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ABSTRACT

In December 1990, in an effort to identify the telecommunications and electronic technologies that will be used in the 1990s for distance learning programs at postsecondary institutions, questionnaires were sent to the chief executive officers of all two-year institutions nationwide, and to a random sample of 750 four-year baccalaureat institutions. The study examined the degrees offered by these institutions via distance learning, and the availability of recorded materials, particularly telecourses. Usable surveys were returned by 368 two-year colleges for a 33% response rate, and by 184 four-year institutions for a 25% response rate. Telephone follow-up calls produced an additional 103 responding two-year institutions and allowed for a weighting of two-year college responses to account for the additional non-responding institutions. Study highlights included the following: (1) broadcast television was the single most important delivery method among two- and four-year colleges, though videotapes, either used in the library or available for check-out, were also used by more than 40% of the responding institutions; (2) both two- and four-year institutions will double the average number of telecommunications technologies used for live instruction between 1991 and 1994; (3) institutions starting distance learning programs after 1991 will be less likely to use public television stations; and (4) 11% of two-year colleges and 40% of four-year institutions stated that off-campus instruction was not part of their mission. Data tables and the survey instrument are included. (PAA)

U. S. Postsecondary Distance Learning Programs in the 1990s
A Decade of Growth

Ron Brey

Assisted by Cynthia Elliott

U.S. POSTSECONDARY DISTANCE LEARNING PROGRAMS IN THE 1990S

A DECADE OF GROWTH

A Research Project of the

Instructional Telecommunications Consortium/

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PART 1

Introduction

Offering college credit instruction to distant learners via electronic media and telecommunications systems is now a common activity of U.S. colleges and universities. Distance learning has evolved from "talking head" lectures on black and white television, with limited enrollments and markets, to the wide variety of telecommunications technologies in existence today. Over twenty years ago, only a few thousand students participated in distance learning activities using telecommunications; now, hundreds of thousands of students enroll annually in distance learning programs. Similarly, the technologies used in telecommunications have expanded from broadcast television and telephone systems to encompass many new telecommunications technologies, including satellites, cable television, audiographics and compressed video.

Electronic technologies, particularly for the home market, are also playing a key role in distance learning programs. These technologies, such as video cassette players and recorders, personal computers and their software and electronic mail networks, videodiscs and CD-ROM, did not exist twenty years ago. The term "technology" will be used throughout this report to refer to the telecommunications systems and electronic equipment described above.

Distance learning via telecommunications often has been controversial. In the 1960s and 1970s, the overriding concern was whether televised instruction was effective. The numerous studies that addressed this question concluded consistently that such instruction could be effective. As newer technologies were adapted for distance learning, they in turn had to address this concern, and very often other concerns as well. However, by the end of the 1980s, it was generally accepted that television and other technologies could be used effectively in distance learning. Since then, research has taken a more positive turn, and now addresses other issues, such as how to increase the effectiveness of telecommunications technologies and how to adapt these technologies to meet the range of student learning needs and styles.

Although the initial controversy surrounding distance learning via telecommunications has faded, it has been replaced by many other concerns that challenge the basic structure and nature of postsecondary education in the U.S. For example, telecommunications technologies are introducing previously unknown forms of local, state and national competition among postsecondary institutions.

Upper level institutions tend to compete for students and resources in limited ways and for well defined groups of potential students. Ivy League universities compete for

the top high school graduates nationally and state universities for the best students from their state, while teachers colleges draw on smaller areas. Community colleges and technical institutes are usually non-residential institutions; students come from their local communities and live within commuting distance.[1] Two year institutions in rural areas are more likely to have student residence halls and larger geographical service areas, but they also face little competition from other two year institutions. Community colleges face competition from proprietary vocational/technical schools and some upper level institutions.

One of the most important consequences of distance learning via telecommunications during the 1990s will be the accelerated removal of the traditional barriers to competition among postsecondary institutions for students and institutional resources. Most states are confronted with conflicts between institutions that want to limit this new competition, and hence prevent the growth of distance learning programs, and those institutions that want the removal of all barriers. This is particularly a problem at the interstate and national levels, where the power of state agencies to regulate the delivery of instruction via telecommunications into their states may not exist, and will undoubtedly lead to calls for intervention by the federal government and regional accrediting associations. Although attempts have been made to develop voluntary guidelines, little has been achieved to date.

The direction that distance learning in the U.S. will take over the next decade is already visible. The data and analyses in this report will make that direction clearer. The hundreds of local telecommunications networks and distance learning programs that already exist will grow to the extent that most people in the United States will be served by at least one such program, and many people will be served by a number of distance learning programs. The majority of local networks will probably be managed by two year institutions. The emerging statewide networks will be managed by upper level institutions, and will offer baccalaureate and graduate degrees. Interstate and national networks will offer everything from certification programs to doctoral degrees in many fields of study. Some programs will be highly specialized, and therefore not available locally, while others will lead to undergraduate and graduate degrees.

The issues raised by the opportunity for American citizens in most parts of the U.S. to earn degrees via distance learning programs from dozens of institutions located throughout the country are not part of this report. These issues will be left to others to address. The dramatically increasing access to postsecondary education in the 1990s will have to be balanced with the issues of assuring quality instruction and affordable access to distance learning opportunities.

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[1]"Two year institutions" and "community colleges" will be used interchangeably throughout this report. Both terms include all public and private community and junior colleges as well as technical institutes offering associate degrees. "University" and "upper level institution" are also used interchangeably.

This research report examines the telecommunications and electronic technologies that postsecondary institutions will use for their distance learning programs during the 1990s. It will also look at the degrees that these institutions will offer via distance learning programs. Additionally, related issues such as the availability of recorded materials - particularly telecourses - and the impact of newer electronic equipment designed for the consumer market will be discussed.

The research project was initiated by The Instructional Telecommunications Consortium/AACJC in cooperation with six funding organizations in order to provide guidance to institutions with distance learning programs in the 1990s. The data are also intended to assist the funding organizations in their efforts to provide instructional resources that colleges and universities can acquire for their programs.

PART 2

Presentation of the Data

A research questionnaire was sent to the chief executive officers of all two year institutions in the U.S. and a random sample of 750 upper level institutions that offer at least a baccalaureate degree over a two week period in December 1990. (Religious institutions that offer only degrees in religion were excluded). See Appendix A for a copy of the questionnaire. A total of 368 two year institutions returned the questionnaire, a return rate of one-third. Approximately one-fourth of upper level institutions, for a total of 184, responded to the questionnaire.

It was hypothesized that data from non-responding institutions would be somewhat different from the data for institutions responding by mail. Non-responders would be less likely to have or plan to have a distance learning program. The president or chancellor of an institution with a distance learning program would be more likely to respond because there would be an identifiable person to complete the questionnaire, and that person would understand the benefits of doing so. An institution without a distance learning program would lack an easily identifiable person to complete the questionnaire, and also see less reason to participate in the project.

Although not part of the initial research design and funding, a process to test the hypothesis that non-responders would be less likely to have a distance learning program was developed by obtaining data from additional community colleges. Repeated telephone contacts were made to institutions chosen at random until a response to the questionnaire was obtained. Responses were obtained from 103 additional community colleges. Ten other randomly chosen institutions did not respond. Due to financial limitations, a similar follow-up of upper level institutions was not made.

Table 2.1 shows the percentage of institutions that have a distance learning program via telecommunications, are planning to start one within three years, or do not and are not planning to have one. The data was drawn from the initial and follow-up respondents.

