teachers delivering on-line have generally commented that the time allowance to cover planning, monitoring and evaluating the audio-graphic classes was inadequate. To some degree successful delivery has relied on the goodwill and commitment of teachers who have recognised the project as “worth the extra effort” in terms of what it could provide for the students, for the school and, from the viewpoint of those who really believed in the projects, for themselves as teachers and for education as a whole.

The need for thorough preparation

One of the most frequent observations made by participants was about the need for organisation and thorough preparation. Teachers who delivered on-line developed “the skill of paring a lesson down to the essentials and presenting it in a way that was digestible and useful to the kids.” One teacher explained how, in the limited time available on-line, “there was no way that you could just speak four times faster in order to get the same content through. You had to sift down to what was vital and important. It was a great exercise because it forced you to look at what was essential and also to look at what things were done quite well by other methods, for instance a map from a text book, a video perhaps or that sort of stuff, that kids could look at and learn from on their own.”

The focus on oral language for communication also increased the need for thorough preparation. As one teacher commented: “Normally you would be able to read body language and the odd frown or a look of boredom or a blank face. But none of those cues were available, so it made your lesson planning all the more important.”

Students were quick to note where this organisation or planning was lacking. One spoke of a teacher who was “a very much talking to you face-to-face sort of person and wasn’t quite so good at having strong lesson plans and preparing lots of things in advance. You really didn’t know until you turned up to the lesson what you were going to be doing that day.” Whereas in a regular classroom, such situations
may be recoverable, it was much more difficult to put things right for on-line delivery. Efforts such as “trying to fax things through to us that we were supposed to receive and read before our class started” did not always work. It is not surprising that “quite often there were problems with that”, largely because leaving it till virtually the last minute made no allowance for all of the other difficulties that might get in the way and prevent the material from reaching the students in time.

The majority of the students who provided information for this study also had very complimentary things to say about teachers. The classes “that worked really well” were run by teachers who “had really well planned classes” and “sent the information in plenty of time.” One student said that the on-line “teachers seemed to be better organized than in normal teaching. They just seemed to be prepared so much in advance.” Another student, in relation to on-line teachers said: “I was really impressed, they had things so organised, extremely organised and there was no ‘Oh, hang, I’ve lost…’ or ‘Hang on a minute, let me try and find…’ (They) just had it all organised.”

Students also had to be well organised and properly prepared for the weekly on-line lesson in order to get the most out of it. It was important to be pro-active in the time between classes. Apart from necessary reading or written work to complete, with “only one contact period a week, if you were doing assignments and that sort of thing, you had to think about the issues you were having and think about how you were going to word them in the most effective way to get to the point of what you were trying to talk about.” This reflected the ‘distance’ aspect of the learning, the fact that “you didn’t have your teacher there who you could just, when you were working, doing your work or whatever, just fire questions at.” Although it was possible to contact teachers during the interval between classes, there was the perception that “to actually be bothered going and sending a fax or writing a letter and waiting for the feedback, you wouldn’t do that unless there was something quite major.” This meant “you had to learn to tackle things a lot more on your own.”
Students recognised this need for self-discipline. "As a student, you needed to be well-organised, motivated and self-disciplined—similar to correspondence study; if you weren’t motivated or couldn’t work without the pressure of a teacher there you weren’t going to succeed." The idea that this medium required more direct supervision was also expressed by at least one student. "I think motivation for the students needs to be provided. Supervised periods when the students are expected to complete their week’s work. And if there is a teacher in the school who has expertise in this area, that teacher should be made available to the students." This student failed an external exam in the subject picked up by audio-graphics delivery. "It was the only subject I failed and I believe the main problem was that I didn’t spend as much time on that subject as the rest because I had teachers hounding me in all the other ones." The student admitted that this was largely her own fault but the experience made her believe that this was not "a learning style that suited me particularly."

**Oral communication skills**

Oral communication skills became high priority for successful on-line classes. There was a visual component to the on-line lessons in terms of the shared computer screen and any texts or workbook material that everyone could have in front of them during the lesson. However, most of the interaction during the lesson was via oral communication: speaking and listening.

Teachers, as one admitted, “had to be very perceptive in order to be able to pick up across six different schools what the students were thinking so they had to be alert to different cues and clues in the environment. The teaching environment was totally different.” Once that had been recognised and adapted to, teachers said that they “can hear the instant anybody’s come into the room. The door doesn’t need to creak or anything like that, but they know when there’s another person there. They know if somebody’s changing. Even though they can’t see them, they know.” Teachers also had to become very adept at “reading voices” and their “listening skills really increased”, a necessity when, as was mentioned before, there were no visual clues such as body language and facial expressions available. This helped to cope
with the fact that “what people say is one thing but their tone might indicate what they actually mean.” Another aid was to ask students to use the screen to explain their answer further, “rather than just oral they could use the medium of graphics as well.”

A teacher described the on-line classes as “stressful for the students” because, without the visual contact and all the clues and cues that visuals can offer, “they don’t know when they’re going to be coming involved directly.” Students needed to be prepared for involvement at any point; their name might be the next on the list to receive a question so they needed to have not only done the required preparation but also to be listening carefully to the on-going discussion. When the opportunity did arise to contribute, one student said that it was “kind of hard to be on-line with a whole lot of people there. You’ve got questions and you can’t be sort of waffling on and trying to figure out what you’re saying. I guess you got better at asking the right sort of questions, or the questions you were going to get the right answers from I suppose.”

Several of the students interviewed mentioned the adjustment they had to make to rely heavily on oral language as a communication tool. One student recounted completing an assignment that involved an oral delivery. She chose to write a song and “played it to the speaker phone while I was in the room by myself. It felt really odd and I remember being quite nervous, even more nervous possibly than I would be in front of a group cos you can’t see whether they’re sort of cringing or smiling or what they’re thinking of you, so it’s sort of like: oh, okay…” In this case the silence of classmates was an issue but equally daunting was having to be prepared to speak up, sometimes to intrude on what the teacher or other classmates were saying in order to ask questions. This was highly important because, as a student explained, “if you couldn’t communicate with that teacher, and you were too scared to talk to her, you would just miss out, and it was only that one opportunity to do that while you were on-line.” Students could not indicate through body language that they had a contribution to make, something that may have been possible in a face-to-face class;
in the on-line situation they had to make the effort to use the Polycom and communicate orally.

**Questioning skills**

The use of questioning techniques was another aspect of on-line delivery that was frequently identified as very important. From the teacher's perspective it was questioning which was not simply open-ended but also purposefully geared at engaging participation from all the students at the various locations, creating a rapport with them that was based almost solely on the verbal interchange. In order to ensure that all students were drawn into an on-line discussion, one teacher would “put a person’s name down, or people’s names down, and make sure that I asked them a question and got a reply from them.” This technique was noted by students, “(the teacher) went round all of you and said ‘what about you...’ by name and said ‘how did you find it?’” One Principal who had observed on-line lessons was impressed that the teacher “seemed to work to a definite pattern in terms of questioning, it was almost like he had a class seating plan or a sort of a site plan in front of him with all the kids (marked on it).”

Apart from addressing each student directly to make sure that they were all participating in the class, questions also had to be open-ended to encourage real participation from students, not simple ‘yes’ or ‘no’ answers, “and not only open-ended, (but phrased) in a way that would actually extend the student and the student couldn’t get away with it.”

Students’ questioning skills also needed to develop as was outlined above in relation to improved oral communication skills. They had to be prepared to ask for help when needed and to make it clear exactly what they needed to know. While this skill is also relevant in face-to-face classes, circumstances were different on-line. There was no opportunity for a quick aside to a classmate to check what was said, nor to speak to the teacher for a moment at the end of a lesson or around school outside
the class. Questions needed to be asked during the on-line session to optimise effective learning progress.

Creating rapport

Apart from listening and questioning skills, another aspect of delivery style that was valued by both teachers and students was what a teacher described as the ability “to put kids at ease, kids have got to feel very welcome, they’ve got to feel safe.” Several responses touched on the use of humour as one tool to achieve this. One teacher said: “I think the kids have got to see that you can have a sense of humour and I think that a sense of humour breaks down some barriers for some students, not all.” In the end, the students’ “enjoyment or feeling of satisfaction from this style of teaching has been very dependent on the teacher at the other end.”

Teaching style is very important because, as one teacher acknowledged, “if you don’t present it in the right manner or if you’re looking a bit haphazard, then kids soon pick up that this is not going terribly well and it’ll backfire. They lose confidence very, very quickly.”

A successful on-line teacher managed to instil confidence in the students in terms firstly of creating belief in the teacher’s knowledge and enthusiasm about the topic and secondly having faith in the student’s own ability to make comment, to answer and ask questions and generally become involved in the lesson as a significant contributor. With the lack of visual contact, “because normally you would be able to read body language and the odd frown or a look of boredom or a blank face but none of those cues were available,” it was even more impressive when the students developed a really good rapport with the teacher.” This rapport was seen by a Principal as something that “you wouldn’t get from the print media type of courses. Kids could (have contact) with their Correspondence teachers, you know from Correspondence School, through the phone and what have you, but most didn’t.”

In order to establish an effective level of rapport, on-line teachers had to work a little harder to find contact points, something that is easier to establish when
students are not only in your classes four or five times a week, but in the same school as the teacher on a daily basis and probably living in the same community. A teacher who had made this effort was observed by a Principal to “have a fair bit of detail about them (the students) because he would say things like: ‘Okay, Hayden, in Karamea, you’re a dairy farmer...’ but he actually used all the normal good questioning techniques such as asking questions and identifying respondents, all that sort of stuff,” proving that it was possible to do this in the on-line situation. The Principal who observed this teacher in action said: “That was probably his natural style, it came across very naturally, but he had to make a very conscious effort to think hard about the experience and background of the different kids and to vocalize, to be quite specific about it, to bring it in specifically, and to include it on a very, very systematic and regular basis in his lessons.”

In terms of rapport between classmates, students may have been able to discuss some issues with classmates based at the same school “if you had one or two other people doing the same course as you.” However it was uncommon in the early years for students to make any direct contact with classmates at other locations. Occasionally this might happen as a spin-off from something else such as “I talked to one of them at Tournament”, but it was not accepted practice to contact one another on a regular basis to discuss class work in the way that might happen with a regular class. Past students stated that this might have been more likely to happen had email been as common as it is today.

A current on-line teacher, when asked if email was used in this way now, said, “some do, some will make contact.” This teacher also explained that there had been some effort to encourage this electronic contact between students. “One way of doing that is to actually make a group effort for a result so that kids can work as a team. They have to actually be in touch with one another by fax or by email, whatever method they choose to communicate between one another. So you can actually make group activities that work very, very well.”

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Interaction with the other students occasionally happened independent of teacher involvement, such as at the beginning of the phone conference if the teacher had not yet logged on. According to one student: “We’d have a wee yak to them. And sometimes if she had other students coming wanting to ask questions she’d say, ‘Well, just have a chat between yourselves,’ and you could have a yarn to each other and, yeah, that was quite good.” This was seen to be “quite interesting actually, not having a face to the voice.” It is unclear whether this was a deliberate strategy on the teacher’s part to encourage class interaction, or simply a spin-off of a situation where the teacher was otherwise occupied and the students were left to fill the time communicating with one another.

The discovery of common or different interests or experiences could also contribute to the on-line learning. This was different to a normal class situation where most people had an aspect of geographic location in common and where, as is likely in a small school, classes were often shared with the same students over a long period of time and, from a teacher’s perspective, “kids get to know what their mates think all the time.” With audio-graphic delivery, an on-line teacher explained how “kids are working across distance and only have contact for one hour a week and they’re actually getting a far wider selection of ideas that are being generated by geographical location. And that’s something that can be tremendously good because kids can talk about their environment for problem solving and things like that: what they see in their particular town is different to what they have here, or different to what they have on the West Coast.”

