Communications Technology in Higher Education in Alberta: Current Status and Policy Perspectives

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Abstract: The infusion of communications technologiesthroughout an existing educational system is made complex by a variety of conditions including the costs and complexities of electronic and computer devices. Perhaps more importantly, such a process requires the organization, coordination and often, the cooperation of people from various sectors of society.

This paper describes some of the specific activities, mechanisms, processes and outcomes of attempts made in Alberta to deal with technologically based communications for instruction in the post-secondary educational system. The mechanisms and processes outlined are intended to facilitate the application of electronic technologies for instruction and are viewed as necessary but not sufficient conditions to achieve that end. A number of unanswered questions are identified and additional solutions are sought.

INTRODUCTION

Current economic and political contexts in conjunction with continuing technological change and the realities of population demographics are all exerting pressures on post-secondary institutions to change the ways in which they provide educational services. The autonomous, monolithic institutions of the 1980's providing multi-faceted services will likely give way in the 1990's to collaborative ventures and decentralized services. To help achieve this end, greater use could be made of communications technologies.

This paper describes some of the uses of communications technologies in developing collaborative ventures and providing for decentralized instructional services in Alberta. Some of the barriers to these developments and strategies for overcoming them are described. Finally, the paper concludes by identifying a number of issues that remain to be addressed as the use of computer communications technologies accelerates.

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CURRENT USES OF THE NEW INFORMATION TECHNOLOGIES FOR INSTRUCTION IN ALBERTA

Communications technologies for instructional purposes are used in two primary ways in Alberta: for delivery of distance education courses; and, for the individualization of instruction on campus.

Distance Education

Almost 700 credit and non-credit courses are offered by our post-secondary institutions using a variety of distance education methods during the 1986-87 academic year. These courses are described in a catalog entitled *Distance Education Courses in Alberta,* which is compiled each year by Alberta Advanced Education. This catalog provides the following information for each course: the name of the originating institution; the name of each course: the credit value assigned; the primary instruction medium or vehicle used for delivery: the type of tutorial support provided, and the grading method used.