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Table 2.1

Distance Learning Programs Via Telecommunications
at Two Year Institutions: Initial Compared to Follow-Up Responders

	Initial Responders	Follow-Up Institutions
Having a Distance Learning Program	61%	57%
Planning a Distance Learning Program	22	18
No Distance Learning Now or Planned	17	24

Data Analysis

This document is not a highly refined research report with statistical analysis. The research project was conceived to obtain descriptive data of the current and planned uses of telecommunications systems for distance learning programs at postsecondary institutions. Therefore, the report will not contain any statistical analysis. A report that contains such statistical analysis, particularly between the initial and follow-up respondents, will be available in 1992. Information on how to obtain a copy of the statistical report may be obtained by contacting the Instructional Telecommunications Consortium.

The database used as the basis of discussion for two year institutions in this report is a combination of the data from initial responders and data from the follow-up group; the data have been adjusted to represent all non-responders. It was assumed that the follow-up group was representative of all non-responders. The goal was to form a representative sample of all community colleges. Table 2.2 compares the responses for question G for initial responders, follow-up institutions and the weighted database. The questionnaire is contained in Appendix A. The responses in the weighted data are closer to the follow-up data because it is given approximately twice the weight in the database as the initial responders. Unless stated otherwise, the combined weighted database will be used in presenting data for community colleges.

Table 2.2

Distance Learning Programs Via Telecommunications
at Two Year Institutions:
Initial Responders Compared to Non-Responders

	Initial Responders	Follow-Up Institutions	Weighted Database
Have a Distance Learning Program	61%	57%	58%
Planning a Distance Learning Program	22	18	20
No Distance Learning Now or Planned	17	24	22

Reporting the Findings

The structure of this report follows the order of the questionnaire. Whenever appropriate, community college and university data are compared. However, it is important to remember that the data for community colleges have been adjusted for institutions not responding to the initial mailing, whereas the data for universities are only from those responding by mail.

PART 3

Technologies for Recorded Materials:
Institutions with Distance Learning Programs

Two decades ago, few postsecondary institutions had distance learning programs via electronic technologies or telecommunications systems. By 1980 changes were occurring that would result in a rapid increase in the number of such programs. The PBS Adult Learning Service had just launched its telecourse activities. This made it possible for many more institutions to offer recorded telecourses by showing programs on local Public Television Stations (PTV). The programs could either be received by PTV stations from a satellite and broadcast simultaneously, or played on a tape-delayed basis.

During the 1980s, the nation was being wired for cable television. Many cable systems provided educational access channels to colleges and universities, often as part of a franchise agreement. And video cassette recorders were becoming a household consumer item.

Well established, full motion television technologies, in particular Instructional Television Fixed Service (ITFS) and point-to-point microwave, were gaining in popularity. Each year additional systems were constructed with local funds and/or federal grants.

Al: of the technologies discussed above were well established by 1990, while other technologies, such as compressed video, satellites and CD-ROM, were just emerging. The data in this report will determine the current status of these technologies and project their utilization by 1994.

Recorded Instructional Materials, Non-Live Instruction

Data from institutions with distance learning programs that use recorded instructional materials and are accessed by students via electronic media were obtained from part H of the questionnaire. (Print only courses were not included.) The materials for these electronic media can be accessed by students either by telecommunications systems, such as broadcast and cable television, or via electronically stored media, such as video tape and videodiscs.

Broadcast Television

During the 1980s broadcast television was the single most important delivery system. It is still important today. It allows students to view recorded telecourses at home. However, research shows that during the last few years of the 1980s, other methods used to distribute telecourse programs increased in importance. (See *Telecourse Utilization Survey Project Third Year Report: Fall 1986 - Summer 1989.*)

Table 3.1 (see next page) indicates that existing distance learning programs rely heavily on broadcast television. The popularity of the PBS Adult Learning Service (ALS) for licensing telecourses to be shown on PTV stations is to be expected. (However, institutions also license telecourses from ALS/PBS and show them on cable television, duplicate video tapes for student use, and utilize other technologies as well.) Broadcast television reaches the greatest number of people and can be a low cost delivery method, particularly if PTV stations do not charge for air time. The use of PTV stations is an example of how an educational institution can have access to a very costly telecommunications systems at little or no cost. In many cases, the college or university needs only to license the telecourses it uses and, perhaps, acquire a set of master tapes for broadcast use; broadcast time is free. In other cases, institutions need only to provide video tapes, because home television sets and VCRs are provided by the student. There are approximately 250,000 college credit enrollments annually in telecourses licensed from ALS. Many institutions also license telecourses directly from the producers and show them on PTV stations. The importance of ALS/PBS and other distributors to all two year institutions with a distance learning program is indicated by the fact that the percentage of institutions using broadcast television is virtually the same for those that responded by mail and those that responded to the telephone follow-up.

Table 3.1

Technologies Used for Recorded Programs in 1991

	2YR*	4YR
PTV Station	63%	43%
Low Power TV Station	4	4
Commercial TV Station	8	2
Educational Cable Channel	49	28
National Cable Network**	9	6
Videotape in Libraries	75	43
Videotape Check-out	43	47
Interactive Videodisc	20	5
CD-ROM	13	2
CDI/DVI	1	2
Average # of responses per institution:	2.9	1.8

*See Appendix B for a comparison of data for institutions
responding by mail and those by the follow-up process.
**E.g., The Learning Channel or Mind Extension University

An increasing number of colleges hold low power television (LPTV) station licenses. LPTV is a VHF or UHF channel that broadcasts at only a fraction of the power of a regular commercial or PTV station. Its signal may reach only ten to fifteen miles from the broadcast antenna site. However, a LPTV station is much less expensive to construct and operate than a full power station.

Two year institutions are much more likely than upper level institutions to use PTV or commercial broadcast television. There are several possible reasons for this. Most recorded telecourses provide instruction at the freshman and sophomore level. Few exist that are suitable for upper level or graduate courses. The much greater use of broadcast television by two year institutions also relates to one of the fundamental differences between these two types of institutions. Community colleges serve everyone in the geographical area around their campuses; in most cases, these people can be reached easily and effectively by broadcast television. Universities, however,

may serve much larger geographical areas -- as much as one or more states -- that cannot be served by single broadcast stations. This observation is valid, as is reflected by the data for different types of technologies throughout the report.

Cable Television

Postsecondary institutions have been major beneficiaries of the growth of the cable television industry during the 1980s. Today there are approximately 56,000,000 cable television subscribers. Colleges and universities in many urban areas now show college credit distance learning video programs on one or more channels. Access to this telecommunications technology is usually provided free by cable companies to postsecondary institutions; students pay monthly cable fees and provide television sets and VCRs. In some areas, colleges have either supplemented PTV broadcasts or eliminated its use in favor of cable television if charged for air time by PTV stations. Cable television is another way postsecondary institutions can use a telecommunications system without investing either in transmission or reception equipment.[1]

The pattern of the data in Table 3.1 for cable television is similar to that for broadcast television. Two year institutions are much more likely to use cable television; this is a reflection of the higher probability that they will use recorded telecourses to serve their local service areas. Cable television is not usually an appropriate telecommunications technology for institutions that serve a state or multi-state area.

Video Cassettes

The remaining technologies discussed in this chapter are not based on telecommunications systems. They are electronically stored media: video, audio and computer software. They are included in this study because they play an important role in many distance learning programs. Either they provide the only means of student access to programs, or they are used in conjunction with other technologies.

The use of video cassettes for student viewing of recorded telecourse programs has become widespread during the 1980s. This is now a low cost technology, which makes it possible for most institutions to put video tapes and VCRs in libraries and/or permit students to check them out for home use. If broadcast and cable television are

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[1]Some institutions may have to invest in equipment, such as point-to-point microwave and playback facilities, to get their signal to the cable companies' master control and onto a subscriber channel.

not options, it can be an effective single viewing method for telecourse programs. It is clearly the technology used most often for recorded telecourses by community colleges. It is used to supplement PTV broadcast and cable television, or as the sole viewing option. It ranks just as high as broadcast television for universities. Data from the *Telecourse Utilization Survey Project 1986-1989* for community colleges show that during the 1987 academic year, only one percent of these institutions had tape check-out, but within two years sixteen percent used it. The data for this report indicate that this dramatic increase has continued; over forty percent of all institutions now offer this viewing option. It has been possible for tape check-out to become so widespread because of the low cost of tape duplication, the fact that approximately eighty percent of U.S. homes have a VCR, and its effective uses as an instructional technology for distant learners.