Several examples were provided of how the class could go wrong where rapport had failed and there was an inadequate sense of commitment or trust. A student recalled several times when the teacher was trying to facilitate an on-line discussion. The student felt that it was obvious that some of the students at one or more of the other locations had not done the required work so they were either unable or unwilling to contribute. “None of them were saying anything and were being quite uncooperative.” Apparently the teacher was “getting quite frustrated because she
wasn’t able to actually look at them in the eye”, to put them on the spot and elicit a response in the way that might be done in a face-to-face classroom. The student I interviewed believed that “the students were sort of saying that they couldn’t hear the teacher properly as well. I don’t know whether that was true or not, but it was quite easy to use those sort of things as an excuse for not participating in the class fully.”

The rapport between teacher and student was important here, as well as the preparation invested before the lesson. According to one administrator, the students “who had a bit of self-discipline and what have you anyway and were motivated, they were fine. But for kids who weren’t, it was a little bit harder.” Observation was made about at least one class of students who were generally regarded as “no-hopers” but who, because of the teacher’s efforts to establish a rapport, became reasonably successful on-line learners. This rapport was based on using individual students’ names, on speaking directly to each one about their own experience and on drawing them into listening to the experience of others and seeing how it compared to their own. Someone who observed these classes explained that the teacher “would build up the interest and then the kids’d be thinking broadly about it so that it wasn’t just a specific question that related to just them, and so in other particular circumstances the other kids would probably switch off. I was quite impressed by that, the way he handled all that. It was very, very skilful actually.”

Pedagogical shifts

It was noted around the time that CASAtech was first taking shape that “technological developments are at present well ahead of educational thinking about their effective use.” (Stevens & Tate, 1993, p.321) Much of that "educational thinking" took place during the later 1990s, shaped by the experience of those involved in a variety of new learning projects world-wide, mostly at tertiary education level but including Cantatech, TOSItech and other school-based programmes. Morgan and O’Reilly (2001) in their discussion of Innovations in on-line assessment made the following observations.
It has been necessary (in these case studies) to reconceptualize their teaching and learning activities to exploit the on-line medium effectively. There is a new learning context (an interconnected community rather than a series of individual learners), a new medium to explore (the World Wide Web, listservs, e-mail, course delivery tools), and new ways in which learners go about their learning (higher levels of interaction and collaboration). This rethink includes a consideration of subject aims and objectives, learners needs and interests, approaches to the provision of course content and materials, facilitation of the teaching and learning environment and the most appropriate forms of assessment to promote and support these new objectives and learning arrangements. (Morgan & O’Reilly, 2001, p.188).

It appears that very few of the early Cantatech and TOSITech teachers fully appreciated the degree to which their teaching style may have to change in order to deliver effectively on-line. Data collected for this current study has indicated that, in some cases, where teachers did not appreciate the differences between on-line and face-to-face delivery, they “tried to cover a lot of content material and present a lot of new ideas on their on-line sessions.” According to at least one site administrator, this would result in students becoming “switched off; there was too much content.” Without the visual feedback, “a kid could sit and just say ‘Yep, yep’ you know, every thirty seconds”, and the teacher “thought they were still on track, but....”

With experience, on-line teachers explained how they “found other ways of presenting through maybe getting people to do reading beforehand or reading slides beforehand, some other way of grappling with some of the content, or maybe they present(ed) just an overview of the content in the lesson and then that’s followed up with the reading and then they go back to it the next week.” In this way, many discovered that: “The difference in the pedagogy of traditional (face to face) and telelearning classes is to be found not in the structures, processes or technologies that are used but in the pedagogy that mediates teaching and learning.” (Stevens, 2001, p.47-48).
Several teacher and design team participants commented that the skills for successful delivery on-line could be said to be those of a good teacher anyway, they just became more accentuated by the on-line situation. In the words of one participant: “Teaching and learning on-line, in my experience, exaggerates all of the weaknesses in your own teaching and learning style, so the things that you might get away with in the classroom, you don’t get away with on-line. Often those weaknesses come back to basic pedagogical issues.” This was a reference to the need to shift from a transmission model of delivery, in which the teacher dominates as instructor and purveyor of knowledge, to one which is much more interactive for students, with a higher degree of participation on the part of the learners. The term often used in relation to this new style is "constructivist".

A teaching style that is associated with constructivist beliefs typically is characterised by a strong emphasis on facilitating student initiative rather than closely scripting student tasks. If understanding cannot be "taught" and must be "constructed" by the learner, students must be given more responsibility and the "space" to develop your understanding. (Becker & Ravitz, 1999, p.358).

Adjustment to the new delivery style had to be made by learners as well as teachers and, again, the shift was not always easy. Although there were some examples which illustrated success on-line for more reluctant learners, in general the information provided pointed to a need to screen the type of students encouraged to study on-line as it is not (or was not) a delivery style which suited all learners any more than it suited all teachers. The general consensus gathered around the notion expressed by one administrator that “there are some students who, if they haven’t got good skills, good work ethic, if they’re a wee bit casual about their approach to learning, any type of correspondence thing will pose a problem for them.”

Another teacher/administrator wrote in the questionnaire: “The type of student involved has to be vetted carefully. In most cases they are students who could arguably have achieved similar successes in other forms of distance learning such as Correspondence School.” Further to this, another teacher stated that what “we found
initially was that kids tended to see the graphics of distance learning as a little bit less serious (compared to Correspondence School work). That actually meant that, in the early stages anyway, more self-discipline was required of kids, or else more direct supervision.”

Some of those interviewed put the reasons for successful learning by this method down to the student’s age and the stage of development. According to a Principal: “The sense of responsibility for their own learning wasn’t nearly as enhanced at a younger age. It’s just their habits haven’t been as well formed.” In terms of ‘younger age’ the general consensus appeared to say that audio-graphic delivery was better suited for 6th form/Year 12 up. A teacher had further comment to make: “This is just anecdotal but my feeling was that the sense of responsibility for their own learning wasn’t nearly as enhanced at a younger age. I found that particularly for Years 9, 10 and 11 you needed to be strongly in there with them, supporting them, or somebody had to be.” Another teacher gave some qualification, or perhaps justification, to this age boundary: “I think that a lot of it depends on the culture of the school and what sort of teaching methods they use. If they encourage independent learning and using other resources apart from just the teacher at the front, then I think you could probably transfer it further down. But I think certainly then fifth form was the limit.”

The need for more maturity could help to explain why this style of delivery appears to have suited some adult students. A teacher spoke about adult students being initially daunted by the technology if they did not already have confidence in using computers. Once those skills were mastered however, “they’re usually head of the class because they did unusual things like listened, and practised and did homework and stuff.” Some adult students, including one I interviewed directly, appeared to find it easier to fit into an on-line class than to be part of a regular classroom. Part of this was the environment: “I guess too being an adult student I wasn’t surrounded by a whole lot of other students, giggling or whatever.” Adults choosing to come back to school tend to be “really enthusiastic and really determined
to achieve something” and can have limited patience with the off task behaviours of adolescents. The other more appealing aspect for adults was the once-a-week class. As explained by one Principal: “It meant that somebody who had some sort of domestic constraint on their education, like they could only come out once a week, could pick the one day a week that the lesson was on and they could go to it. And so instead of having to turn up at school four times a week they only had to turn up once a week. Brilliant.”

Another administrator disagreed that student suitability was determined by age or development. “No, I think it’s personality. I think there are some kids who will never work very well on a Cantatech type thing because of their nature. They can’t organise themselves.” This was supported by another teacher’s response which stated that “you need to have students who are really, really comfortable and committed to the medium” and one which stated: “some of the students just did it and did it well, you know, just through talent or natural empathy for the methods.” The intense, focused style of on-line delivery “wouldn’t stand any approach from a student who wanted to drift off or sound off or anything like that.” This was attributed as a reason for some problems that arose. An early administrator reflected that “we pushed students to that because it was the only way we could deliver the courses and we didn’t pay enough heed to student selection.” Another administrator felt that to be truly successful the delivery required “not just preparation from the teacher but that commitment from the students to buy into this and to really put their back into it, make it work.”

One teacher who saw such commitment in action was able to make a direct comparison between teaching a subject to a ‘live’ class and, directly afterward, delivering the same subject, same year level, on-line. He spoke of “sometimes tearing my hair out with frustration at dealing with the (live) class with kids who hadn’t done the work who were distracting others.” He would “finish (the live class) at 10 to 12 and start at 12 o’clock” delivering to the on-line class “where kids were focused” and “on task.” He found the on-line class “far more rewarding” because “it was good to
have the students with you in your lessons. They had generally all done the work that
was required and you weren’t wasting time as was often the case in the live class.” He
found the experience to be “an interesting comparison” and this provides a clear
example of the shift that on-line teaching was introducing to the teacher—learner
relationship.

These new technologies do not merely modernize the traditional ways in which teachers
and students interact; the new technologies are transforming the relationships between the
individual tasks of the students and teachers. A transformation of the teaching and
learning enterprise is taking place. (Glahn & Gen, 2002, p.782).

**Technological skills**

Ability to use the technology was an issue for some of those interviewed
although for most, picking up the necessary skills was just part of the early learning
curve as they adjusted to the new style of delivery. When participants did mention the
technology it tended to be comments about early frustrations when things did not go
well or when connections were lost. These issues were covered in more detail earlier
under the question about the resources required to run the projects.

Teachers who had difficulty with problem solving in this context when things
did not go well with the technology tended to opt out of using this delivery method.
Technical glitches could also create a sense of insecurity for students, especially in
the early years when, to quote one early on-line administrator: “it didn’t take many
breakdowns for teenage students to say, well, hey, what’s going on here? What’s the
great thing about this?”

The technology also provided ways in which students might indulge in off-
task behaviour during on-line classes. A situation was described where the mute
button on the Polycom was used to avoid participating fully or answering teacher
questions. A similar behaviour was noted by a teacher who commented: “an honest
student wouldn’t require to turn the Polycom off but others were having a joke at the
tutor's expense, I did witness that on occasions. I thought it was like a lack of integrity really, the fact that they weren't prepared to even own up to ill discipline.” Example was given elsewhere about “using the pointer or highlighter when they're obviously just doodling on the computer or on the lesson going on.” Indulging in such distractions, while not an unfamiliar problem in the regular classroom, was perhaps more noteworthy in the pressurised context of one on-line lesson per week.

On a more positive note in relation to students coming to terms with the new technology, a Principal related an interesting anecdote about a learner with a reputation as a “terribly difficult” student who worked happily on-line alone for extended periods with no real problems. When asked if this student would not prefer to be in a class with other students and a teacher, the “kid just looked at him and said: ‘It doesn’t tell me off’.” The perception was that the non-judgmental atmosphere of the audio-graphics class had created a new learning opportunity for this student. “The fact that the technology wasn’t judgmental was a source of support in itself.” The focus was on the learning task rather than on behaviour such as having feet up on a desk or other habitual body language that may have been a pattern for this student in normal classes.

**Transference of enhanced skills**

It was stated earlier that many of the teaching skills required on-line were also valuable in the regular classroom. Encouraging student participation through questioning for instance was seen by at least one on-line teacher as “an extension of what you used in the classroom anyway but you formalised it.” As well as being able to apply teaching techniques that worked in the classroom to on-line delivery, there appears also to have been transference of such skills in reverse. A Principal stated that: “The teachers all said to me that they reckon they were teaching their face-to-face classes better.” This applies to vocal and listening skills as well as planning, organisation and questioning techniques, all of which are features of good teaching whether on-line or in the regular classroom.
The flow through, however, was not automatic. Some people who appear to teach quite effectively in the classroom will not necessarily be as effective on-line according to one administrator because, in identifying the attributes of these teachers, "often they’re things that are not vocal and so certain sorts of personal teaching styles were very much better" suited to the regular classroom. There are certain things that "you try to do that you can sort of get away with in a normal classroom (because) your kids have got a fair bit of shared experience." With on-line students based at something like six different locations, shared experience can no longer be presumed.

Discussion

The third key question about the Cantatech and TOSIttech projects asked *What impact did they have in terms of teachers and learners?* The fact that there were changes seems to be an inevitable outcome of involvement with distance learning and with innovation, an outcome recognised in other studies besides this one. Lockwood (2001), for instance, has claimed that "a decision by individuals and organizations to embrace DL (distance learning) methods, and the new technologies, will require changes to the way we teach and how we manage that change; this is not an easy task." (Lockwood, 2001, p.2).