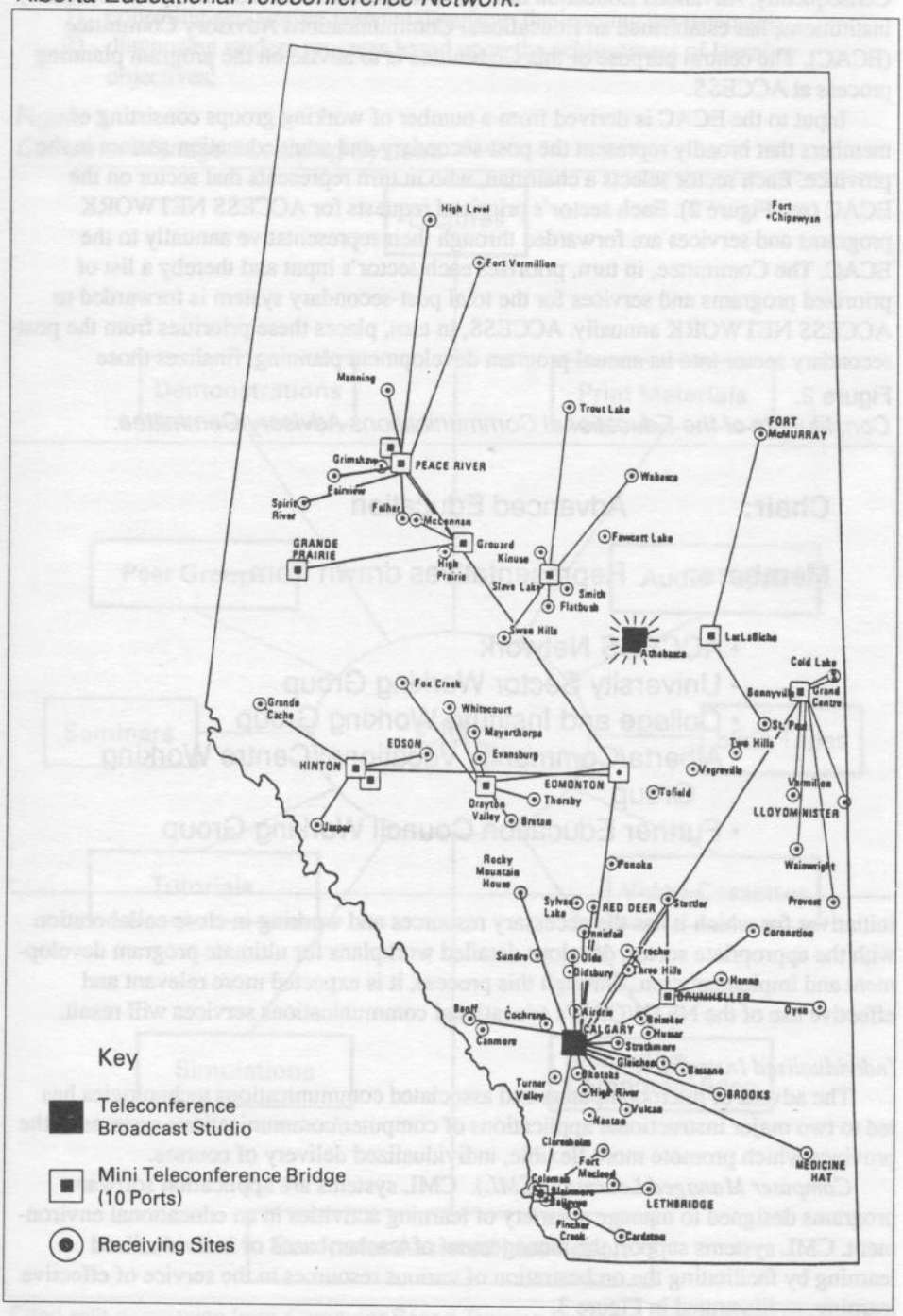
To date, print is the most common medium reported for the provision of distance education courses. However, electronic communications technologies are increasingly being cited as an element in the delivery systems. The telephone, either for tutorial support or for use in audio-teleconferencing, is the most widely used non-print communications technology.

A variety of audio-teleconference networks using existing government and public telephone services has emerged over a number of years. Figure 1 (see next page) displays the geographic dispersal of broadcast studios, bridges and receiving sites. These networks currently provide both credit and non-credit courses using audio-teleconferencing as the primary instructional vehicle. Additional courses are being offered using teleconferencing in conjunction with some other distance education delivery method. Expansion of the audio-teleconference networks is being planned for the 1987/88 academic year. While minor technical problems have occurred, the need for coordination of activities has been more significant. As a result, the users themselves have established the Alberta Educational Teleconference Council. This Council, along with a variety of planning, evaluation and steering committees, is addressing issues pertaining to course planning and scheduling. The Council also serves as a forum to facilitate discussion and resolution of technical and operational matters related to the expansion of these networks. The Council has established a teleconference network coordination planning group to prepare a three to five year strategic plan that is designed to coordinate all teleconference networks and services that they provide.

In addition to the teleconference-based distance education courses, a small number of video broadcast telecourses are being developed and delivered. However, 72 courses use either video broadcast or video cassettes along with other media in support of delivery. If courses require broadcasting, they are delivered on behalf of sponsoring post-secondary institutions using the Alberta ACCESS NETWORK satellite service. Additional learning resources for the courses are provided in part by ACCESS NETWORK.

In general, the services of ACCESS NETWORK, particularly in relation to its

Figure 1.
Alberta Educational Teleconference Network.



broadcast capability, have not been adequately used by the post-secondary system. Consequently, Advanced Education in collaboration with ACCESS and post-secondary institutions, has established an Educational Communications Advisory Committee (ECAC). The central purpose of this Committee is to advise on the program planning process at ACCESS.