Interactive Videodiscs

During the early 1980s there was an effort to market videodiscs players as a major home entertainment product for motion pictures. However, VCRs became a much more successful product. Although videodiscs were used as an instructional tool during the 1980s, they did not became a major force in distance education because students did not purchase the players.

The power of videodiscs as an instructional tool has increased significantly now that computer software can be integrated with video and audio. The computer can be part of the videodisc player, or the player can be connected to a personal computer. The ability to access full-motion video, thousands of single still pictures and audio in an interactive environment cannot be achieved by broadcast or cable television. Also, the cost of producing the master and copies of interactive videodiscs have dropped so much that an increasing number of institutions can produce discs to meet their unique needs.

Table 3.1 indicates that fourteen percent of two year institutions use videodiscs for distant learning programs. Since few telecourses are available on videodisc, the magnitude of this number may be surprising. The Telecourse Utilization Project data indicated that this was a minor technology for distant learners in 1989. However, there are several possible explanations for the differences in these two sets of data. In the past two years there may have been an increase in the number of institutions that produce their own videodiscs for use by distant learners. Their students would still have to come to an institutional facility because few students have interactive videodisc players at home. It is also possible that some people who completed the

questionnaire included on-campus videodisc systems that are used to support distance learning programs.

CD-ROM

CD-ROM (compact disc-read only memory) is a relatively new medium, being only several years old. It is used to store large amounts of text data, such as reference materials, on a compact disc that is the same size as those used in home audio systems. Few people have home CD-ROM systems. It is probably not used in very many distance learning programs; at thirteen percent, its use is undoubtedly over-reported for community colleges. Logical explanations are difficult to provide. Perhaps the use of CD-ROM resource materials in college libraries by distance learning students was reported.[2]

By the end of the 1990s it is possible that CD-ROM may become one of the more important technologies to provide distance learners with access to reference and research materials. It may become a major household electronics entertainment item if a single low cost CD-ROM format for audio and text materials becomes dominant. If consumers buy the hardware, it will become attractive for producers and users of distance learner instructional materials to use this technology in lieu of others.

CDI/DVI

Compact disc interactive (CDI) and digital video interactive (DVI) are new technologies that will require close attention by institutions with distance learning programs in the 1990s. They have the potential of changing the home and educational electronics marketplace as much as VCRs did in the 1980s.[3] CDI integrates video (still frame or motion), audio and computer software in a way that allows the user to customize the information.

Currently there are two competing, and incompatible, technologies. The first one to market was produced by Commodore, which is called CDTV. It runs only on Amiga

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[2]Specific questions about technologies used to support distance learning students in the students' use of libraries were not included in the questionnaire. Due to the wording of the questionnaire, it is not clear how much of such support technologies should be reported.

[3]Some of the material used for the discussion in this section is based on a review of CDI technology and applications by Eben Shapiro, "Now, CD's Emit Sights as Well as Sound", *The New York Times*, May 12, 1991, Section F, page 5.

computers, and is unlikely to become the industry standard. CDI is the term Philips uses for its version, which was developed in conjunction with Sony; other electronics firms have announced that they will support it as well. Discs produced for any of these machines will operate on all of them. Although Commodore's product reached the market first, it is more likely that Philip's version will become a standard.

A CDI disc can store up to 300,000 pages of typed text or 7,000 video images. The importance of CDI is that text, video, audio and computer programs can be stored on a single disc. Currently, several minutes of full motion video will fill a disc, but soon the use of compression techniques will enable twenty minutes or more to be stored on a disc. Computer programs are also in CDI disc players.

Some critics are skeptical of this technology's potential market acceptance. Existing alternatives, such as video tape, can be interfaced with computers. Additionally, the fact that competing formats exist may limit their acceptance, as was the case for VCRs and digital audio tape. [4]

Postsecondary faculty have been particularly attracted to technologies that enable them to create their own instructional materials. Most technologies for recorded programs have been prohibitive. One reason for the popularity of live televised instruction is that it allows the instructor to have almost total control of the instructional process and resources. When introducing its CDI system in 1990, Philips offered a base hardware and software system to create a CDI master tape for $9,500. The tape could then be used to manufacture twenty-five discs for a cost of $995. In a few years, the cost for producing discs may be low enough to make it possible for colleges and universities to produce their own discs for their distance learning programs. For this to happen, the technology must find widespread acceptance as a consumer electronics product. If this occurs, CDI will become a major technology for distance learning programs.

Similar technologies are being developed by computer companies as well. Personal computers will interface with a variety of external audio and video sources for instructional purposes. Each company has a different name for their system, but the generic term used of these technologies is DVI (digital video interactive). However, these may be much more powerful than CD-ROM and CDI technologies because they will enable users to manipulate video, audio, and text under the control of computer programs. Read-write storage media, such as hard disks and optical discs, are used in conjunction with DVI.

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[4] "Now, CD's Emit Sights as Well as Sound"

Average Number of Technologies Used For Recorded Programs

An institution with a distance learning program may use any combination of the technologies described above to provide student access to instructional materials. Table 3.1 shows that, on the average, a community college uses 2.9 different technologies, while universities use 1.8. This difference is probably a reflection of the greater importance of recorded telecourses in community college distance learning programs.

These data indicate a continuation of a trend from the 1980s. The *Telecourse Utilization Survey Project* reported that in 1987 the average was 2.1 percent, increasing to 2.4 percent in 1989.

Impact of Institutional Setting On Use of Technologies

Several characteristics of an institution's setting may affect the possibility that it would use any of these technologies. The most likely characteristics that can be measured from this questionnaire are enrollment (question B), population in an institution's service area (question D), and the areas in which college credit instruction is provided (question E). These three factors are interrelated, particularly for two year institutions.[5]

As shown in table 3.2 (see next page), there is a consistent relationship between the use of cable television and enrollment as well as population and area served. One-half of the two year institutions with the largest enrollments or populations are almost fifty percent more likely to use cable television than those in the lower one-half. The difference is even greater when comparing two year institutions serving only small towns and/or rural areas with those serving all other areas: the former are almost half as likely to use cable television.[6]

These differences in the data for cable television probably relate to the fact that larger urban areas are more likely to have cable television systems. The fact that these systems are more likely to have educational access channels for the use of postsecondary institutions for recorded telecourses may be even more important.

An institution's enrollment is the only characteristic that is related to the use of PTV stations as a delivery method. There is no obvious explanation, particularly since

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[5]There is a very high correlation between service, area population and institutional enrollment.

[6]Upper level institutions have the same correlation as two year institution, except the impact is even greater. However, this relationship may not be valid because the number of institutions used for the university analysis is very small.

there are no relationships between PTV use and population or PTV use and rural/non-rural characteristics.

Table 3.2

Factors Relating to the Use of Recorded Materials
by two Year Institutions*

	Enrollment		Population		Service Area**	
	<2500	>2500	<250000	>250000	Rural	Other
PTV Station	53%	68%	61%	64%	63%	64%
Low Power TV Station	5	3	5	2	7	3
Commercial TV Station	6	11	8	9	6	8
Cable Educational Access	44	59	43	61	31	55
Cable National Network	11	7	10	7	11	8
Library Viewing	70	77	74	74	69	77
Tape Check-out	36	49	37	49	37	44
Video Discs	21	20	21	17	17	21
CD-ROM	15	8	18	3	12	13
CDI/DVI	0	1	2	1	0	2

*No data are reported for universities because the valid
number of data for each category is too small.
**The service area was configured as those reporting small
towns/rural areas only and the remainder in "other".