Fullan (1998) talks not just about the inevitability of change but the need for these changes in schools as he believes that: "they are not now learning organisations." He identifies the need to "reculture" and "retim" as well as "restructure" schools.

Restructuring is commonplace and all it does is alter the timetable or formal roles. Reculturing, as I have argued in several recent writings, transforms the habits, skills and practices of educators and others toward greater professional community which focuses on what students are learning and on what actions should be taken to improve the situation. Retiming tackles the question of how time can be used more resourcefully for both teachers and students. Reculturing and retiming should drive restructuring because we already know that they make a huge difference on learning, although they are very difficult to change. (Fullan, 1998, p.226)
The identified changes or impacts that were the outcome of Cantatech and TOSItech included the impact on timetable and staffing. This could fit with Fullan's "restructuring". It also has elements of "retiming" and "reculturing". Once-a-week online classes as opposed to approximately four times a week 'live' classes allowed a higher degree of flexibility for both teachers (in terms of how staffing could be best utilised) and for learners (increased opportunity to pick up first choice options.) The projects also demonstrated a break away from the reliance on a 'four periods per week' fixed timetable; it challenged the belief that courses could not run successfully without such rigid boundaries.

This shift also has bearings on the degree to which the course delivery of Cantatech and TOSItech classes was distant (as opposed to contiguous) or synchronous (as opposed to asynchronous). In relation to Rumble's (1989, p.28) ideas about the existence of a continuum from highly contiguous to purely distance based education, it was stated earlier (see Chapter 1) that the Cantatech and TOSItech projects were one the distance end of this continuum but were more contiguous than what was on offer at the time via the Correspondence School. The distance was established by the fact that the teacher and students were not in close proximity; however, their contact with one another was increased by the regular weekly opportunities to communicate via audio-graphics. Thus the on-line classes were more contiguous than Correspondence course which relied mainly on postal communication, but less contiguous than a face-to-face class where the teacher and students could all see and speak with one another directly several times a week.

The issue of synchronous communication has some connection with the distant/congruous description. Where teachers and learners can communicate directly in 'real' time, proximity is increased and the interaction is likely to be more congruous. Asynchronous communication is often a feature of distance education as can be seen in the delivery style employed by the Virtual High School. (Berman & Tinker, p.52). The absence of set times at which all members of a Virtual class...
(teacher and all students) must meet up, either face-to-face or to take part in some kind of teleconference, allows course delivery to be more flexible.

Cantatech and TOSltech introduced a delivery style that was not as contiguous or as synchronous as the regular class, and yet more contiguous and less asynchronous than what was on offer by Correspondence. This style of delivery had not been available to secondary students before, one that was in part synchronous (once a week audio-graphic conferences) but was also more asynchronous than the regular school classes in that classes were only timetabled once a week instead of the usual four timetable slots. In between the weekly on-line sessions, students were expected to complete work at times that suited them. Even though Cantatech has since shifted to web-based delivery of some elements of their courses so that students can now access some course-related information on-line in their own time, the weekly timetabled sessions are still in place.

The fact that the synchronous element of delivery was reduced to one session per week appears to have contributed to the sense of intensity that many of this study’s participants related to the on-line sessions. According to them, the intense, highly focused nature of the time spent on-line was a challenge for both teachers and learners and required a high level of concentration. There was also a danger of falling behind more noticeably if lessons were missed. Both teachers and learners commented on this. One lesson could equal one week of learning as opposed to equalling one quarter of the week in the case of face-to-face classes.

This effect could be tempered by strong support systems such as clearly detailed course booklets. Again, this change contains elements of restructuring (a change to timetabling and the structure of lessons), of retiming (shifting the notion of how time can be used for learning, intense periods of class involvement interspersed with extended independent, individual study), and reculturing (a transformation of traditional practices and beliefs about what can improve and support learning.) The
following identified changes could in fact all be seen as aspects of Fullan's (1998, p.226) restructuring, retiming and reculturing.

The changes or impacts identified through this study do tend to have common ground in terms of reference to both teachers and learners, reflecting the fact that the two aspects of education are inextricably linked. For instance, both teachers and learners needed to be thoroughly prepared in order to make best use of this on-line time. This required a high degree of organisational skills and self-discipline without which the classes would not run smoothly. Any failings in this area, on behalf of students or teachers, were clearly noticeable. Conversely, students expressed appreciation and were impressed by those teachers who were obviously well organised and effective.

Oral communication skills were of increased importance in on-line classes, particularly in the absence of visual body language. Again, coming to terms with this shift was a challenge for both teachers and learners. Ensuring all students were included in the learning process meant improved speaking and listening skills for all involved. Lack of visual clues such as body language required enhanced listening skills to clarify messages, as well as incorporating the visual element of on-screen graphics as reinforcement. The development of questioning skills to draw out the information required was an extension of this oral communication emphasis. While a relevant skill in any class situation, it became essential to ensure inclusion of all students in the on-line learning process. It was also important from a student perspective to ensure that they kept in touch with the basic thrust or requirements of the lesson.

Oral language skills also contributed to creating a rapport between teacher and learner and between learners. This enabled the sharing of ideas, attitudes and experience across geographical distance. This was another important element that facilitates learning in any situation but was a bigger challenge here because teacher and learners had perhaps only had one opportunity during the year to meet face-to-
face. Observation was made (by students and by Principals) of teachers who succeeded very well in this despite the obstacle of distance, probably also reflecting enhanced oral language and questioning skills.

Successful on-line delivery indicated a shift from a teacher focused transmission model of delivery to one that was more independent and learner-centred. While this was reflected in educational research emerging at the time, it was also proved in practice as being the pedagogy that worked best for on-line learning. This link between computer use as a teaching tool and the development of a more constructivist pedagogy has been explored elsewhere.

Existing research and development support our hypothesis that teachers' computer and Internet use may be related to the development of constructivist teaching practices and to a set of fundamental beliefs about learning and good teaching that might underly such practices. (Becker & Ravitz, 1999, p.359).

Teachers who participated in this study spoke of the impact that teaching Cantatech or TOSIttech classes on-line had on their existing delivery style. Several spoke about how they welcomed the changes that this practice encouraged them to make in terms of increasing learner involvement, shifting the focus away from themselves as ‘teacher experts’ who simply transmitted information. If they used the medium to transmit a lecture (as some teachers tried to do), they lost the interest and the motivation of the students and very little learning took place. Although this is also true in a regular class, it seems to become even more obvious in the less contiguous on-line situation.

Whether the learning communities created by Cantatech and TOSIttech were not just “learner centred” but also “peer-supported”, “collaborative” and “cross-cultural” (Lai, 1996, p.4) deserves a little more consideration. In the early stages of these projects, there does not appear to have been a high degree of peer-support unless directly encouraged by the teacher. If there was more than one student at a
particular school taking the same on-line course, peer-support commonly increased in the absence of easy opportunities to access teacher support outside class time. Students at different sites had less opportunity for contact with one another than if they were physically in the same location. When asked directly about contact with other students during those early years, participant responses indicated very little communication took place, apart from the odd chat when the teacher was not on-line. There was no regular use of email, fax or phone to communicate with other distance students and face to face meetings occurred once, maybe twice in a year. These infrequent conversations were more likely to be social in function than a tool for learning support.

A current Cantatech teacher was asked if email was now being used more frequently for students to contact one another and discuss class matters. The teacher’s reply indicated that while there was some increase, it mainly happened when encouraged by the setting of co-operative tasks which required group work (collaborative learning) and thus obliged contact outside the on-line class. Teacher intention to foster greater learner participation was obviously a significant factor, reflecting Bates’ (1995, p.44) “need to make a conscious choice of learning theory …with respect to the selection of technologies for teaching.”

In terms of Lai’s (1996, p.6) claims that an electronic community includes “a diversity of language and cultural backgrounds” and therefore “cross cultural exchanges and understanding will be enhanced”, there is only limited evidence of this provided here. It is likely that Lai was envisaging an electronic community of much greater geographic spread than is provided by either Cantatech or TOSItech. Electronic communities, as Lai says, have “no physical boundaries” (Lai, 1996, p.6). The Cantatech or TOSItech clusters however were based on geography (one group centred on the Canterbury region, the other on the top of the South Island) and therefore were less likely to contain a wide range of cultural perspectives. Nevertheless, the claim does have limited truth in this context, as several participants attested. When students spoke of personal experience in relation to their learning,
such as in the study of Geography or Agriculture, they were interested by the
different perspectives that living in a different location could bring.

In relation to the shift in pedagogy to more student-centred learning, there was
some speculation by teachers about what type of learners could best cope with this
shift, including the notion that it was more likely to be older, including adult, students
who were more capable of the independent self-motivation involved. There was also
some suggestion that suitability had as much to do with temperament as with age. It
was generally agreed that not all students nor all teachers were suited to this mode of
delivery.

The need to be competent and comfortable with the technology was perhaps
the first hurdle to overcome in taking part in on-line delivery. It was helpful if some
technological skills were already in place but if there was a willingness to learn and
develop new skills, problems could be solved. The mediation of technology could be
both an aid and a distraction in the learning process. This recognises the identity of
technology as a tool for education that could be used according to the inclination of
the teacher or the student. If the teacher was still committed to a transmission style of
delivery, they would attempt to use the technology in that way; if students were not
motivated, they found a way to use the technology to indulge in off-task behaviour.
Reculturing, which transforms habits, skills and practices, is more significant here in
producing positive change than the restructuring and retiming of delivering lessons
via a once-a-week audio-graphic medium.

Transference of skills between ‘live’ and on-line classes was acknowledged
during this study. A number of those involved spoke of how their teaching skills in
the regular classroom had been improved by their on-line experience. This connects
to the points made earlier about pedagogical shifts having a connection with computer
use. The necessary development of skills such as tight organisation and planning as
well as improved oral language and questioning techniques brought a spillover of
these improved skills to face-to-face classes. Teacher and student participants
commented on this. The transfer of skills was not necessarily automatic when it came to the reverse situation; not everyone who was an effective classroom teacher or learner became an effective teacher or learner on-line.

To return to the very beginning of this chapter, Rogers has described three different classifications of consequences of innovation: desirable versus undesirable, direct versus indirect, and anticipated versus unanticipated. (Rogers, 2003, p.31). Applying these classifications to the impacts/changes identified through this chapter is a matter of conjecture to some degree. Participants who provided the data for this study were not asked directly whether they felt any of the changes were desirable, direct or anticipated.

However, it does appear that many of the consequences were seen as desirable, given the enthusiasm with which a number of teachers and students spoke of their on-line experiences and how these compared or transferred to their regular classes. Undesirable impacts would probably include the sense of increased pressure and the complaint made by at least one teacher that the time allowance for preparing on-line classes did not match the expectations for successful delivery. Another undesirable consequence for one student was failure in the external assessment of that course, a consequence that the student put down to the absence of enough pressure or teacher supervision to see that all work was completed on time. This student obviously preferred greater proximity, a more contiguous form of course delivery.

The identification of which consequences were direct and which indirect would probably require more discussion than there is room for here. There would first need to be clarification of the terms and then the creation of some sort of continuum between the two extremes as there is not an obvious 'either/or' distinction. All participants will not necessarily see consequences, such as the changes to pedagogy, as a direct result—for many it was more a spin-off of their involvement in on-line delivery. Teaching by this medium did not automatically produce a change in teaching style, but it did become apparent that transmission-style delivery would not
have the same degree of success as a shift to something more learner-centred. In the same manner, without checking with participants, it is difficult to claim which consequences were anticipated and which were not. Nevertheless, it is worth mentioning Rogers' ideas here for those who may wish to consider the classifications in relation to their own innovation experience.