Input to the ECAC is derived from a number of working groups consisting of members that broadly represent the post-secondary and adult education sectors in the province. Each sector selects a chairman, who in turn represents that sector on the ECAC (see Figure 2). Each sector's priorized requests for ACCESS NETWORK programs and services are forwarded through their representative annually to the ECAC. The Committee, in turn, priorizes each sector's input and thereby a list of priorized programs and services for the total post-secondary system is forwarded to ACCESS NETWORK annually. ACCESS, in turn, places these priorities from the post-secondary sector into its annual program development planning, finalizes those

Figure 2.
Constituents of the Educational Communications Advisory Committee.

Chair: Advanced Education

Members: Representatives drawn from —

ACCESS Network
University Sector Working Group
College and Institute Working Group
Alberta/Community Vocational Centre Working Group
Further Education Council Working Group

initiatives for which it has the necessary resources and working in close collaboration with the appropriate sector, develops detailed workplans for ultimate program development and implementation. Through this process, it is expected more relevant and effective use of the NETWORK's educational communications services will result.

Individualized Instruction

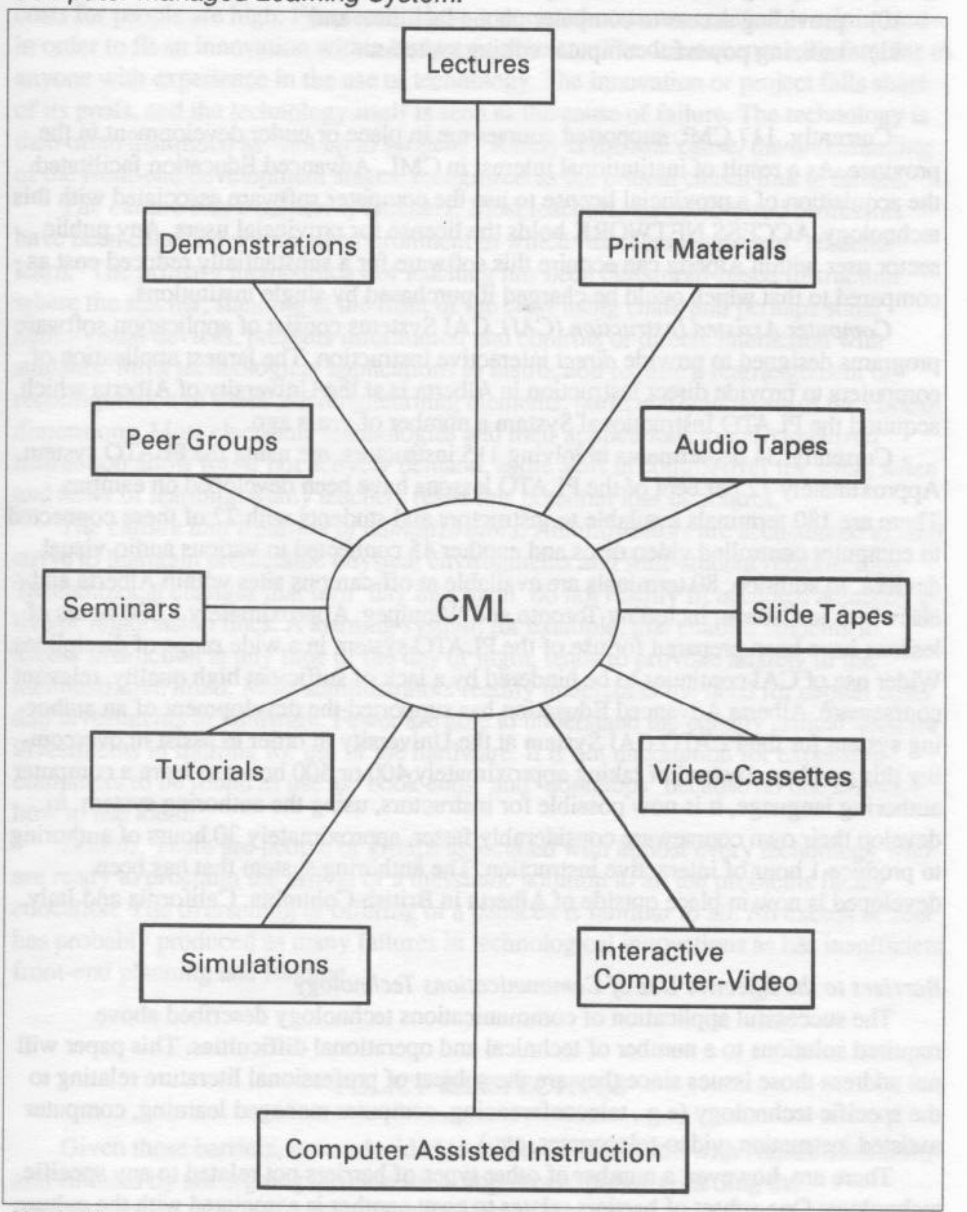
The advent of microcomputers and associated communications technologies has led to two major instructional applications of computer/communications systems in the province which promote more flexible, individualized delivery of courses.