The use of national cable television networks (e.g., The Learning Channel), relate consistently to enrollment, population of service area and rural/non-rural. National networks that deliver telecourses to cable companies via satellite are a low cost method by which smaller, rural institutions may offer telecourses, particularly if they are not served by PTV stations willing to broadcast telecourses for free. Such institutions do not have to acquire video tapes and make copies for cable companies.

They don't even need an access cable television channel, because the cable companies provide all of the technology. The institutions are merely responsible for licensing the telecourses and paying the appropriate fees.

A relationship for these three characteristics and the use of video cassettes in libraries and check-out is similar to the use of PTV stations and educational access cable channels. Larger and more urban institutions are more likely to provide students with these viewing options. However, the differences in the use of cable television are much greater. A likely explanation is that larger institutions have higher telecourse enrollments, and video cassettes are an important supplement to PTV and cable television networks. These institutions are also more likely to possess the resources to provide such services.

Technologies Adopted by 1994 by Institutions with Distance Learning Programs in 1991

If the trends of the recent past continue, institutions with distance learning programs will not let the next three years pass without expanding their programs. Both two year and four year institutions will add about one new delivery system for recorded programs. See table 3.3. The data for both types of institutions are fairly consistent. However, there are several notable exceptions.

Universities are almost three times as likely as community colleges to add library viewing of video cassettes to their options. Universities will catch up to community colleges; currently only forty-three percent of upper level institutions use this option, compared to seventy-four percent of two year institutions. A similar situation exists for commercial television stations; one percent of universities and five percent of community colleges currently use it.

The proposed use of CDI-DVI is somewhat different. Universities are nearly seven times more likely to add it than community colleges. This might be caused by their desire to develop their own instructional materials due to the inability to obtain them from the commercial market. Universities will be more likely to have the resources to develop their own discs.

Table 3.3

Technologies to be Adopted By 1994 by Institutions With Distance
Learning Programs in 1991

	2 Year	Upper Level
PTV Station	4%	7%
Low Power Television	6	5
Commercial Television	1	5
Ed. Access Cable	14	12
National Cable Network	9	11
Video Cassettes in Libraries	5	14
Video Cassette Check-Out	16	17
Videodisc	21	19
CD-ROM	13	13
CDI-DVI	3	20
Avg. # added per institution:	0.9	1.2

Table 3.4 reports the data for the technologies to be used in 1994 for recorded programs for all institutions that currently have distance learning programs. Community colleges and universities will increase their average number of technologies used per institution by one-third (to 3.7) and by one-half (to 3.2) respectively. In 1986 community colleges used 2.1 delivery systems for telecourses.[7]   This is clear evidence that recorded instructional materials, particularly recorded video telecourses, will remain a vital part of distance learning programs.

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[7]*Telecourse Utilization Survey Project*, p. 44

Table 3.4

Comparison of Technologies Used for Recorded Programs by Institutions
with a Distance Learning Program in 1991

	2 Year		Upper Level	
	1991	1994	1991	1994
PTV Station	63%	67%	43%	51%
Low Power Television	4	10	4	8
Commercial Television	8	9	2	7
Ed. Access Cable	49	63	28	46
National Cable Network	9	18	6	18
Video Cassettes in Libraries	75	80	43	58
Video Cassette Check-Out	43	59	47	64
Videodiscs	20	30	5	24
CD-ROM	13	26	2	16
CDI-DVI	1	4	2	23
Avg. # per Institutions:	2.9	3.7	1.8	3.2

Although many colleges and universities were slow to develop distance learning programs and to adopt new technologies as instructional delivery systems in the 1980s, it is clear from the data here that this is no longer the case. Institutions are adding additional technologies in order to expand the reach of their distance learning programs and improve instructional resources. However, several important issues must be addressed in order for these technologies to meet the needs of distance learners. The most significant one is the availability of telecourses. Several telecourses are currently under production that will increase the national inventory. These were funded, at least in part, by The Annenberg/CPB Project. However, the Project's focus is now on instruction for secondary schools. Dallas County Community College District (DCCCD) is the major producer of telecourses in terms of enrollments and licensed uses, followed by Southern California Consortium and Coast Community College District. DCCCD is still very active as a producer, but all of its productions over the coming several years will replace outdated series. Although telecourse users may increase the technologies that are used for student viewing, there is no indication that there will be a corresponding increase in the number of telecourses.

Little production of instructional materials has occurred for videodisc, CD-ROM, CDI and DVI equipment. Several college courses have been produced for national distribution by videodisc; several others are in production. Some colleges have produced videodiscs for their own use. Although these technologies may become readily available to colleges and in homes, there is no indication how the production of instructional materials for distance learners will be funded or distributed.

CDI may become a major method of distributing recorded instructional materials if the production costs decline and CDI players are purchased in large numbers for home use. If these events happen, many colleges and universities may determine that it is cost effective to produce their own discs. Businesses and colleges also may produce discs for a national market if CDI players become common household items.

PART 4

Live Interactive Instruction
Via Telecommunications Systems

The use of telecommunications systems to offer live instruction to distant learners has been in existence in the U.S. for many decades. Older technologies, including audio teleconferencing via telephone lines, instructional television fixed service (ITFS) and point-to-point microwave, are still in use today. Additional institutions are acquiring these technologies to provide new opportunities to the people in their service areas. The distance learning instructional applications of these technologies are being expanded as other technologies are used in conjunction with them; for example, personal computers equipped with modems can be used with audio teleconferencing to transmit text, electronic mail and asynchronous communications.[1]

Some technologies that are not interactive are being used in new ways as interactive capabilities are added through the use of companion technologies. For example, live classes are now offered on cable television that allow students to interact with the instructor and among themselves via telephone lines and personal computer networks. PBS is exploring a technology that will allow people at home to respond to questions, request information from instructors and, conceivably, interact with other people.

Cable Television

Cable television technology can help institutions to produce live interactive televised classes inexpensively because the telecommunications costs may be very low. As in any live televised system, institutions will need to provide the appropriate television studios or classrooms from which the courses will originate. However, they will not have to lease or build the distribution network because they have free use of educational access channels. Nevertheless, institutions still will need to transmit television signals from their television facilities to cable companies' for routing to the

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[1] The data in part H2 of the questionnaire provides information on the use of interactive technologies for live instruction.

subscriber networks. This is sometimes provided by cable companies, but institution may need to use their own microwave path, or coaxial or fiber optic cables.

Table 4.1 indicates the use of cable television for live, televised distance learning courses. Upper level institutions are much more likely than two year institutions to use cable television for live classes. This is probably due to the greater use of broadcast television for recorded telecourses by community colleges as compared to universities; live instruction compensates for the lack of recorded telecourses for upper level undergraduate and graduate classes. Also, some faculty may believe it is more appropriate for upper level courses to be live and interactive.

Table 4.1

Cable Television

	2YR	4YR
Cable Television	14%	22%

During the 1990s cable television will encounter increased competition, but it will have significant opportunities for growth as well. The way it copes with these circumstances may have a dramatic impact on the use of cable television as a distance learning technology. Video compression techniques will enable one existing channel to carry up to four channels. Therefore, a fifty two channel system could be expanded to 208 channels by changing electronic components; rewiring the network would not be necessary. And when existing cables need to be replaced, cable companies are likely to use fiber optic cable, which can carry many more channels. Cable companies are using such enhanced delivery systems to expand the services they provide by supporting data and voice. Ideally, they would like to compete with telephone companies. These additional channels will require more highly specialized programming that appeals to narrower markets. Postsecondary instruction could be an important component of these expanded services.