The impact of transferring skills between on-line and regular classes is one aspect of measuring the sustainable effects of these projects. This is the concern of the next chapter. It provides the opportunity to explore whether any changes that resulted from the introduction of Cantatech and TOSITech became built in to the seducation system, or whether the changes have simply been discarded or worn away.
Chapter 6: Sustainable effects

The fourth and final key question of this study asked: *In what sense were the projects, or their impact, sustainable?* If the earlier questions fit with Fullan's Phase I and Phase II of change, then continuing the link suggests that this last key question could be Phase III of the process of change, also called "continuation, incorporation, routinization or institutionalization (and) refers to whether the change gets built in as an on-going part of the system or disappears by way of a decision to discard or through attrition." (Fullan, 2001, p.50)

In terms of Rogers' (2003, p.170) five stages of the innovation-decision process, it seems logical that the final stage should be relevant here, the stage which Rogers identifies as "confirmation". The description of this stage is one at which "the individual (or other decision-making unit) seeks reinforcement for the innovation-decision already made, and may reverse this decision if exposed to conflicting messages about the innovation." (Rogers, 2003, p.189). This could be applied to the way the TOSItech project was discontinued while Cantatech was maintained. Further description of the confirmation stage includes "recognition of the benefits of using the innovation, integration of the innovation into one's on-going routine, and promotion of the innovation to others." (Rogers, 2003, p.199). This is also relevant in terms of which aspects of both projects were valued and continued, and even used as a model for other similar change projects.

The first approach to this question is via each of the projects. In other words: Cantatech—was it sustainable? If so, in what sense? TOSItech—was it sustainable? If so, in what sense? In Rogers (2003, p.189) terms, were the projects *discontinued* or *confirmed*? The fact that, at the time of writing up this study, Cantatech continues to operate while TOSItech delivery ended a number of years ago indicates that the answer will be different in each case.
The second approach to this question is in a more general sense, considering the flow-on effects that these projects had on teachers and learners. In establishing if there was a sense in which the impact of these projects was sustainable, it could be argued that we are assessing whether these projects have been at all worthwhile. What, if anything, did they contribute to the development of teaching and learning? This study suggests that the flow-on effect applies in several ways: the viability of distance learning; teaching and learning pedagogy; the use of information communication technology as a teaching tool; and the existence of co-operative inter-school projects.

Cantatech

The Cantatech project is at present (2003) still operating. Although the project involves a slightly different group of schools and is now using some different systems to those employed when CASAtech began in 1994, there is still a line of continuity and development that can be clearly traced through the intervening years. This implies that this project is indeed sustainable, or at least it has been to this point. The qualifying nature of this last statement requires further explanation.

Cantatech’s continued operation has passed through various phases, from the early years of the initial network of the Canterbury Area Schools Association to the inclusion of other rural secondary schools (which brought the name shift from CASAtech to Cantatech), to the current use of web-based delivery of graphics as opposed to the original ‘graphics bridge’ conferences. Each phase has seen the need to address new issues and challenges in order to sustain operation. Laurence Zwimpfer, in his introduction to the Cantatech Handbook published in 1997, made reference to the importance of remaining committed to the vision.

It has not been easy. When the technology was unreliable, they could have given up. When staff discovered they needed new skills to operate the equipment, they could have given up. When staff had to redevelop their teaching resources, they could have given up. When budgets were overspent, boards could have pulled the plug. But the vision remained strong and students responded positively. (Zwimpfer, 1997, p.3).
This continued commitment to the vision appears to be at the core of Cantatech’s sustainability, not just between 1994 and 1997 but also through to the present. As has been mentioned elsewhere in this study, the presence of key personnel has been crucial to the sustainability of this commitment. One TOSItech participant expressed the perception of Cantatech that “those schools have maintained a fairly stable staff and maintained the whole thing all the way through.” This was in contrast to TOSItech where (as is outlined in the TOSItech section below) the coincidental departure of a number of key personnel at the same point in time perhaps helped that project to fold.

In terms of particular personnel, a Cantatech Principal spoke to me of the importance of having a site supervisor who “is very, very committed and has been involved for a number of years.” This type of person carries the vision of the project from one year to the next as well as being “able to assist anyone else who wants to come on-line as an on-line teacher, and keeps a good watching brief on the kids that are on-line.”

Apart from individual people carrying the vision, some importance was also placed on the need to share that vision, to extend the ownership of it so that if individuals moved on, the culture of the school would have absorbed the vision enough to sustain it. One teacher expressed concern about “making it an inclusive thing (rather than) an exclusive thing within schools.” This was based on a belief that “the schools that have made it an inclusive part of their programmes and have included a number of people” and “have tried to involve as many people as possible” are the ones where the vision is likely to survive. “But the schools where it becomes a little pet project of somebody, I don’t think will survive.”

In 2001 the Cantatech schools decided to appoint an over-all co-ordinator or administrator to do a lot of the support work and monitoring. While this appointment was seen as a way of ensuring continuity, some Cantatech teachers have expressed
doubts about its impact. The introduction of a paid co-ordinator is seen as “a change of driving force” and one that has changed “the philosophy of the whole thing and how it ticks over.” One teacher saw this negatively, commenting that “it puts in more of a business structure into it, makes it, you know, where it’s got to be very financial and the rest of it, whereas I don’t think it ever had to be. It was a give and take thing originally and I think we’ve actually lost out.” There is a fear that the original vision may be lost and with it an essential ingredient for sustainability. Time will presumably reveal any truth to this fear.

Finance is clearly a relevant consideration in assessing sustainability. More than one participant made the comment that Cantatech delivery will “be sustainable as long as there is money to fund it.” While comments have already been noted that regard finance as secondary to the commitment to a vision (the attitude that ‘where there is a will there’s a way’), problems with funding continue to influence schools’ decisions about sustaining involvement in the project. Recent change to the Ministry’s isolation funding formula has again put pressure on some schools and, as of the start of 2003, at least one school has made the decision to withdraw from the project. As a Principal reported to me, this was “mainly I understand because of financial considerations, as they went to a six day timetable, which made it hard to release the on-line teacher, who then withdrew her services. Without the income for her, the school no longer wanted to be part: they could not afford it or justify the cost.”

More than one participant from a Cantatech school professed a commitment to this form of teaching as part of their way of staffing. However, there seem to be an increasing “number of schools that have had to think very seriously about the financial side of it.” This statement was largely made in reference to the loss of some degree of isolation funding. “At the moment it costs each school ten grand to get into it (Cantatech), but you can’t get ten grand on the table if you haven’t got ten grand coming in.” Concern was expressed that “if the government don’t come to the party very soon, the thing’ll fold.” One teacher voiced the belief that the government
should see that “projects like this are initiatives and they do need to be considered to be a very worthwhile way of delivering education.”

Sustainability for Cantatech is therefore very much an on-going issue, one that needs to be faced again and again with each new year, in relation to changes in both staffing and funding. There is a constant need to revisit the vision and review its relevance.

TOSItech

TOSItech had a shorter life than Cantatech. To clarify possible reasons for this, it is necessary to review the stages of TOSItech’s existence. It began in 1995, a year later than Cantatech, and possibly may not have begun at all without the Cantatech example. This is suggested in statements from early TOSItech participants. When asked how they first encountered the idea of audio- graphic distance learning several participants said, “Carol Moffatt talked about it at an Area Schools’ Conference.” This was at the 1994 conference, by which time CASAtech was already in operation. Participants recalled that Carol Moffatt spoke at the conference about what was happening for the Canterbury Area Schools. She was also able to talk about what she had observed in South Australia.

Several participants in this study also recall hearing Ken Stevens from Victoria University speak at this conference about the idea of creating the “virtual class.” The impact of this was considerable for at least one teacher. “His message was, in a sense, it was visionary and I thought that that was worth aiming for.”

The idea of looking into cyber options had already been discussed at Collingwood Area School, later to become one of the lead schools of the TOSItech group. One participant who was based at Collingwood at the time said: “The principles of it (distance delivery via audio-graphics) had been floating around for quite a while”. A further development was the appointment of a new Principal at Collingwood, Stewart Gavin, who came from the position of Deputy Principal at
Cheviot Area School. Cheviot was part of the CASAtech group and, even more significantly, Stewart Gavin was already delivering a CASAtech course on-line. At the time of the 1994 Area Schools’ Conference, Stewart had been notified of his appointment to the Collingwood Principal’s position although he had not yet taken up the post. He attended the 1994 conference more in that new capacity than as a representative of Cheviot. This provided very favourable circumstances for the ‘top of the South Island’ (TOSI) schools to begin their discussions about setting up a network similar to CASAtech but based in the TOSI region.

When Stewart arrived at Collingwood several months later, the equipment had already been purchased and set up for audio-graphics delivery. This meant that he was able to continue delivering his CASAtech course. It also meant that as discussion about the new TOSItech project progressed, he was able to demonstrate the delivery in practice and thus increase understanding and commitment to the idea. More than one participant commented that the first demonstration (of audio-graphics delivery) they saw was Stewart Gavin delivering to his on-line class. Several of the other schools, including Karamea, were already receiving some courses from Tai Poutini, the Greymouth Polytechnic, by this stage, and this added to their willingness to launch on the new venture. “We had an audio-graphics thing up and running too but the actual TOSItech network didn’t start until some time later.”

Once Tositech was operating, as it was from the beginning of 1995, why was that operation only sustained for five years while Cantatech has continued to run? One suggestion has been that the structure of the project was flawed from the outset. One design team participant, when asked why they thought TOSItech folded and Cantatech did not, replied: “I just think that first of all the funding model was quite different.” (see Chapter 4: How the projects operated: Finance) The way in which Cantatech was perceived as “a cooperative venture, rural schools helping each other out” was perhaps less clearly the focus for TOSItech where the emphasis was shifted to each school caring for the interests of their own students and even striving in a very self-interested way to ensure their own survival.
At the early meetings held to discuss the formation of TOSItech, several participants who were present suggested that there was “a bit of partisan stuff going on” particularly in terms of the charging system. There appears to be a perception that while “lots of people had lots of different ideas” some of those ideas “seemed to get buried.” The feeling that “we don’t want to have too many seeds of discord at the start, we need to be working as one” appears to have predominated at this stage and some participants “went along with actions just basically because we wanted the thing to have a decent start, and get cracking on a good footing. We let things that were going to happen, happen.”

This willingness to compromise, while it may have helped to get the project off the ground, possibly provided one of the reasons that the TOSItech network was not sustainable. It is likely that schools that felt their interests were not so clearly in focus were less committed to the long-term continuation of the project. Once the initial funding ran out and course costs could no longer be subsidised, these were the schools that more readily made the decision that TOSItech “just wasn’t hitting enough targets and it seemed easier, lower risk, to direct students to either Correspondence courses or Poly(tech), or that sort of thing.”

One administrator, when asked about the sustainability of TOSItech, described it as a “cul-de-sac.” He believed that “the development of audiovisual computer technology (at that time) could never match the sophistication of the vision which lay behind TOSItech.” Ultimately, in his view, TOSItech “didn’t get to that point where it could take off, and that could have been dependent on personality, it could have been related to finances. I mean, if money had been no object it would have worked, wouldn’t it?”

It is difficult to separate the funding issue from that of personality, or more particularly, from personnel. The point at which funding became critical coincided with the departure from the TOSItech schools of a number of key personnel, people
who had been very much involved in the inception of the project. This included three Principals of key schools in the group (including Stewart Gavin who became an IT advisor for the Christchurch College of Education) as well as at least one technology teacher who had contributed strongly to promoting the audio-graphic delivery or ‘virtual school’ vision. Given the importance placed on key personnel by most of the participants in this study (see Chapters 3 & 4), the question is raised: if these key people had continued to be involved, or had been replaced by people with equal commitment to the vision, would the funding issue have been solved and the momentum of the project sustained? The Cantatech example suggests it is likely that this would have been true.

A final quote from a TOSIttech administrator: “I was enthused by the vision, but I suppose the important point was that we would get over the hump of that critical mass thing and the thing would mushroom and it would become both economically and pedagogically viable. But it didn’t.”

**Distance learning**

In terms of distance learning delivery, the example that these two projects provided does appear to have had a sustainable impact. One Principal stated: “It has allowed us to explore the development of remote teaching/learning.”