Computer Managed Learning (CML). CML systems are application software programs designed to manage a variety of learning activities in an educational environment. CML systems support the management of teacher-based or individualized learning by facilitating the orchestration of various resources in the service of effective learning, as illustrated in Figure 3.

Most CML systems facilitate some or all of the following:

1) collecting and storing relevant data from the learning environment;
2) diagnosing student progress based upon the achievement of learning objectives;

Figure 3.
Computer Managed Learning System.



Cited with permission from *Computer Based Training Systems*, Calgary, Alberta.

3) providing practice by allowing students access to self-tests;
4) prescribing remedial learning activities when warranted;
5) maintaining secure instructor-prescribed tests:
6) displaying student and class progress records on demand;
7) providing student help on request;
8) permitting testbanking when necessary;
9) analyzing test items when specified;
10) providing access to computer phone facilities; and
11) utilizing powerful computer editing systems.

Currently, 117 CML supported courses are in place or under development in the province. As a result of institutional interest in CML, Advanced Education facilitated the acquisition of a provincial license to use the computer software associated with this technology. ACCESS NETWORK holds the license for provincial users. Any public sector user within Alberta can acquire this software for a substantially reduced cost as compared to that which could be charged if purchased by single institutions.

Computer Assisted Instruction (CAI). CAI Systems consist of application software programs designed to provide *direct* interactive instruction. The largest application of computers to provide direct instruction in Alberta is at the University of Alberta which acquired the PLATO Instructional System a number of years ago.

Currently, 54 departments involving 115 instructors, are using the PLATO system. Approximately 72 per cent of the PLATO lessons have been developed on campus. There are 180 terminals available to instructors and students with 22 of these connected to computer controlled video discs and another 45 connected to various audio-visual devices. In addition, 80 terminals are available at off-campus sites within Alberta and elsewhere in Canada, including Toronto and Winnipeg. Approximately 2,000 hours of lessons have been prepared for use of the PLATO system in a wide range of disciplines. Wider use of CAI continues to be hindered by a lack of sufficient high quality, relevant courseware. Alberta Advanced Education has supported the development of an authoring system for the PLATO CAI System at the University in order to assist in overcoming this problem. Instead of taking approximately 400 or 500 hours to learn a computer authoring language, it is now possible for instructors, using the authoring system, to develop their own courseware considerably faster, approximately 30 hours of authoring to produce 1 hour of interactive instruction. The authoring system that has been developed is now in place outside of Alberta in British Columbia, California and Italy.

Barriers to the Effective Use of Communications Technology

The successful application of communications technology described above required solutions to a number of technical and operational difficulties. This paper will not address those issues since they are the subject of professional literature relating to the specific technology (e.g., teleconferencing, computer managed learning, computer assisted instruction, video-telecourses, etc.).

There are, however, a number of other types of barriers not related to any specific technology. One subset of barriers relates to cost; another is associated with the culture

and traditions of educators; and a final barrier pertains to the beliefs of the proponents of technology.