Point-To-Point Microwave and ITFS

Point-to-point microwave and ITFS have many similarities. Each is a broadcast technology that uses microwave frequencies. Because receiving sites must be on a direct line of sight from the transmission tower, their effective distance is limited by the height of the transmission and receiving antennas, ground obstacles such as hills and buildings, and even the curvature of the earth. Depending upon these variables, signals can reach receive sites more than forty or more miles from the transmission antenna. Audio for ITFS can be either via telephone lines or transmitted back to the origination site via special FM radio frequencies.

These systems are usually designed to serve an institution's regional areas. However, multiple microwave and ITFS systems can be extended into a regional or statewide network by constructing additional transmitters that "repeat" the signal and transmit it further from the original transmission site. Microwave and ITFS have been in use for several decades.

One major difference between ITFS and point-to-point microwave is that the latter requires separate transmission hardware and signal path for each receive site. It is best suited to reach only a few sites due to the cost of the equipment. ITFS is omni-directional; that is, its signal goes out in all directions; therefore, there can be an unlimited number of receive sites.[2] Point-to-point microwave is also suitable for two-way interactive video because the technology can be used to transmit signals in both directions. The same towers can be used at each site for receiving and transmission antennas with the use of additional electronic equipment. In the past it has often been the technology of choice, particularly for graduate level courses, where several remote sites needed to be reached and interactive video and audio were desired.

The data in Table 4.2 (see next page) once again show that these live interactive technologies are more likely to be used by universities. Many of the point-to-point microwave systems were developed specifically to offer graduate level classes to remote sites where a sufficiently large number of students would justify the capital outlay. These are often business sites or branch campuses that augment a limited number of on-campus classes with distance learning programs. These technologies will experience some growth during the 1990s, but it will be limited. Other technologies, such as compressed video via telephone lines, are now competitive with point-to-point microwave. Most ITFS frequencies have already been licensed in large

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[2] Like broadcast television, the actual area that can receive the signal is affected by the design of the broadcast antenna.

metropolitan areas by educational institutions either for their own use or for leasing to wireless cable companies.[3]

However, ITFS will remain important because it provides a "broadcast" television system that can be received by an unlimited number of sites in the signal reception area.

Table 4.2

Point-To-Point Microwave and ITFS

	2YR	4YR
ITFS	16%	29%
Microwave	12	25

Sateilites

The instructions! and training applications of satellite telecommunications networks expanded dramatically during the 1980s. Many telecommunications satellites were launched, which expanded access to transponders and satellite networks. Technological innovations lowered costs and increased the effectiveness of satellite networks as a training and information exchange technology. Businesses have taken the lead in the use of satellites for training purposes. Many companies, including IBM, Federal Express and JC Penny, have established their own networks and use them to disseminate information rapidly as well as to train employees.

There is no doubt that satellite telecommunications will play an ever increasing role in the delivery of college credit instruction throughout the U.S. in the 1990s. Satellites, along with optical fiber networks, will change the framework and rules by which postsecondary institutions operate.

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[3]Wireless cable companies compete with coaxial cable television systems. They can offer many of the same channels. New ITFS technology is particularly cost effective at providing pay-per-view programming.

The most common satellite network transmits full-motion analog video and audio. It is similar to broadcast television and ITFS in that any site in the signal's reception area (footstep) can view the programs with the proper antenna. However, while broadcast television may cover an area seventy or more miles from the transmission tower, any U.S. satellite will cover the lower 48 states. Similarly, full-motion satellite networks generally have one-way video and two-way audio with the return audio to the origination site being by telephone lines. Multi-site to multi-site full motion video is invariably far too expensive via satellite for instructional purposes, because uplink costs and transponder time are prohibitive.

There are an increasing number of networks with one way full-motion analog video via satellite with two-way audio by telephone. The best known postsecondary network is National Technological University (NTU), an accredited institution that offers all its master degree level courses via satellite. It is located on the campus of Colorado State University and has participating universities and businesses throughout the nation.

There are, however, several important limitations to the growth of full-motion analog video satellite networks:

*Uplink facilities are expensive, costing $300,000 or more per site to build.

*Although the cost of receive antennas has declined, the minimum is around $3,000; they can cost $10,000 or more due to the special requirements of some networks.

*Transponder time is costly and may increase during the 1990s.

*Many receive sites must participate in an event or course in order for the activity to be cost effective. Thus, several hundred students may be in a single class. This may not be appropriate for classes that require a great deal of interaction among students. A major complaint about satellite teleconferences is that they are not really interactive because of the large number of sites and participants.

Given these limitations, it is unlikely that full-motion analog video networks will become a major delivery method for college catalog credit courses to distant learners during the 1990s. However, they will continue to increase in importance for single events, short series of programs used to deliver specialized training, and for the distribution of time sensitive information.

Very Small Aperture Terminals (VSAT) networks that remove most of the limitations of full-motion analog systems are being developed. Because VSAT transmits digital video information, which can be compressed, much less bandwidth is used per event. A single satellite transponder (channel) is needed to transmit one analog full-motion video signal, whereas many VSAT signals can be simultaneously transmitted on a transponder. This makes it is less expensive to operate an interactive

video network with many sites being able to receive as well as transmit video and audio.

Data VSAT systems are already in wide use in the U.S. For example, retail chains perform credit card verifications by VSAT, instead of using telephone lines. Several states are planning the use of VSAT for secondary and postsecondary instruction.

Table 4.3 indicates the current use of satellite technology for distant learners. One-third of upper level institutions and one-fifth of two year institutions report that they are currently using full-motion video for college credit distant learners. The author believes that the data, in this case, may be inaccurate, because the respondents may have interpreted the question differently than intended. The survey was intended to obtain data only on *college credit* courses using these telecommunications technologies. The respondents probably included their general use of satellite networks for non-credit training.[4]

VSAT technology is virtually unused by two year institutions; only one case was reported. A similar situation exists for upper level institutions.

Table 4.3

Satellites

	2YR	4YR
Satellite (full-motion)	15%	33%
Satellite - VSAT	<.5	1

Compressed Video Via Telephone Lines

Compressed video via telephone lines is another telecommunications technology used by distance learning programs that will experience rapid growth during the 1990s. The technology is similar to VSAT, but it utilizes terrestrial telephone lines rather than satellites as its telecommunications system. It provides for interactive video, audio and data. Because optical fibers can transmit vastly more data, optical

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[4]This misinterpretation may have occurred on several other places in the questionnaire; these will be discussed when the analysis of that data is presented.

fiber cables are used more often than copper wire telephone lines. Fiber now connects all major cities and many towns in the U.S. The equipment costs needed at each participating site can still be a significant barrier to developing a compressed video network, but these costs are decreasing rapidly.[5]

The delivery of degree coursework to distance learners throughout large geographical areas via compressed video over fiber optic lines is proving to be an economically viable alternative to other technologies. The mission of many state universities includes offering advanced degrees directly to business and government sites as well as to areas of their state where no upper level institution exists. Several dozen states are either operating or developing systems to meet these needs. This is reflected in Table 4.4, which indicates much greater use of this technology among universities than community colleges.

Table 4.4

Compressed Video Via Telephone Lines

	2YR	4YR
Compressed Video (telephone lines)	3%	13%

Audio Teleconferencing and Audiographics

Audio teleconferencing is a low cost technology that uses telephone lines to create interactive audio among many sites. Interactive audiographics networks can be developed by using it in conjunction with simple computer technologies to include graphics and still images. Audio teleconferencing was the first telecommunications system used for distance learning. See Table 4.5 on the next page for the current use of these technologies.

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[5]An advantage of DS3 over T1 networks is that the required compression equipment is less costly.