Cantatech, as the forerunner to TOSIttech, provided the model for the latter project as well as for various other audio-graphic delivery projects that have been set up in New Zealand since the mid 1990’s. This includes networks set up in areas such as East Cape, the Far North, Thames/Coromandel and Otago. Carol Moffatt, already identified as a key figure in initiating the Cantatech project, stated that it “was away ahead of its time in New Zealand. We were looked on as oddities in some ways but, as I reflect now on the numbers wanting to work in this way to provide their students with a much richer learning opportunities, I feel vindicated in the stance we took.”
The innovative nature of Cantatech has some parallel in Cicourel and Kitsuse's 1973 study of an American school, Lakeside High, in that that school was: "...in the vanguard of changes that were taking place among US high schools, so that more and more schools would become similar to it in important aspects in the future. Thus, they claimed, it offered a good basis for generalizing to a future population." (Gomm, Hammersley & Foster, 2000, p.105).

Cantatech and TOSltech were the first audio-graphic networks set up specifically to serve the education needs of secondary school students in remote parts of New Zealand. They demonstrated that course delivery could happen over distance without total reliance on printed matter. The appeal that this new delivery method had was that it provided more immediacy, was more contiguous than the print based correspondence courses that were already in existence. It demonstrated the possibility of virtual classes, existing largely in cyberspace, where, in the words of one design team participant, "the centre of learning becomes an electronic one." It is an idea that appears to be steadily gaining credence, perhaps more so in the tertiary education sector but still having an increasingly significant place in secondary school and area school education.

This mode of distance delivery also appears to have suited adult students, especially those who found it difficult to stay motivated studying alone on a print based course. It was argued by one Principal that any students "learn a lot better when they actually feel there is a human being at the other end of things" and this is what the audio-graphics delivery provided and which print based courses often did not. The audio-graphics style of delivery was also convenient in that it only required adult students to attend school once during the week as opposed to on the four or five different occasions necessary for live classes. This made it much easier to fit in amongst the other commitments in their adult life. Such an improvement to distance education options increases the likelihood of sustainability.
As an extension of this, at least one design team participant discussed the idea that “the impact of this kind of distance education experience is much wider than just secondary.” The current trend is that “people want to learn in diverse ways and in diverse places” so there is “an on-going need for development of distance courses at secondary and tertiary level.” The Cantatech and TOSItech experiences have helped to demonstrate just what is possible and encourage the sustainability of this style of education. The importance of such a demonstration relates to where students move on to, beyond school, as is expressed in the following quote.

If we are to prepare students for the future they need to learn in an environment that is flexible in terms of time and space—one that more closely resembles their future working and living environment and lifestyle. (Tiffen, 1993, p.45).

The other factor which makes this style of distance learning more viable is the developments in technology that have taken place in the last decade. The immediacy that was identified earlier as an advantage that audio-graphics had over print delivery has increased as technology has improved and become more accessible. When CASAtech was first set up, an on-line teacher recalls that: “video then was just a dream apart from Microsoft, but now often schools can run real time video.” Being able to actually see other people in the class as well as hear them is a step forward that is already being taken by some of the more recent projects that have been set up with Cantatech as the original model for their delivery system. The Otago network is an example of this.

The delivery of computer graphics has also been simplified. An early on-line teacher said that in the past, “you always had to keep an eye on how big a piece of graphics work you had was because they were always bit maps in those days and therefore slow to download and pretty bulky, whereas these days you can do it as a j.peg or a tif or a gif and you can download at 350 or 56k now.” Access has improved because “generally speaking, modems are not only fast but they’re much more stable. In those days we were working on 14.4 modems, and they were state of the art, and
now a lot of people are running 56.” The problems that were encountered at the outset have at least been reduced if not removed altogether. If that had not been the case, it is unlikely that this style of delivery would have continued. Evidence shows that not only have such delivery methods continued, they have expanded and developed and continue to do so.

The distance education market has changed dramatically over the last decade. What used to be dominated by the Correspondence School, Massey University and the Open Polytechnic now includes dozens of providers: universities, polytechnics, even schools and overseas institutions. (Rowe, 2000, p.9).

The developments in technology over the past decade have clearly extended possibilities. Mark Beach, head of teaching at the Correspondence School, stated in a 2002 interview that: “research around the world indicates the most successful distance courses are those that include a strong element of discourse between students and teachers and between students and students. That means letters, telephone and face-to-face meetings when possible, but also email, internet bulletin boards and chat rooms. Such interactions are just as important for the teachers as for the students.” Beach has also said that: “distance education is a huge growth area, and not just for people living in remote areas. Many find it more flexible and more appropriate for the way they want to learn – there are tertiary institutions delivering courses to students that live practically next door.” (Gerritsen, 2002, p.5).

This final comment could apply to secondary as well as tertiary institutions, in urban as well as rural areas. A Cantatech design team member said when interviewed that “one third of all our secondary schools are in the same situation as the schools within the Cantatech model: they really are not in a position to provide the breadth of curriculum options that senior secondary kids are needing.” This participant’s statement was based on a recent New Zealand Ministry of Education / PPTA working party report which he said stated that “about a third of all the (New Zealand) secondary schools have got rolls of less than 120 from the fifth form up. Now the Ministry is saying that at that point there’s a sort of cut-off that comes from their
research, a break-even point, where you may have enough staffing to provide the breadth of curriculum that is required to give kids a decent education. My own view, from looking at international research is that that figure may be closer to 300; I think the Ministry have under-estimated.” It seems likely that the impact of distance learning projects such as Cantatech and TOSIttech will continue to spread.

**Teaching and learning pedagogy**

The nature of the effect of these projects was explored in addressing the key question: *What impact did they have in terms of teachers and learners?* In general, it appears true that through Cantatech or TOSIttech, teachers and students involved became aware of new ways of learning. This is expressed in a article written by two TOSIttech teachers, reflecting on their on-line teaching experience.

> We now have a clearer perception of the teacher’s role in facilitating learning and the need to identify and manage those aspects where the teacher input is of critical importance. It seems that teachers become more focused and students can accept more responsibility for managing and adding depth to their learning.” (Dobbs & Coburn, 1996, p.11).

However there were varied responses when the questionnaire asked: *Do you think that this project has produced any long term or sustainable changes to teaching and learning?*

Some teacher participants expressed reservations as to whether sustainable change could clearly be proved, particularly in terms of school culture. The response of one teacher/administrator when asked if the projects had “had a long term impact” was simply: “Can’t tell.” This participant expressed the view that while these projects had “certainly created a lot of arguments” about changes “in terms of teaching style or learning style,” and had led to further discussion of “cross-curriculum classes and glide time and open time-tables and things like that,” schools involved had not necessarily reached the point where “the culture starts changing deep down.” This is in line with the earlier recorded description from another participant who described
the TOSInfo experience as “a cul-de-sac” and also fits with the following statement: “If differences between teachers’ beliefs and the intended operation of the innovation or change are not reconciled, practices will revert or be suborned.” (Lockwood, 2001, p.9).

A past student from Cantatech, when asked if the project had produced any long term or sustainable changes, gave the answer: “No, I think it is similar to Correspondence School.” It is of interest to note that this student had not enjoyed the experience of audio-graphic delivery and regarded her own involvement in it as unsuccessful based on external exam results. While this student achieved reasonable success in subjects studied in live classes, the audio-graphic subject exam result was below pass level for university entrance. The same student commented: “I didn’t feel the teacher was particularly well organised, or particularly approachable.” It appears that a negative attitude to the whole audio-graphic experience, possibly a product in turn of poor delivery, may have contributed to the belief that there was nothing of value in this learning style worth sustaining.

The result was perceived to be different for students who did well via audio-graphic delivery. According to one administrator: “If the results have been successful they’re certainly very confident about taking an on-line course again and being able to have some control of the pace of their learning. And also, those ones who were successful and managed their own time and were independent and assertive learners, those skills… they’ve got those good, I’d say.” Teachers and students participating in this study said that learning on-line “led to the development of successful individual study habits and self-motivation” and “encouraged greater individualised learning.” This was because “the system requires that the learning be pupil-centred. Students have to accept more responsibility for their own learning.” The independent learning skills necessary to and developed by audio-graphic delivery were, in the words of a student: “more like what you’re having to do at university” and in that sense could be carried forward or sustained when students progressed to tertiary education.
A specific skill that was mentioned by participants as having an ongoing impact was “the questioning techniques that you need to do on audio-graphics, the type of open questions that create discussion.” These were regarded as “some of the skills which are inherently audio-graphic type skills” but which “I think you can transport.” The importance of questioning effectively in order to elicit more information and to facilitate learning applied to both teachers and learners in the online situation and was just as applicable for both in the regular face-to-face classroom.

For individual teachers, it was believed that involvement in audio-graphic delivery “has encouraged a more structured approach to the planning of their face-to-face programmes.” One teacher stated that “the long term benefit was a change in teaching style and it forced people like myself out of the ‘sage on the stage’ style and that’s to be greatly commended I think.” There is indication here of a shift toward a situation which Derek Wenmoth describes where “the education process becomes more a negotiation of meaning rather than a one way discourse.”

As the learners become increasingly active in how they define what it is they want to know, then set about locating and processing the relevant information, the role of the teacher/learner relationship must change. No longer can the teacher be the “fount of all knowledge” requiring students to come as empty vessels and be filled. (Wenmoth, 1996, p.2).

Responses that identified some form of sustainable impact generally saw it in positive terms. For some who have been involved in Cantatech or TOSITech, it provided the opportunity “to look at the pedagogy of learning rather than staying with the familiar model of up-front delivery.” Several participants voiced a hope that positive changes would flow-on from these projects, or from others like them. One Principal said, “Certainly there is evidence of this at an international level. The shift towards more student-centred approaches, and the adoption of constructivist pedagogies are two of the things that are identified in much of the recent research.” This last reference to research suggested that evidence of real sustainability was available. There is even indication that on-line learning processes are becoming part
of mainstream practice. As Husu states, "the development of new communications technologies may encourage the merger of distance education with conventional education so that the distinctions between the two become blurred. (Husu, 1996. p.37).

The Principal of one school spoke of involvement in audio-graphic delivery leading to modularisation of other courses on offer within the school, a flow-on effect from the teaching style that worked on-line. "We learnt from the staff who were doing TOSITech that it was really good to be really focused and modularising, do one thing, finish, move on, make the connection." While some teachers apparently struggled with this initially, "once the philosophical mind-shift was made, the teachers willingly embraced modularising things so that they could teach certain aspects and then provide independent follow-up work that the students could actually do on their own, just like in TOSITech."

Along the same lines, another Principal spoke of how the on-line delivery experience meant "teachers realised they didn’t have to teach students four hours a week. A lot of people would say that’s heresy but our results didn’t appear to be affected at all." Both of these responses indicate that the Cantatech and TOSITech projects did challenge assumptions and arguably brought irreversible change to the mind-sets, the teaching philosophy or beliefs of at least some teachers. These were the teachers who became committed to the innovation, to sustaining the vision.

Teachers’ ‘commitment’ to an innovation might usefully be viewed as a set of beliefs they hold which they use to judge an innovation’s ‘relevance’, ‘connected-ness’, and ‘centrality’ in relation to their more fundamental beliefs about teaching and learning. (Errington, 2001, p. 36).

**ICT as a teaching tool**

Another general aspect of teaching and learning that the Cantatech and TOSITech projects have probably helped to sustain is the use of information
communication technology as a tool for education. This is an issue of considerable concern in education today.

Students are increasingly computer literate and often rely heavily on technology-driven venues for learning. Today's students will constantly retool and retrain with industry's demand for lifelong learning. Therefore teachers have a responsibility to implement technology-based educational systems that will facilitate this ongoing renewal. (Glahn & Gen, 2002, p.783).

Cantatech and TOSItech have played a part in facilitating students' awareness of the applications of technology for learning. As one teacher said, the use of audio-graphics as a delivery method "has definitely developed a wider appreciation of the possibilities and problems of using computers to enhance teaching and learning." As early as 1996, TOSItech teachers were explaining how "other benefits emerge through gaining new perspectives on how technology can be applied and teaching approaches modified within the schools." (Dobbs & Coburn, 1996, p.10).