Costs. Any educational change with substantial cost consequences can be expected to provoke resistance from a variety of sources. This is particularly difficult with the new information technologies since, while hardware costs are dropping, the investment is still substantial on a system-wide basis. More importantly, costs associated with planning, design, analysis and development of learning material and training costs for people are high. Frequently, these associated costs are reduced or minimized in order to fit an innovation within budget parameters. The consequences are familiar to anyone with experience in the use of technology. The innovation or project falls short of its goals, and the technology itself is seen as the cause of failure. The technology is then often dismissed as "not up to scratch." Rarely is the real cause, the underfunding of the front-end development stages, recognized as the critical causal link to failure.

The culture and tradition of teachers. Most teachers, instructors and professors have been educated within an environment in which 'teachers teach' and 'students learn. The primary methodology of teaching has been classroom-based instruction where the teacher, standing at the front of the class using chalk and perhaps some audio-visual devices, presents information and controls or directs interaction with students. Most technological applications to instruction require a rearrangement or reconfiguration of these teaching/learning elements, particularly in terms of the control dimensions. Most electronic technologies and their applications to individualized instruction allow for, if not actively demand, some shift in control over the *what, when* and *hows* of learning. Many teachers resist this potential loss of control.

The culture and tradition of administrators. Administrators are accustomed to, and strive to maintain predictable physical environments and staff-student relationships. Technological changes that turn 'day into night' do not readily fit accepted administrative or relationship lines. A learning system, for example, that enables students to access instruction at any time of the day or night, tends to provoke anxiety in the administrative mind. Most administrators readily understand the need for capital costs and investments in hardware. Fewer are able to understand the equally critical need for investments in training for use of the hardware. It is not uncommon for expensive computers to be found in use as 'book ends' and 'doorstops' because no one knows how to use them.

Zealots. There are people or groups associated with almost every technology who are ready to proclaim the arrival of a messianic solution to all the problems facing education. The overselling or offering of a panacea is familiar to all. An excess of zeal has probably produced as many failures in technological innovations as has insufficient front-end planning and funding.

POLICY PERSPECTIVES

Given these barriers, it was decided to avoid confrontation with resistant attitudes and cultures by not arguing the case for a 'top-down' policy regarding the implementation of new information technologies into higher education. Rather it was

decided to support initiatives that come from institutions on a project by project basis. Proposals are encouraged which, in addition to including the usual operational details, also include four other elements.

First, at least one senior administrator of the proposing institution is strongly encouraged to be involved throughout a project so that the participating institution is committed to continuing any successful innovation from its own resources. Second, initiatives are encouraged which involve more than one institution and, where possible, the private sector. Third, sufficient direct funding is required, along with necessary indirect support from all stakeholders in the early stages of a project — the analysis, planning, design and development components. Finally, government fiscal involvement diminishes as the institutions demonstrate successful implementation and move to continuation under their own control, as illustrated in Figure 4 (see *next page*). This strategy of infusing technology-supported innovation has emerged in Alberta over a number of years and will be described in more detail in what follows.

A PROCESS APPROACH TO THE ADOPTION OF TECHNOLOGY

The approach adopted by some of the staff of Advanced Education, briefly described above, could be referred to as a 'process' approach as contrasted to a 'product' centered approach when implementing an innovation. The product centered approach, more commonly associated with the introduction of new products form the manufacturing sector, typically is described as consisting of four stages: research, development, diffusion and adoption (RDDA) and assumes that resistance to new products or innovations is initially high and falls off in a linear fashion until the product is ultimately adopted. Innovation in the social/education sector however, does not appear to follow the RDDA model. Rather, the course of acceptance of innovation appears to be a non-linear relationship in which resistance may wax and wane throughout the time span of any innovative initiative. This comparison is shown in Figure 5.