The growth in audio teleconferencing may be modest during the 1990s, but it will continue to be an important technology. Its importance also derives from its use with ITFS and full- motion satellite systems to provide live multi-site interactive audio.[6]

Table 4.5

Audio Teleconferencing and Audio Graphics

	2YR	4YR
Audio Teleconference	12%	30%
Audio Graphics	5	10

Other Technologies

Item H2 allowed respondents to list technologies not on the questionnaire. Two responses stand out. Four percent of community colleges specifically stated fiber optic networks. However, these responses should be included in "compressed video via telephone lines". Two percent of community colleges listed personal computers and some form of network. The use of PCs might have been greater if it had been listed as a separate question.

Technologies to be Added by 1994 by Institutions with Distance Learning Programs

In Part 3 it was shown that colleges and universities with distance learning programs in 1991 would add new technologies over the next three years to deliver recorded programs to distance learners. On the average community colleges would add .9 new technologies; the average number for universities was 1.2. A similar situation exists for technologies used to deliver live instruction. Table 4.6 indicates the percentage of institutions with distance learning programs in 1991 that will add

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[6]The author believes that some of the reported uses below include this support role for ITFS and satellites.

each of the listed technologies. The average increase per institution is greater for live instruction than for recorded programs.

Community colleges are slightly more likely than universities to add well established technologies: cable, ITFS, microwave and audio. On the other hand, universities are likely to add newer technologies: full motion satellite, VSAT and compressed video. The technologies preferred by community colleges are better able to serve metropolitan and small regional areas, while those preferred by universities are better at serving state and national markets.

Table 4.6

Interactive Technologies to be Added by 1994
for Institutions with Programs in 1991

	2YR	4YR
Cable Television	21%	23%
ITFS	18	17
Microwave	15	12
Satellite (full motion)	15	19
Satellite (VSAT)	8	17
Compressed Video-Tel. Lines	13	22
Audio Teleconferencing	13	7
Audiographics	9	12
Other	8	2
Avg. Number of Technologies:	1.2	1.3

Table 4.7 (see next page) summarizes the data for the use of all interactive technologies in 1994. Universities will still be more likely than community colleges to use each telecommunications technology. As previously discussed, this reflects the differences in the missions and service areas of the two types of institutions. The mission of universities includes providing instruction to much larger areas than community colleges. Lower level recorded telecourses are more appropriate for non-interactive technologies such as broadcast television, video cassettes and subscriber

interactive technologies such as broadcast television, video cassettes and subscriber television. Few recorded telecourses exist for upper level courses. Upper level and graduate courses have smaller number of students, and also rely more heavily on student-instructor and student-student interaction. Therefore, live interactive technologies are generally more appropriate.

Table 4.7

Comparison Between 1991 and 1994 of Technologies Used for
Interactive Programs

	2YR		4YR	
	1991	1994	1991	1994
Cable Television	14%	35%	22%	45%
ITFS	16	34	29	46
Microwave	12	27	25	37
Satellite (full motion)	15	30	33	52
Satellite (VSAT)	<.5	8	1	18
Compressed Video-Tel. Lines	3	16	13	35
Audio Teleconferencing	12	25	30	37
Audiographics	5	14	10	22
Avg. No. of Technologies:	.8	1.9	1.6	2.9

The uses of both classifications of technologies discussed in this part of the report will increase dramatically over the next three years. Table 4.8 indicates that the total increase will be fifty-one percent for community colleges and seventy-nine percent for universities.

Table 4.8

Total Number of Technologies Used for Distance Learning Programs

	Community Colleges			Universities		
	1991	1994	Change	1991	1994	Change
Avg. No. Technologies Used	3.7	5.6	+51%	3.4	6.1	+79%

PART 5

Combining Recorded and Live Technologies

Institutions can base their distance learning programs on recorded technologies, live technologies or a combination of both. Table 5.1 shows how institutions with distance learning programs use these three basic approaches for distance learning in 1991, and how they plan to do so in 1994.

In 1991, community colleges were four times as likely to use only recorded technologies as compared to universities (58% to 14%). By 1994, however, this will decline by one-half for community colleges; twenty-nine percent will be using only recorded technologies. This will still be almost twice the university rate of fifteen percent.

In 1991 eight percent of colleges and universities use only live instruction: only small changes are expected by 1994. Between these two dates there will be a small decrease for community colleges and a slight increase for universities.

Thirty-five percent of community colleges and seventy-eight percent of universities used recorded *and* live instruction in 1991. Within three years this will almost double to sixty-six percent for community colleges, while it will remain almost unchanged for universities. Perhaps the most important observation for these data is that the percent of community colleges using just one technology will decrease from sixty-six percent to thirty-four percent over just three years. This latter figure shows a trend; if it continues after 1994, community colleges will use both types of technologies at a rate similar to universities.

Just as the 1980s saw a rapid increase in the use of technologies to provide student access to recorded instruction, the 1990s will experience a surge in the number of institutions using technologies to offer live instruction, as shown in tables 5.1 and 5.2.

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Table 5.1

Institutions with Distance Learning Programs in 1991

	Community Colleges		Universities	
	1991	1994	1991	1994
Recorded Instruction Only	58%	29%	14%	15%
Live Instruction Only	8	5	8	10
Live and Recorded Instruction	35	66	78	75

The data for community colleges and universities planning to begin a distance learning program within the next three years are surprisingly similar. As community colleges developed their distance learning programs during the 1980s, they concentrated on recorded technologies. A majority did not use any form of live instruction. However, institutions starting a program during the next three years are very aware of the new types of live interactive technologies, and do not intend to repeat the developmental process of their predecessors. This is evidence that both types of institutions are aware of the instructional needs to be met by their distance learning programs, and that a combination of technologies will be required in the future.

Table 5.2

Institutions Beginning a Distance Learning Programs by 1994

	Two Year	Upper Level
Recorded Only	19%	17%
Live Only	15	14
Live and Recorded	66	69

PART 6

Institutional Settings and the Use of Telecommunications Technologies by Institutions with Distance Learning Programs

Certain characteristics about institutions and their settings may have a proportional relationship to the probability that the institutions have a distance learning program and the telecommunications systems that are utilized. As in previous discussions, data for community colleges and universities are treated separately.

There are three questions on the survey instrument that obtained information on an institution's size and setting. These three variables are highly correlated with each other: total full time equivalent enrollment, population of the institution's service area, and the size and extent of the service area's urbanization.

In preparing the data for comparative analysis, enrollment and population were divided approximately in one-half, with the median being approximately 2,500 for enrollment and 250,000 for population. Service area was separated into small towns and/or rural areas and any larger areas. Table 4.1 examines the use of the different technologies for recorded instructional programs by these three categories.

Factors Affecting the Use of Non-Interactive Technologies at Community Colleges

The use of PTV stations relates only to institutional enrollment. It is difficult to understand why smaller community colleges are less likely to use PTV stations than larger ones. This differentiation holds true regardless of the population of its service area or degree of urbanization.

There are explanations for the small but consistent trends for low power television (LPTV). It may be easier for institutions in rural areas to obtain LPTV licenses because of the greater availability of frequencies. They may also be in greater need of their own broadcast television station because of the absence of PTV stations that can or will meet their needs.

The consistent positive relationship between educational access cable television and the three variables has several possible explanations. Larger areas are probably more likely to include cable television systems with franchise provisions that require educational access. Colleges in these areas also may be more likely to have the resources to provide the video tapes, logs and playback facilities needed to operate a cable channel. For opposite reasons, smaller institutions are more likely to use a national cable network, such as The Learning Channel. Smaller franchises may have fewer channels and limited access channels. In these cases the cable companies may carry the national channel. The colleges simply license the telecourses and pay appropriate student fees; there is no need for the college to pay for master tapes.

Video tapes use correlates positively with enrollment, population and service area, perhaps because larger institutions are more likely to have the resources and staff to provide this service. Their larger telecourse enrollments also may necessitate additional delivery methods.