In one sense this was an incidental spin-off in that those who were placed in a position of being involved in this delivery method inevitably became more familiar with using the technology. One teacher perceived that the weekly on-line sessions helped to create "a much better culture of cranking up modems." Those involved, teachers and students, became far more comfortable not only with how to operate the technology in a hands-on sense, but also with the style of teaching and learning required to be successful in this delivery environment. It would be interesting to discover whether this increased hands-on experience with the technology had a similar effect on attitudes to that observed in a study of two small rural schools in Northern Canada. There the students "who had high access to telecommunications technologies were more likely to perceive them as having a positive impact on their education than their peers who had low access." (Healey & Stevens, 1998, p.30).

In another sense the increase in skills and a changed awareness about the power of ICT was deliberately encouraged. This was done through the training
sessions provided for on-line teachers and students at the beginning of each school year. In some cases it was also extended to teachers who were not directly involved in on-line teaching. One administrator explained how “we actually involved our teachers quite a lot in trying to bring teachers up to speed with technology.” Staff who did not normally teach on-line were brought in to see what happened during on-line sessions “and then to actually do quite a lot of PD work with them using computers and to make sure all the staff were up to speed using computers and all that kind of thing.”

In the case of Cantatech, this professional development was part of the group’s involvement in a separate ICT contract, aimed specifically at improving the use of this technology for teachers and learners. The audio-graphic delivery network provided a good base for this development, a logical cluster of schools with links already in place and a clear demonstration of one way in which ICT could be effectively employed as a teaching tool. From this point it is easier to make the step toward using more synchronous and asynchronous time facilities such as forums and chat rooms which are possible now but were not in place when CASAtech first began. A design team participant commented: “Those sort of environments would have been greatly useful in the early days of audio-graphics conferencing because they would have added another dimension of interaction.”

The Cantatech and TOSItech projects were successful in demonstrating how ICT could maximize the opportunities for interaction so that learning can occur. They also opened the possibility for what was to follow and in this sense created continuity or sustainability for ICT use in education in the future. They were a part of the move from an Industrial to an Information Age, a shift that has meant that: "new tools allow different learning opportunities particularly in relation to time, space, ability, access to experts and collaboration." (Campbell, 1997, on-line).

One design team participant, after reflecting back on how the projects operated when first set up, went on to describe the scenario that could exist now, with
the possibilities that have been created by further developments in technology over the intervening years:

Imagine then that after the audio-graphic conference, or even before it, a forum was running, a meet the teacher forum, a question and answer forum, a forum where you could continue the debate associated with the geography or biology or whatever subject it happened to be. Those sort of chat line opportunities, which capture the imagination of the learner but where they’re structured around a learning task, become very powerful learning. (Participant interview, 2002).

It could be argued in terms of Cantatech and TOSIttech that “the case investigated is a microcosm of some larger system or of a whole society: that what is found there is in some sense symptomatic of what is going on more generally.” (Gomm, Hammbersley & Foster, 2000, p.99).

**Inter-school projects**

Apart from innovative use of technology, another aspect of Cantatech and TOSIttech that could be described as ground breaking was that they involved a co-operative network of schools working together to improve curriculum delivery for all their students. Schools had shared classes before, and no doubt still do in towns or cities where schools are located close enough to one another to allow students to move between sites during a school day. Specialist subjects at a senior level can become viable if the number of students in the class is a composite from two schools. For example, Bursary level Classical Studies may be offered at one school while Accounting is offered at the other and students move between schools for those classes.

The extended geographic distance between rural schools makes the possibility of such regular inter-change unlikely, or it did until the delivery method shifted to audio-graphics. Once students and teacher could still be based at their home school location but meet as a virtual class in cyber space, the sharing arrangements could be
extended to more than just one other school, even at times to as many as five or six separate sites on-line at the same time.

In 1995, a small number of teachers have commenced teaching from one network to another. Each participating school within a network has to interface with all of the other members by co-ordinating of its timetable, evaluation procedures and much other planning. Each participating school therefore has to be academically and administratively open to all schools in the network. (Stevens, 1992, p.82).

One administrator stated that: “The whole way this project was managed between schools is a good example of how schools could work together even though they were geographically isolated. It required the right people in the right place at the right time but I thought that was the real benefit and showed what could be done, particularly when you’re talking about sharing financial resources.” Cantatech and TOSIttech created a precedent that is still being imitated and developed.

The fact that Cantatech and TOSIttech showed that such co-operation was possible was a significant achievement especially considering the belief expressed by one teacher administrator: “Schools, especially secondary schools, or schools with a secondary element tend to work in very isolated areas; they don't actually share resources or expertise very well.” Creating that shift from competition to co-operation was an essential element for sustaining the projects. One Principal summed up the importance of this aspect, stating that: “Distance learning will not work unless you have the commitment of the contributing and the delivery schools.” So long as the inter-school co-operation can be sustained then the project will have more chance of continuing.

Oxford Area School Principal Bob Norrish says the project has brought the Cantatech cluster of schools closer together. “It has made schools stronger. They share a lot more. One of the offshoots of building syndicates in schools is that they can all work for the common goal,” he says. “The real strength is that we work together with other Principals.
We meet about six times a year, and that is a really valuable network for isolated schools like ours. (Velde, 1999, p.17).

**Discussion**

In dealing with the final key question, *In what sense were the projects, or their impact, sustainable?* the notion of sustainability (or "continuation" to use Fullan's (2001, p.50) Phase III term,) has been approached from two separate angles. The initial approach was via each of the projects as a whole. In other words, once up and running, could they continue to operate? Did the changes they introduced become institutionalised, part of the established routine? To employ Rogers' (2003, p.189) terms, at this stage of *confirmation*, were the innovations *discontinued* or *maintained*? Each project has provided a different response.

Cantatech continues to operate at this point (2003) and despite some pressures, caused largely by funding issues, shows no likelihood to fold in the near future. The vision was created and carried forward i.e. sustained, despite changes in key personnel. Whatever problems Cantatech has had to face appear to have been overcome by whatever means were available. Various responses have been developed to carry the project forward, such as shifting to web-based delivery of much of the visual material, using the ICT professional development contract (with the Cantatech group as a PD cluster) to extend skills and promote pedagogy, and the appointment of an overall administrator for the project as a paid position. Cantatech continues to face challenges to its sustained existence, most recently the changes to isolation funding which has led to one school's withdrawal from the project, but a strong commitment to the vision remains within the group.

TOSIttech, however, is no longer in operation. Two reasons which Hargreaves (1997, p.viii) suggested could make the educational change process falter or fail seem to be applicable in the case of TOSIttech. One is related to resources, suggesting that: "The change is poorly resourced or resources are withdrawn once the first flush of
innovation is over." In combination with this is another of Hargreave's reasons for failure which states: "There is no long-term commitment to the change to carry people through the anxiety, frustration, and despair or early experimentation and setbacks." (Hargreaves, 1997, p.viii). There was an initial commitment to sustaining the original vision, to turning the possibilities that TOSItech could offer into realities, and the project did operate reasonably successfully for four years and on a more limited basis for one further year. However, changes in key personnel coinciding with issues about financial viability eroded commitment to the project and, as several schools withdrew, the group could no longer afford to operate. TOSItech failed to reach the point of critical mass that would sustain its existence.

Rogers describes two types of discontinuance; "replacement discontinuance, in which an idea is rejected in order to adopt a better idea which superseded it, and disenchantment discontinuance in which an idea is rejected as a result of dissatisfaction with its performance. Later adopters are more likely to discontinue innovations than early adopters." (Rogers, 2003, p.217) TOSItech's discontinuance fits more with disenchantment than with replacement. The school's which stepped back from their involvement in audio-graphic delivery did not replace this with anything new or better. They returned to previous solutions to the senior options problem.

The best example of this is of a student who spent two years accessing courses via TOSItech and then, in his final year at school, was obliged to turn to Correspondence School delivery as his school had withdrawn from the project. The decision was made purely in relation to cost as the student had been quite happy with his audio-graphic delivery experience. This particular student was choosing to study three different course options that were unavailable in terms of live delivery at his school. He was the only student choosing these options. TOSItech had finally exhausted the initial funding pool which had helped them get the project up and running. This meant shifting to a more 'user pays' scenario. It was seen as too expensive to pay for three different courses to be delivered to the school, each of
which was only providing for one student. The *disenchantment* stemmed not from the student in terms of learning, but from the school in terms of economics.

Whether Rogers' claim that late adopters are more likely to discontinue than early adopters could have some truth here. In the years since that particular school had first become involved with TOSIttech, leadership of the school had changed. Staff who had been among the early adopters of the innovation had moved on and had been replaced by others who did not have the same degree of commitment to the project. Less conviction about the long-term value of this innovation meant that the cost issue readily provided a reason to discontinue. If the original early adopters had still been at the school, would the problem of cost have been overcome in some way so that the innovation could be maintained? It is only possible to speculate here as this is not what occurred. More than one school in the TOSIttech group made the same decision at the same time and their combined withdrawal meant that discontinuance of the project as it was set up became inevitable. It is important to recognise however that some members of the TOSIttech group have continued their involvement with audiovisuals by accessing courses via Cantatech or other providers such as polytechs.

Another approach to assessing sustainability or continuation is to consider the contribution both projects made to issues affecting teachers and learners on a much broader scale, beyond just secondary school level education in rural schools, which provided the base for both Cantatech and TOSIttech. The issues that were addressed or explored by these projects have had a flow-on effect to a number of other aspects of education and in that sense their influence has been sustained. Whether the changes made during these projects were untried elsewhere or not, the fact that they did happen meant that they did contribute to a broader pattern of change, an incorporation of new educational methods and styles.

These aspects of influence include the viability of distance learning. Cantatech and TOSIttech helped to demonstrate in a practical sense (rather than simply in theory) that learning across distance could not only be mediated electronically but
could be done in a more effective and immediate way than learning by print-based correspondence courses alone. The example which they provided (an example that was previously largely tertiary-based in the New Zealand setting,) demonstrated that this delivery method was applicable to secondary schooling and added to the body of convincing evidence that this ‘experiment’ was worth pursuing. The example is further valued because, in the secondary school context, it was groundbreaking, one of the first New Zealand examples of this form of distance learning.

Teaching and learning pedagogy were also influenced by these projects. The style of delivery needed for the audio-graphic teaching method to work well was found to reflect much that was being promoted by educational research at the time. This included independent, learner-directed instruction, as opposed to the more common teacher-centred transmission-based model. It also promoted the value of flexible learning demonstrating that the traditional framework for delivery (four periods per week with the teacher in front of the class) was not necessarily the only effective option. The Cantatech and TOSIttech schools provided a valuable practical demonstration of theory in practice.

There were other secondary school level demonstrations going on elsewhere in the world by this time. The South Australian network that Carol Moffatt visited in 1993 has already been mentioned. Other examples include the use of video conferencing to integrate remote classrooms in Finland (Husu, 1996, p.34), the application of telecommunications technologies for accessing learning opportunities in Northern Canadian schools (Healey & Stevens, 1998) and the creation of the Virtual High School in the United States in 1996 (Berman & Tinker, 1997). Each of these projects undoubtedly had it’s own character in that it was responding to local needs and in a local context. The shared significance is the way in which they all involved collaboration between two or more schools—as many as 183 schools in the case of the Virtual High School in 2003. This collaboration, especially in the early 1990s, was highly significant, as the following quote from Fullan indicates.
There has been an explosion of knowledge and breakthroughs recently in the science of learning—brain research, cognitive science, the role of emotions, technology and more. We are still at the beginning of an intellectual burgeoning of the quality and depth of pedagogical knowledge and means of enhancing learning for all. This revolution has barely touched schools. The exciting part is that collaborative schools have entered the race, and in so doing are unleashing unprecedented change forces. (Fullan, 1999, p.47-48).

Cantatech and TOSltech demonstrated the use of information communication technology as a teaching tool. They began at a time when awareness of the shift from the Industrial Age to the Information Age was coming more and more into focus and demonstrated one way in which the tools of the Information Age i.e. information communications technology, could be effectively employed in education. They provided a great learning environment for what worked and what didn’t in terms of on-line education and further provided a particular purpose for experimentation and development. These projects illustrated how ICT might enable the creation of the virtual school. They did not take the possibility as far into cyber space as other projects such as the Virtual High School, but they did point toward that possibility—the potential of on-line delivery to create classes that could exist independent of a single shared physical space.