Three strategies have been found to be particularly useful in introducing educational innovations using a process model in Alberta. First, care has been taken to ensure that all staff and administrators who will be affected by an innovation are *co-opted* into the process at the outset. Often, a project is initiated by one or two staff members and little communication occurs among colleagues and/or administrators. If this continues, at a later stage the non-involved parties tend to see the innovation as a potential threat or impediment. The activity can be construed as someone's 'pet project' or viewed as irrelevant to them and to the institution. Consequently, a concerted effort is made at the outset to bring more staff members into the activity, to make the innovation *ownership* more broadly based and to gain commitment from administrators to provide continued support from institutional funds when the project has successfully terminated and thereby facilitate the adoption of the innovation on an on-going basis.

Second, provision of expert support is important, not only in the early planning stages, but also throughout the project cycle, especially during those periods of frustration and anxiety that characterize the *process* model of innovation. As shown in Figure the adoption of innovation in social/educational contexts is not accurately

portrayed by a linear model. The process is rather more *bumpy* and is characterized by frequent points of resistance over the course of initiation through to project completion and ultimate adoption. Innovations in which expertise has been available at the front-end only may become *derailed* and collapse if expert support cannot be brought in to assist the project team through crisis periods.

Finally, a third strategy that facilitates adoption and diffusion can be likened to the reproduction of strawberry plants through runners. Staff from a successful innovation site are available to new receptive sites but maintain their link to the original site, like strawberry plants with the 'adventitious stems.' The staff member developing the new

Figure 4.
Relative Involvement/Support of Government and Institutions.