The use of videodisc and CD-ROM technologies is difficult to explain. As previously discussed, it is unlikely that these are used extensively for distance learning programs. Small institutions also seem unlikely to use new technologies that can be utilized only in college facilities.

Table 6.1

Factors Relating to the Use of Non-Interactive Technologies
by Community Colleges

	Enrollment		Population		Service Area	
	<2500	>2500	<250000	>250000	Rural	Other
PTV Station	53%	68%	61%	64%	63%	64%
LPTV	5	3	5	2	7	3
Commercial Television	6	11	8	9	6	8
Ed. Access Cable	44	59	43	61	31	55
National Cable Network	11	7	10	7	11	8
Video Cas. in Libraries	70	77	74	74	69	77
Video Cas. Check-out	36	49	37	49	37	44
Videodisc	21	20	21	17	17	21
CD-ROM	15	8	18	3	12	13
CDI/DVI	1	1	2	1	0	2
Avg. Number of Uses:	2.6	3.0	2.8	2.9	2.5	3.0

Factors Affecting Live Instruction at Two Year Institutions

The appropriateness and cost of using some of these telecommunications technologies for live instruction for distance learners are clearly related to the population density and the number of sites to be reached. As indicated above in Table 6.1, larger, more populous urban areas are more likely to use cable television. Because ITFS is a broadcast television technology that needs to reach many sites to be cost effective, it is much more likely to be used in these same areas. When compared to ITFS, point-to- point microwave is only slightly related to these characteristics as compared to ITFS. Microwave has been used for decades to connect several sites separated in a regional area. Many of these sites are small towns lacking direct access to a postsecondary institution.

The cost of a full motion satellite antenna and related equipment is low compared to most other technologies. One antenna can serve an entire campus. It is an effective way to receive programs delivered nationally either for direct use on broadcast stations or to be recorded for later playback.

The data show that telephone technologies — audio teleconferences and graphics — are used about the same in all environments. These are relatively low cost and simple technologies. Note that the use of full motion video via satellites does not relate to enrollment or rural/non-rural setting, but it is highly related to population. This is probably due to the fact that most satellite programming is non-credit and marketed to the general public. Institutions in a larger population center may find it easier to justify this technology.

Table 6.2

Factors Relating to the Use of Live Instruction
by Community Colleges

	Enrollment		Population		Service Area	
	<2500	>2500	<250000	>250000	Rural	Other
Cable Educational Access	12%	17%	10%	19%	2%	17%
ITFS	8	21	8	29	9	17
Point-To-Point Microwave	11	14	10	16	11	12
Satellite (full motion)	15	13	9	22	16	15
VSAT	0	0	0	1	0	<.5
Compressed Video	2	2	3	2	0	4
Audio Teleconference	13	12	14	13	9	14
Audio Graphics	5	3	6	4	6	4
Avg. Number of Uses:	0.7	0.8	0.6	1.1	0.5	0.8

Factors Affecting the Use of Non-Interactive Technologies at Upper Level Institutions

The patterns of the data for upper level colleges and universities are similar to those of community colleges. The only noticeable difference is that in this case the use of videodiscs and CD-ROM is what would be expected (i.e., it relates to size).

Table 6.3

Factors Relating to the Use of Non-Interactive Technologies
by Universities

	Enrollment		Population		Service Area	
	<2500	>2500	<250000	>250000	Rural	Other
PTV Station	35%	46%	53%	47%	Insufficient	
LPTV	0	6	0	5	Data	
Commercial Television	0	4	6	3		
Ed. Access Cable	15	40	24	47		
National Cable Network	5	8	6	11		
Video Cas. in Libraries	35	46	29	55		
Video Cas. Check-out	45	48	35	53		
Videodisc	0	8	0	5		
CD-ROM	0	4	6	0		
CDI/DVI	0	4	0	5		
Avg. Number of Uses:	1.4	2.1	1.6	2.3		

Factors Affecting Live Instruction at Universities

The use of telecommunications systems for live televised instruction (cable, ITFS and microwave) in larger, more populous areas is greater for universities than for community colleges. Telephone technologies are better able to serve sites at greater distances, and are also less expensive to operate.

Table 6.4

Factors Relating to the Use of Live Instruction
by Universities

	Enrollment		Population		Service Area	
	<2500	>2500	<250000	>250000	Rural	Other
Cable Educational Access	5%	29%	0%	37%	Insufficient	
ITFS	15	37	12	37	Data	
Point-To-Point Microwave	15	29	24	29		
Satellite - Full Motion	25	37	29	34		
VSAT	0	2	0	3		
Compressed Video	10	15	18	13		
Audio Teleconference	25	29	24	3.		
Audio Graphics	15	8	14	5		
Avg. Number of Uses:	1.1	1.9	1.1	2.0		

The data pertaining to live instruction are similar for community colleges and universities, with cable television, ITFS and microwave relating to enrollment and population.[1]

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[1] Because the number of responses is too small, no conclusions should be made from the data on the use of videodiscs, CD-ROM, CDI, VSAT, compressed video and audio graphics.

PART 7

Institutions Starting a Distance Learning Program by 1994

Almost one-half (48%) of two year institutions not having a distance learning program in 1991 intend to implement one within three years. Consequently, eighty percent of all two year institutions will have a distance learning program by 1994. The data are similar for upper level institutions; forty-two percent of those without a program will have started one by 1994, for a total of seventy-eight percent. These numbers, perhaps more than any others in this report, indicate how significant distance learning programs will be for U.S. postsecondary instruction in the 1990s. College credit distance learning opportunities will be commonplace. Virtually every urban and most rural areas will be served by at least one institution.

This part of the report will examine the technologies that the institutions initiating a distance learning program within the next three years will use. The data will be compared to data from institutions that already have such programs.

Institutions starting distance learning programs will use a variety of technologies, as is the case for those institutions that currently have such programs. These are indicated in Table 7.1. The following observations can be made for both community colleges and universities:

*By 1994 institutions starting a program will use only two technologies significantly less often than those institutions with existing distance learning programs. The two exceptions are broadcast television and video cassettes in libraries. Perhaps the most likely explanation is that these two technologies for delivering recorded telecourse programs are the oldest and, therefore, the most widely utilized. Additionally, institutions establishing programs may be less likely to be located in areas where PTV stations carry ALS telecourses. Another possible explanation is the fact that other technologies recently have become viable alternatives; for example, video tape check-out is now feasible due to the vast increase in the number of homes with VCRs.

*Only low power television is much more likely to be used by institutions starting distance learning programs as compared to institutions with existing programs. If an institution does not have the option of PTV broadcast television, it my be more likely to consider investing in a LPTV station to

distribute telecourses. Also, cable companies can receive the signal and put it on their system. Only two percent of institutions currently with programs use both PTV and LPTV; four percent of those planning to start programs are considering both technologies.

*Only CDI-DVI technology is more likely to be used by universities rather than by community colleges. University respondents may be more knowledgeable about this new technology or more likely to use a new technology. Also, CDI-DVI may be a more appropriate technology for their courses.

*The average number of technologies to be used in 1994 is higher for institutions already with distance learning programs as compared to those starting them. However, the difference is relatively small.

Table 7.1

Technologies to be Used for Recorded Programs in 1994:
Institutions Starting a Distance Learning (New) and
Those Having a Program in 1991 (Existing)

| | 2 Year | | Upper Level | |
	New	Existing	New	Existing
PTV Station	35%	67%	40%	51%
Low Power Television	16	10	14	8
Commercial Television	3	9	7	7
Ed. Access Cable	66	63	45	46
National Cable Network	12	18	21	18
Video Cas. in Libraries	63	80	40	58
Video Cas. Check-out	63	59	59	64
Videodiscs	29	30	26	24
CD-ROM	29	26	26	16
CDI-DVI	3	4	10	23
Average No. of Technologies:	3.2	3.7	2.9	3.2

By 1994 almost four-fifths of all community colleges and two-thirds of all universities will have college credit distance learning programs that use recorded instructional materials. Table 7.2 summarizes the data for the technologies that these institutions will use. Distance learning programs using recorded television programs

will become an even more pervasive component of higher education over the next few years.