A better way to describe the role of technology in teaching is not to speak of it as a delivery platform through which teachers deliver information and students access it. But rather, to think of the on-line technologies as learning environments, places where teaching and learning can happen. On-line teaching should then be a social space where a community of learners congregate and participate in a shared environment of learning. (Glahn & Gen, 2002, p.782).

As co-operative inter-school projects, Cantatech and TOSltech also demonstrated how schools could operate not simply in partnership but as a group with the shared interests of all their students at heart. They provided a model for success
where the emphasis is on co-operation for a common good as opposed to competition to ensure the survival of individual schools.

In fundamental and far-reaching ways, new technologies are starting to redefine the social geography of schooling. Internally, they are challenging the spatial segregation of schooling into separate subjects and classes. Externally students' capacity to access knowledge and information independently and to communicate with other children and adults internationally, is starting to dissolve the boundaries between community and school, making curriculum "relevance" a global and not merely an immediate and spatially "local" matter. (Hargreaves, 1997, p.5).

The use of audio-graphics for the delivery of secondary school curriculum in New Zealand, and the creation of rural inter-school networks for this purpose, are perhaps the only truly original contributions in the Cantatech/TOSItech legacy. These contributions are significant when considered in the light of developments since and in the existence of other projects modelled on those early examples. Also significant is the contribution that the Cantatech and TOSItech schools made as participants in a broader educational change process, incorporating new methods for distance learning, applications for ICT as a teaching tool, and shifts in teaching and learning pedagogy. While these changes may have been initiated and also put into practice elsewhere, the involvement of these two groups of schools has lent weight to the process and helped to ensure that the shifts would be sustained.
Chapter 7: Conclusions

The aim of this study was to explore and describe Cantatech and TOSItech. The key research questions were used as a guide to seek and share understanding of both these distance learning projects—why the projects were set up, how they operated, what impact they had on teachers and learners, and in what sense any impact was sustained. This has provided an opportunity to increase understanding not just of the projects themselves but also of related issues and experiences, to place them in the context of other literature. This includes literature relating to distance education and open learning, studies specific to the secondary school (as opposed to tertiary level) experience, and more general literature dealing with the innovation/change process, especially as it applies to education.

It is important to understand just why these projects came into existence. When students wish to take courses which a small school is unable to offer, it becomes likely that the students will leave the area, preferring to board away from home and attend a larger school with more options on offer. This reduces the school roll, thus further reducing the staffing and again the course options that can be offered. Distance learning is a way to break this cycle of erosion by providing students with the one or two courses that they want over and above what is already available at their local school. This means that they will stay in the area and on the school roll, a less expensive option for families in terms of boarding and an assurance that the school will at least be able to maintain its current list of locally available options.

When the audio-graphics links first became possible in the early 1990’s, they appeared to offer a better distance delivery alternative to print-based instruction. Students would be able to interact with their teachers and with other class members at least on a weekly basis. Although video transmission, allowing participants to actually see one another, was not viable at the time, the use of Polycom phones and an audio conference link meant that they could all speak to and hear one another in a synchronous time frame. A graphics conference link via a separate phone line also
meant that the computers at each site, using software such as Vis-a-vis and then Farsite, could also have synchronous links to form a limited network. The activity on screen could then not only be viewed by everyone but also at times added to or modified by any of the class members. Feedback and expression of ideas could therefore be visual as well as aural.

Identifying the conditions under which these groundbreaking projects came into being can increase understanding of innovation in general. From the viewpoint of many of the participants in this study, the approach to setting up these projects was "problem centred" (Ellyard, 1992, transcript, not paginated) in that it sought to eliminate barriers, to solve the difficulty of providing an acceptable range of curriculum options to students at remote rural schools. However, in a sense, it was also "mission directed" (Ellyard, 1992, transcript, not paginated) in that it connected with a vision of better education and improved pedagogy, the creation of a positive and preferred future for education, a moral purpose. Members of the initial project design teams tended to have the broader, more mission directed view, while teachers, administrators and students tended to see the value of audio-graphic delivery more from a problem centred viewpoint, offering to solve or reduce existing problems of course delivery for senior students.

Using Ellyard's ideas can help us to identify what drove the inception of these projects, why such an innovative approach to education was adopted when and where it was. While this gives us further insight into Cantatech and TOS1tech, it also helps us to reflect more clearly on the path education may take in the future. It helps us to understand that decisions about change can be a response to present problems as well as a striving for a vision of an improved future. The impact of Cantatech in particular would suggest that the combination of both these drives creates a very powerful force for change.

Ellyard (1992, transcript, not paginated) also spoke of the future as not some place we go but something we create, and the pathway to it being made, rather than
found. This points to the importance of those willing to take on the creative leadership role. It was essential that there were people able and prepared to carry this vision, to voice it and to put it into practice, to harness the necessary political force. This fits quite well with Fullan's description of Phase I of the change process, "variously labelled initiation, mobilization or adoption—consists of the process that leads up to and includes a decision to adopt or proceed with a change." (Fullan, 2001, p.50). Putting the ideas about best practice into action also required the availability of new technology and the finances to pay for it and was helped by examples from elsewhere of similar projects already in operation.

The instigation of these projects came from a melding of all of these factors: a sense of purpose and vision, the availability of examples and ideas to create possibilities, the presence of the right people to carry it forward, and the accessibility of appropriate technology and sufficient funds. Rogers (2003, p.170) combines all these factors in his first three stages of the innovation-decision process. He describes progressing from knowledge of an innovation and how it functions, to forming an attitude to it (in this case a favourable one) which then leads to the decision about adopting the innovation. This decision is based on attributes such as the advantages the innovation offers and its compatibility with existing values, experiences and needs. (Rogers, 2003, p.15). In relation to Cantatech and TOSIttech, once people knew about audio-graphic delivery, heard about its application elsewhere and were impressed, and then found that the cost was manageable and compatible to their socio-economic values, the projects were launched.

How the projects operated in terms of resources and routines is an extension of the practical application of the original vision. The finance, the personnel, the equipment, and the systems all had to be located, developed and maintained in order for the projects to gain their own momentum. Fullan describes Phase II of the process of change as including "implementation or initial use (usually the first two or three years of use)—involves the first experiences of attempting to put an idea or reforms into practice." (Fullan, 2001, p.50). The word "attempting" is appropriate to the
Cantatech and TOSIttech experience. While there were some proto-type models out there to follow (in the New Zealand tertiary sector and in rural secondary schools in South Australia), these examples did not provide an exact fit with the circumstances or needs of the Cantatech and TOSIttech networks. Systems, equipment and techniques had to be attempted/attempted/implemented, to ascertain what would work best.

Rogers' (2003, p170) fourth stage of the innovation-decision process is labelled implementation which suggests it encompasses the hands-on application of the innovation. In discussing the implementation stage in more detail, Rogers introduces the concept of re-invention, during which "the new idea changes and evolves during the diffusion process as it moves from adopter to adopter." (Rogers, 2003, p. 180). Without close study of the South Australia project, it is difficult to say to what degree the CASAtech project, as it was first created, re-invented the ideas that had been applied in South Australia. This application was observed by Carol Moffatt, one of the champions who promoted the idea to the Canterbury Area Schools Association, and she did mention the existence of differences as well as similarities between the two contexts so presumably there was some degree of reinvention there.

Apart from the earlier discussed difference in the funding structure, TOSIttech appears to have applied the innovation in a very similar form to CASAtech so there was little evidence of re-invention as the idea was passed on. However, Rogers explains that the implementation stage may continue over a long period of time. From this perspective, CASAtech as it evolved to Cantatech, as it shifted to a web-based delivery component, and as it made other changes along the way, clearly was involved in a kind of re-invention that ensured the innovation was responding to the needs of the group who adopted it.

This leads into the impacts that the projects had for teachers and learners. There were changes to current practice from the beginning and while some of these changes may have been expected, others had to be faced and accommodated as they arose. As Ellyard said, "The future is not some place we are going to but one we are
creating, the paths to it are not found but made, and the making of those pathways changes both the maker and the destination." (Ellyard, 1992, transcript, not paginated). While some of those original mission directed visionaries may have been aware of the pedagogical changes that this new type of delivery would require, many of the practitioners, the teachers and learners, discovered the shift through practice, realising what worked best and what could provide the core for effective delivery on-line as well as enhance teaching and learning back in their regular classrooms.

As was mentioned in the Introduction, there was some parallel in time between the development of on-line or electronically mediated distance learning practice and the emergence of new theories about learning. The connection between the two is recognised here although not examined in great depth. Atkin for instance recognised that in “extending understanding about the nature of human learning”, we are also “developing educational practices that support and enhance human learning.” (Atkin, 1999, p.1). These practices included the selection of technologies to suit the delivery of distance education courses. (Bates 1995, p.44). The Cantatech/TOSIttech experience as explored in this current study indicates that the learning theory aspect was confronted more through experience (what worked and what did not) than through conscious, informed choice. The hands-on discovery that transmission model learning did not work as well as a more constructivist approach provides relevant examples to the learning theory discussion.

Administrators had to continually problem-solve, addressing issues (often quite pragmatic ones) raised by teachers and students which, unless sorted, threatened to undermine the positive possibilities of the new delivery method. Teachers and students had to come to terms with the changes that this delivery made to the kind of teaching and learning they had been immersed in till now. For some teachers and some students, this was the point at which they decided that the change was not for them and opted out. The attempt at reform in their case, for whatever reasons, failed. However, many who did take on the challenge found that it not only improved learning opportunities but also brought changes to learning and teaching style,
pedagogical shifts, which had positive impacts on their involvement in the regular classroom environment as well. Teachers and students who participated in this study spoke of a positive shift to a more learner-centred, independent approach to study, elsewhere described as constructivism.

According to Lai (1992, p10) this was an expected outcome of the application of information and communication technologies. Lai (1996, p.4) affirmed this view again later when he claimed that computer-networked communities had a student-centred approach to learning. This approach was a feature of many Cantatech/TOSIttech on-line classes according to some participants in this study, especially those who saw their involvement in the projects as a positive one. However, the shift was significantly dependent on the participants' (teachers and students) willingness to change. While taking part in this form of delivery did highlight a need for such a pedagogical shift, it did not necessarily guarantee it. Some teachers and learners expected the education process to operate on-line more or less as it had in their regular classrooms. The outcome for them was usually a sense of dissatisfaction or even failure which often led to the decision to reject audio-graphics and return to what they were comfortable with, a more transmission style of delivery.

The final question of sustainability shifts attention from the internal operations of Cantatech and TOSIttech to the continued existence of the projects as a whole. Fullan identifies Phase III of the change process as: "continuation, incorporation, routinization or institutionalization—refers to whether the change gets built in as an on-going part of the system or disappears by way of a decision to discard or through attrition." (Fullan, 2001, p.50). Asking the key question about sustainability has been an attempt to ascertain whether this Phase III description fits the change experienced through implementing the Cantatech and TOSIttech projects. On the whole, the description is apt.

Rogers identifies this final stage as "confirmation" when "the individual (or other decision-making unit) seeks reinforcement for the innovation-decision already
made, and may reverse this decision if exposed to conflicting messages about the innovation” (Rogers, 2003, p.189). This includes “recognition of the benefits of using the innovation, integration of the innovation into one’s on-going routine, and promotion of the innovation to others.” (Rogers, 2003, p.199). This is relevant in terms of the continuation (or not) of the Cantatech and TOSItech groups, and which aspects of both projects were valued and continued, and even used as a model for other similar change projects.

The fact that this study looks at the two projects allows for some comparison: the former is still in operation, albeit in an evolved form, while the latter, TOSItech, is no longer active. In Fullan's terms, the Cantatech project became incorporated into the culture of the member schools. On the other hand, the TOSItech project disappeared because some schools made the decision to discard it and this created attrition to the point where the project was no longer viable. TOSItech was discontinued while Cantatech has been maintained. The comparison provides some insight into the requirements for sustainability. It contributes to an understanding of how the momentum for change can be continued or lost.