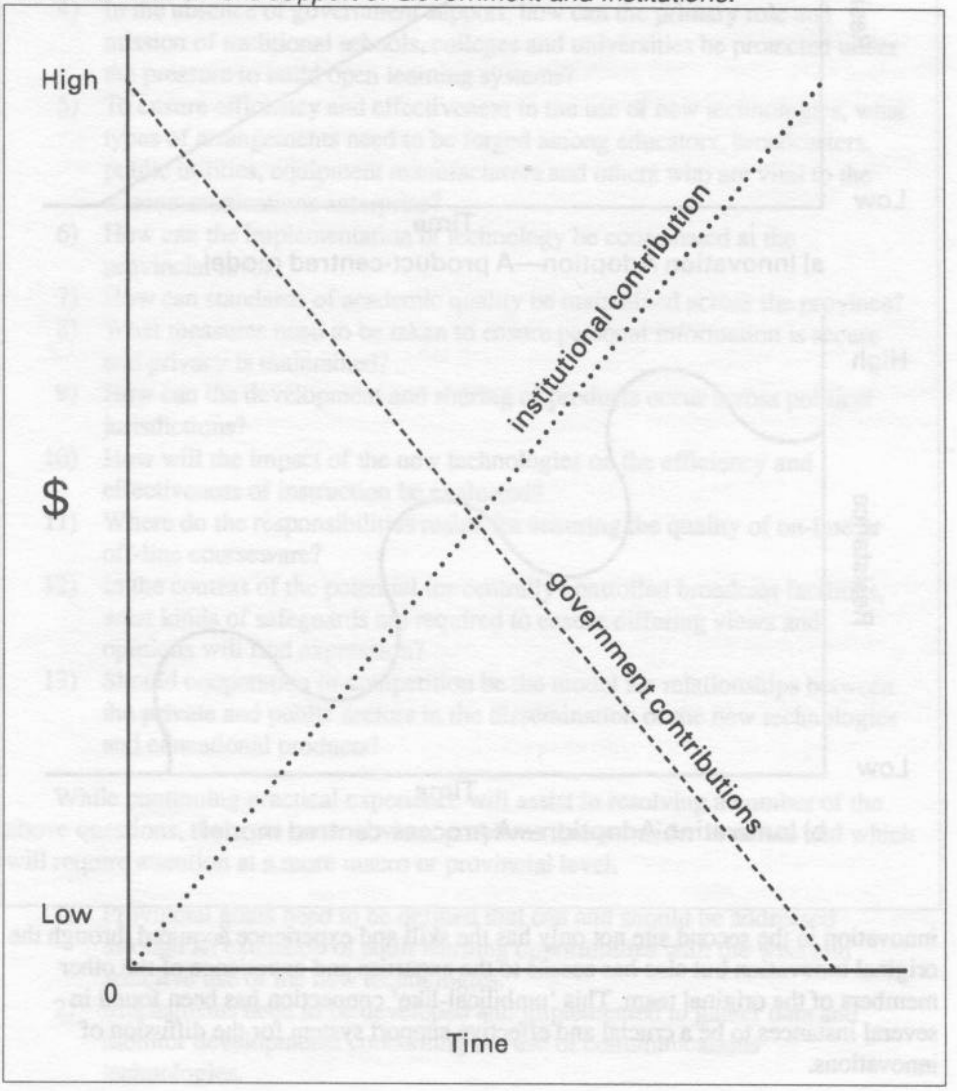
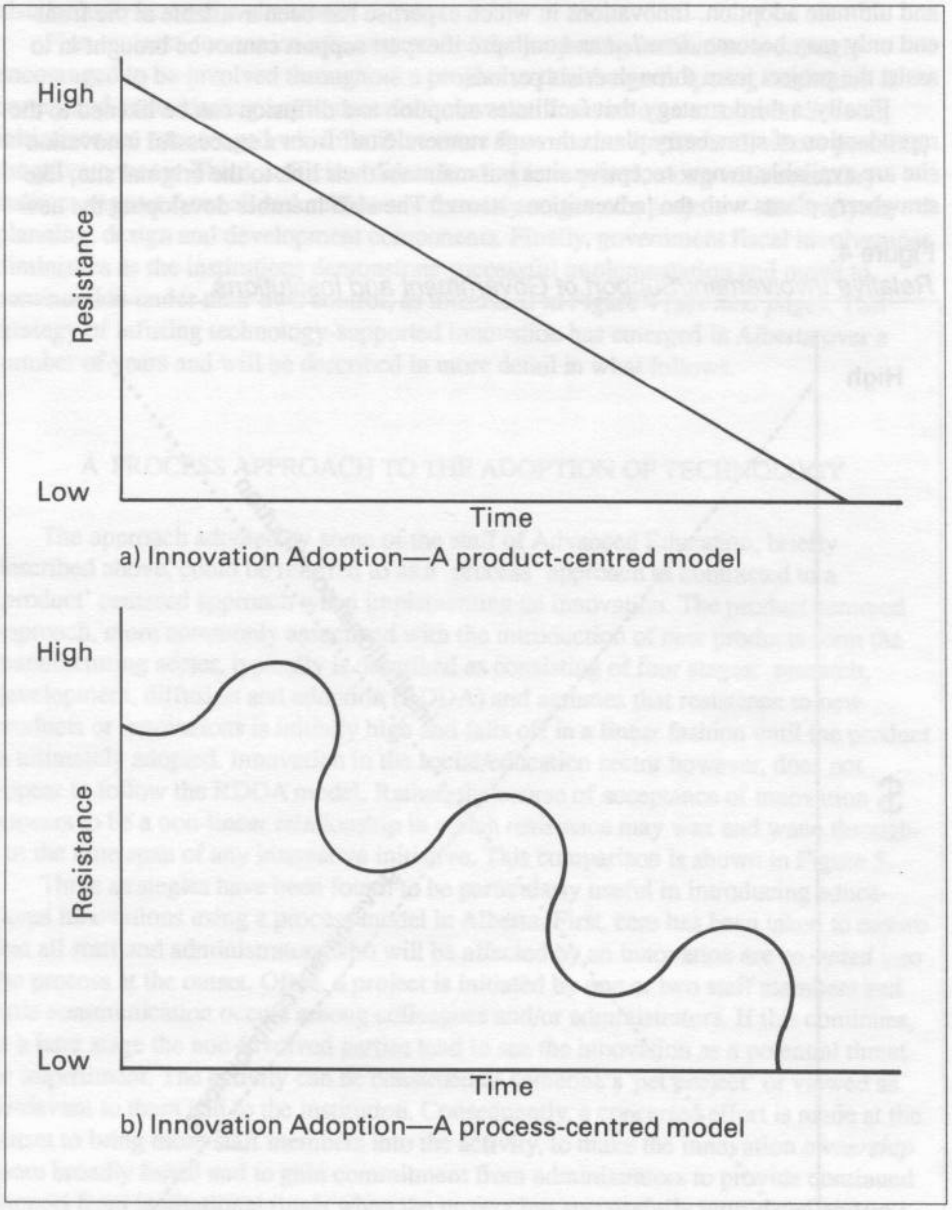