Factors of influence here can include “the teachers' perception that, after a number of years of change, something of the original vision has been lost. The passage of time and events inevitably creates new circumstances. Even when the educational news is good, the trajectory that a change process takes may not suit everyone who originally set out on the journey.” (Adelman & Panton Walking-Eagle, 1997, p.106). For TOSItech, the passage of time and events brought changes in staff and in cost. This meant that even though individual students and teachers may have seen their involvement in TOSItech on-line delivery as successful, the school view of the project may no longer have perceived involvement to be worthwhile. This was particularly in terms of cost, especially compared to receiving such courses via the Correspondence School.
The final key question of sustainability also shifts the focus to spin-off effects that these projects have had on education in a broader sense. Cantatech in particular has provided a model for various other projects and continues to do so. The experience of teachers and learners involved in both projects has also contributed to the body of knowledge about education in areas such as distance learning, development of pedagogy, the use of ICT as a teaching tool, and the operation of inter-school co-operative projects. This should be seen in the context of increasing awareness that “schools must be informed, critical and creative in how they use these media if they are to create worthwhile and workable educational futures rather than pander to educational utopias.” (Bigum & Kenway, 1998, p.393).

The study of both these projects considers challenge and the ability to face it. The challenges faced by those involved in Cantatech and TOSITech were within the cultural, structural and strategic dimensions described in much of the literature relating to change, and they also included the "moral, political and emotional ones" (Hargreaves 1998, p.283) mentioned in the Introduction to this report. The initial challenges to rural secondary school education that drove the birth of the projects were "moral" in the sense of a need to create equity of educational opportunity for rural students in relation to those in urban schools. From there, the challenges faced by those who had the vision had a "political" dimension; in order to turn that vision into reality, they needed to harness political forces that would ensure all the necessary financial and advisory support was available. In addition, the on-going challenges faced by those who wanted the projects to continue to operate required a large degree of "emotional" commitment. This was needed to sustain the momentum and ensure that the changes would be resilient and adaptable in the face of difficulties.

The fact that these were clusters of schools working co-operatively in collaboration rather than independently may have added to their chance of success. As Fullan states, “The combined effect of collaborative cultures serves to mobilise three powerful change forces. Moral purpose (the spiritual) gains ascendancy. Power (politics) is used to maximise pressure and support for positive action. Ideas and best
practices (the intellectual) are continually being generated, tested and selectively retained. In collaborative cultures these three forces feed on each other. They become fused. (Fullan, 1999, p.40). Although not examined closely here, it is possible that the Cantatech schools have had a stronger sense of this power of collaboration. Cantatech has proved more resilient to the latter challenges than TOSIttech, continuing to face issues of funding, staffing and technology, some of which TOSIttech was ultimately unable to surmount.

Cantatech and TOSIttech clearly have a place in each of the literature contexts outlined in the Introduction: distance education, secondary school and innovation. They are examples of distance education that applied the current tools of information communication technology. They provided a more contiguous learning situation than the New Zealand Correspondence School at the time in that they offered more regular contact between teacher and learner. The contact, although not face-to-face, did allow oral communication in a synchronous time frame, backed up by visual aspects of communication provided by shared computer graphics and text.

Cantatech and TOSIttech are part of a small although growing collection of examples of innovative delivery at the secondary school level. In the use of computer technology they share some common ground with projects such as the Virtual High School, although though that project offers a far higher degree of asynchronous delivery than Cantatech/TOSIttech. In this sense they have less potential to be open and flexible, although having only one timetabled class per week they are more flexible than face-to-face delivery. It is possible that, if Cantatech continues to operate, it could include more flexible elements to its delivery. This may be deserving of future study.

Combined, the projects have contributed examples of innovation in practice that are still serving to inspire and inform others who face similar challenges and who are looking for better ways to serve the learning needs of rural students.
Understanding the possibilities offered by audio-graphic on-line delivery is just one signpost toward a possible, and hopefully preferable, future for our education system.

On-line teaching, therefore, is not better than face-to-face teaching nor is it worse. It is only different. Both spaces are unique, each having its own advantages and disadvantages. Additionally, the two teaching environments are not mutually exclusive. They can both be used in the same course at the same time without compromising or denigrating the other. Indeed, they can form a synergistic union that strengthens both. (Glahn & Gen, 2002, p.782).
Appendices

Appendix 1: Letter of Introduction

Dear

Kia ora. My name is Marie Langley and I am studying for a Master of Teaching and Learning from the Christchurch College of Education. While I am the Deputy Principal at Collingwood Area School in Golden Bay, I have been lucky enough to be granted a study award for 2001 which has allowed me to concentrate full time on my degree. As part of this degree, I am undertaking a thesis which will focus on the Cantatech and TOSItech distance learning projects.

The aim is to complete a retrospective case study of these projects. I want to discover what was behind their introduction, how they were set up, administered and operated, and what impact they had on teaching and learning. I may have already been in touch with you in my search for relevant documentation. If so, my thanks again for any help you have given me; if not, but you are aware of some documents which you think may be relevant to this study, I would be happy to hear about them.

I intend to gather data mainly by obtaining information from people who were (or are, in the case of Cantatech) involved in either of these projects. Data collection will include those involved in the original vision / design teams, the administrators of each project, teachers delivering courses on line, and students who have studied via this medium. I would like to invite you to contribute to this study.

If you are willing to be involved, my initial request is that you complete a questionnaire. The questions will be fairly broad and will allow you to express opinions, feelings, perceptions of your experience of distance learning and of being involved in this particular use of ICT in education. The final question asks if you would also be willing to follow up this written response by taking part in an interview. The interview would take place either by phone or face-to-face if that can be arranged, and would allow further discussion of responses recorded in the questionnaire. If you are willing to go ahead with the interview, your written answers on the questionnaire can be less detailed, to serve more as indicators or memory-joggers for the interview. With your permission, I would like to audio record the interview as I need to analyse the data later.
In terms of confidentiality, I can assure you that the information you provide will be used only for the purpose of this research. Further, no names of individuals will be identified in any publication of the data without prior written consent. You may withdraw from the study at any time.

If you have any complaint concerning the manner in which the research is conducted, it may be given directly to me, to my research supervisors (Dr Vince Ham and Elaine Mayo, Christchurch College of Education) or addressed to The Chair, Ethical Clearance Committee, Christchurch College of Education, PO Box 31-065, Christchurch. Ph: (03) 348 2509

If you have any further questions about this project which you would like answered before deciding about your involvement, please let me know. You can write to me at the above address, phone me at 03 3248 396, or my email address is <mmrclangleley@xtra.co.nz>. If you are happy to take part, I appreciate it very much. Please complete the accompanying consent slip and return it to me. A stamped return envelope is enclosed. The next step will be to post you a copy of the questionnaire.

Yours sincerely

Marie Langley

CONSENT FORM

‘The Cantatech & TOS1tech Distance Learning Projects - A Retrospective Case Study’

- I have read and understood the description of the above-named study. On this basis, I agree to provide information to be used in this study.
- I accept that an audio tape recorder will be used to record the interview if I choose to take part in this aspect of data gathering.
- I understand that I may at any time withdraw from the project, including withdrawal of any information I have provided.

Signed ______________________________ Date ____________

If you are willing to take part, please confirm address to which your copy of the questionnaire should be posted, and your phone number if you are happy to be interviewed.

Name:
Address:
Phone:
email:
Appendix 2:

'The Cantatech & TOSItech Distance Learning Projects:
A Retrospective Case Study'

Questionnaire

Thank you in advance for taking the time to complete this questionnaire. The overall purpose, as you may remember from the earlier letter, is to provide information about the Cantatech and TOSItech distance learning projects. The data will be used for a thesis for my Master of Teaching and Learning. Your willingness to contribute is hugely appreciated.

I would like to emphasise again that your contribution will remain anonymous and your name will not be used in the published report without prior written permission.

The amount you write on this questionnaire can be governed by whether you will be interviewed later. If you are happy to be interviewed, you may prefer to simply jot down a few points which can be discussed in more depth during the interview. The questions can be regarded as triggers or starting points for the later discussion. However, if you prefer to write answers in full and wish to write more for some answers than the space allows, please feel free to use extra paper e.g. the back of the form. Simply indicate which question you are referring to on the extra sheet.

Once you have completed the questionnaire, I would appreciate it if you could return the forms to me as soon as possible in the enclosed envelope. Feel free to contact me by email, phone or letter if you need further clarification of any of the questions. If you have indicated that you are also willing to take part in the follow-up interview, I will contact you again in the near future. You may wish to retain a copy of your completed questionnaire, particularly if an interview is to follow.

Thanks once again.

Marie Langley
<mmrc.langley@xtra.co.nz> Phone: 03 5248 396

1. Name:

2. Please indicate by circling which project you have been involved with:

   Cantatech           TOSItech
3. Please indicate by circling which of the following roles you played during your involvement with the project:

   Design Team       Administrator       On-line teacher
   On-line student   Other (specify):

4. For what period of time were you involved with the project (give approximate dates):

   From: To:

5. Describe why and how you became involved with the project:

6. Describe what you knew about audio-graphic distance learning prior to involvement in the project and explain where the information had come from.
7. In what way(s) was involvement in this project different to your previous experiences in teaching or learning?

8. What particular skills did you find were needed for audio graphic distance learning?

9. Did you already have these skills or did they have to be developed?

10. Based on your experience, describe any benefits you think audio graphic delivery can offer for teaching and learning.

11. Again in terms of your experience, were there any specific difficulties to be overcome in order to effectively teach or learn this way?
12. Please add any further comments you may have relating to:
   a. Your involvement in distance learning
   
   b. Your involvement in this study

13. Are you willing to take part in a follow-up interview? Circle your choice. (Please be aware that the interview will be audiotaped for later analysis of responses.)

   Yes     (Please provide phone number and email if not already provided or if different to that in consent letter.)

   No

14. I would like to receive a copy of the finished study.
   Yes / No (delete one)

THANK YOU ONCE AGAIN FOR COMPLETING THIS QUESTIONNAIRE.
Appendix 3:

**Definition of Terms**

_**Area Schools:**_ schools whose student roll extends from Year 1 to Year 13 incorporating primary (Years 1-6), intermediate (Years 7 & 8) and secondary (Years 9-13) schooling. Often situated in remote rural areas, although some schools which fall into this classification in New Zealand (e.g. the Rudolf Steiner schools) are located in cities.

Conferencing: in this context (see definitions for distance learning, ICT, Polycom & Telecommunications bridges), conferencing means linking up with a group of others, all at various locations, for the purpose of teaching and learning. This could be described as a ‘virtual’ conference as, despite being physically distant from one another, participants are able to share ideas and discussion in an immediate, as opposed to delayed, time context.

_**Distance learning:**_ “the separation of teacher and learner and of the learner from the learning group, with the interpersonal face-to-face communication of conventional education being replaced by an apersonal mode of communication mediated by technology” (Keegan, 1996)

_**ICT:**_ Information Communications Technology. Means of conveying information at speed and across distance, usually applied to computers, email and the Internet, but can include other ways of using phone and satellite communication such as fax, conference phone links, TV or video transmission.

_**Polycom:**_ specially designed telephone with an external speaker and microphone so that it can be used by a group of people together. The microphone picks up what any member of the group, seated within range, is saying, and the speaker makes messages from the other end audible to all in the group. Polycom has volume control as well as a mute button that can cut out the transmission of ‘asides’ (comments within the group) or background noise.

_**Synchronous/ asynchronous delivery:**_ synchronous means that events or links are occurring at the same time in real time so that feedback and comment can be immediate, for instance during an on-line conference; asynchronous means that participants are not reliant on making connections at exactly the same time as everyone else in their group, such as in choosing own time for logging on to a web site or email; information posted will still be available even if it is not accessed at the same time as it is posted.

_**Telecommunication bridges:**_ link participants (teachers & students) at a number of remote sites into a ‘conference’ so that information can be shared on a restricted network. Each participant logs on using a modem, specified call number and password. Separate phone lines and bridges are used for voice/audio conferencing and graphics/computer conferencing; both can operate simultaneously but are not directly linked.
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