Figure 5.
Two Models of Innovation Adoption.



innovation in the second site not only has the skill and experience acquired through the original innovation but also has access to the expertise and experience of the other members of the original team. This 'umbilical-like' connection has been found in several instances to be a crucial and effective support system for the diffusion of innovations.

UNRESOLVED ISSUES

Through the use of communications technologies, Alberta educators are now going beyond their classrooms. As this process accelerates, the concerns described in the literature become real and demand attention. The following are a sample of the current issues which seem to be receiving priority treatment.

1) How should post-secondary accrediting agencies respond to the realities of inter-provincial distribution of courses?
2) How will the new technologies affect provincial funding formulae?
3) How will distant learners finance their studies?
4) In the absence of government support, how can the primary role and mission of traditional schools, colleges and universities be protected under the pressure to build open learning systems?
5) To ensure efficiency and effectiveness in the use of new technologies, what types of arrangements need to be forged among educators, broadcasters, public utilities, equipment manufacturers and others who are vital to the telecommunications enterprise?
6) How can the implementation of technology be coordinated at the provincial level?
7) How can standards of academic quality be maintained across the province?
8) What measures need to be taken to ensure personal information is secure and privacy is maintained?
9) How can the development and sharing of products occur across political jurisdictions?
10) How will the impact of the new technologies on the efficiency and effectiveness of instruction be evaluated?
11) Where do the responsibilities reside for ensuring the quality of on-line or off-line courseware?
12) In the context of the potential for centrally controlled broadcast facilities, what kinds of safeguards are required to ensure differing views and opinions will find expression?
13) Should cooperation or competition be the model for relationships between the private and public sectors in the dissemination of the new technologies and educational products?

While continuing practical experience will assist in resolving a number of the above questions, there are some obvious problems that are wider in nature and which will require attention at a more macro or provincial level.

1) hovincial goals need to be defined that can and should be addressed through an extension of adult learning opportunities with the wise and selective use of the new technologies.
2) Mechanisms need to be developed and implemented to gather data and monitor developments concerning the use of communications technologies.

3) Mechanisms need to be available for *buffering* and problem resolution in order to deal with conflict among and between institutions and agencies (e.g., telephone companies and post-secondary institutions).
4) Coordination of the delivery of training and educational services will likely be required among institutions in the public sector and between the public and private sectors.
5) Continuing information dissemination will likely be important in order to build and maintain public support for innovations, many of which affect the basic nature of education itself.
6) Because many of the new technologies substantially change both the cost structures and educational consequences, it is critical that continuing evaluation activities be in place to ensure neither feature is allowed to deteriorate.
7) Plans for effective resource utilization will probably be required at a variety of levels, for example, at the institutional, provincial, regional and national levels.
8) The complexities inherent in hardware acquisition and software development and implementation on a scale that 'will make a difference' will probably require some coordination at the provincial level.

The first of the above actions, provincial goal setting, is particularly important. It is possible to achieve greater economy in the use of these technologies by encouraging greater use of instructional approaches which are effective in terms of both cost and learning outcomes, in addition to careful selection of the instructional priorities required for public support.

CONCLUSION

If publicly supported higher education is to remain a key player in the emerging 'life-long learning society' then it is important that policy makers and educational leaders fully understand how the resources of advanced communications technologies can be most wisely used. The temptation to either adopt the most glamorous forms of these technologies, or not to adopt them at all, must be resisted.