Table 7.2

Technologies Used for Recorded Instructional Materials by All
Institutions with Distance Learning Programs in 1994

	2 Year	Upper Level
PTV Station	59%	47%
Low Power Television	12	10
Commercial Television	7	7
Ed. Access Cable	64	46
National Cable Network	17	19
Video Cas. in Libraries	76	52
Video Cas. Check-out	58	62
Videodiscs	37	26
CD-ROM	27	19
CDI-DVI	4	14
Average No. of Technologies:	3.6	2.8

In 1991 the average number of technologies used by community colleges for recorded programs was 0.5 greater than universities. By 1994 this will increase to 0.8. This is clear evidence that recorded programs will continue to be a relatively more important component for community college distance learning programs as compared to universities.[1]

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[1]The overall average number of technologies used by community colleges and universities will decline between 1991 and 1994. This is due to the fact that new institutions will be using few technologies, thus decreasing the overall average.

Technologies Used for Distance Learning Programs with Live Instruction

Distance learning programs using recorded instructional materials are only part of the picture. The use of telecommunications systems to deliver live instruction to students at remote sites is just as important. Some of these technologies, such as audio teleconferencing, instructional television fixed service (ITFS) and point-to-point microwave, have been used for decades. Others are much newer and will experience rapid growth during the 1990s. They include satellites and compressed video via telephone/fiber optic cables.

Table 7.3 (see the next page) shows the percentage of two year and upper level institutions with distance learning programs in 1994 for each type of telecommunications technology that will be used to offer live instruction. There will be little difference in the average number of total technologies used for live instruction between two year institutions with distance learning programs in 1991 (1.9) and those instituting programs between 1991 and 1994 (2.0). The data for upper level institutions are similar, although those with programs in 1991 will be using somewhat more technologies on average (2.3 versus 2.9).

A comparison of two year and upper level institutions shows a similar ranking for the use of the different technologies in 1994. Cable television, ITFS and full motion video via satellite will be used most frequently. These technologies share the same basic attribute: one-way full motion video with two-way audio. Although the other technologies are ranked somewhat lower, it is clear that all of them will play important roles.

Note that community colleges starting distance learning programs within the next three years indicate that they will be using four of the technologies more often than institutions having a program in 1991. The total average number of uses of technologies also will be slightly higher for new institutions (2.0 to 1.9). This is evidence of the rapidity with which institutions will adopt technologies for live instruction during the next few years. The disparity is greatest for VSAT and cable television technologies. The relationship among the data for institutions with existing versus new programs is different for upper level institutions. VSAT is the only technology that new four year institutions will be more likely to use.

Table 7.3

Technologies to be Used for Live Instruction in 1994 by
Institutions Starting a Distance Learning (New) and
Those Having Programs in 1991 (Existing)

	2 Year		Upper Level	
	New	Existing	New	Existing
Cable Television	45%	35%	45%	45%
ITFS	32	34	38	46
Point-To-Point Microwave	16	26	21	37
Satellite - Full Motion	33	30	40	51
Satellite VSAT	18	8	21	18
Compressed Video-telephone	20	16	26	35
Audio Teleconference	23	26	29	37
Audio Graphics	13	14	12	22
Avg. No. of Technologies:	2.0	1.9	2.3	2.9

Table 7.4 summarizes the use of the technologies for live instruction for all institutions with distance learning programs in 1994. It combines the data for institutions with existing and new programs. Upper level institutions are more likely to use each technology. The greatest differences are for VSAT and compressed video. The disparity between community colleges and universities in the use of technologies for live instruction will decrease. In 1991 the average number of technologies used per community college is 1.9. The number for corresponding universities is 2.9, a difference of 1.0. By 1994 the difference will have decreased to 0.8.

Table 7.4

Telecommunications Technologies for Live Instruction by All
Institutions Having a Distance Learning Program in 1994

	2 Year	Upper Level
Cable Television	38%	45%
ITFS	34	43
Point-To-Point Microwave	24	32
Satellite - Full Motion	31	47
Satellite VSAT	10	19
Compressed Video-telephone	17	32
Audio Teleconference	23	34
Audio Graphics	14	18
Avg. No. of Technologies:	1.9	2.7

The next three years will see a rapid increase in the technologies used for distance learning in the United States. Community colleges will acquire new technologies more rapidly than universities. The average number of technologies used by community colleges as compared to universities will increase .3 for recorded programs and .2 for live instruction.

On the average, community colleges will use twice as many technologies for recorded programs (3.6) for live instruction (1.9) as universities. The latter will use both types of technologies with equal frequency (2.8 and 2.7). The total average number of all technologies projected to be used by both community colleges and universities in 1994 is 5.5. This is a remarkable similarity since the missions, student populations, service areas, and the technologies that best suit the needs of the two types are so different.[2]

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[2]This may overestimate the number of technologies used by universities. See Table B.2 in Appendix B.

PART 8

Institutions Without a Distance Learning Program in 1994

As has been shown previously, a continued growth in the number of institutions with distance learning programs that use various instructional technologies and telecommunications will occur in the 1990s. However, one-fifth of two year institutions and one-third of upper level institutions will not have programs by 1994. Part 8 examines the reasons given by these institutions for not implementing distance learning programs.

The data in Table 8.1 (see next page) indicate several major differences between both types of institutions. Ninety-three percent of community colleges specify financial constraints, such as the cost of starting programs or inadequate income from the state, as a reason why distance learning programs will not be started. Universities give this reason fifty-two percent of the time. The cost of starting a program and lack of adequate state funding are cited as reasons by both types of institutions.

Universities are much more likely than community colleges not to have distance learning programs because the institutional mission does not include them. Community colleges are generally established to provide college credit and non-credit training for people in a geographical area. In order to fulfill their mission, they have had to establish off-campus sites in community facilities, high schools, businesses, prisons and elsewhere. Distance learning programs via telecommunications are simply an extension of these activities. In contrast, upper level institutions often are established with very narrow missions in terms of the populations they serve. For example, a private institution may require that all students to live on campus. A distance learning program would be inconsistent with this mission.

Opposition by key groups within institutions is not a major obstacle for either two year (14%) or upper level (5%) institutions.

Table 8.1

Reasons for not Having a Distance Learning Program in 1994

	2 Year	Upper Level
Off-Campus Instruction Not Part of Mission	11%	40%
Too expensive to Start	46	36
Opposition by Faculty	7	5
Opposition by Administrators	7	0
Opposition by Board of Trustees	<.5	0
State Provides Insufficient Funds for Dis. Lear.	38	16
Other	23	36
Start a Program After 1994	(7)*	(10)*
Enrollment Cap	(4)	
Budgetary Reasons	(5)	
No Local Interest	(4)	
Average Number of Responses:	1.3	1.3

*Major sub-categories of "Other"

Some of the institutions included in Table 8.1 indicated that they will implement a distance learning program after 1994. This is particularly true if the financial aspects of costs and income improve. It is clear that there is very little resistance to distance learning programs due either to opposition by key groups or inappropriateness with institutional missions.

It is probable that many of these remaining community colleges will implement distance learning programs during the 1990s, assuming that fundamental opposition remains low and that telecommunications costs continue to decrease. A conservative estimate is that between 90 and 95 percent of all two year institutions will have a program by the year 2000. The percentage for upper level institutions will be significantly less because the missions of many of these institutions explicitly exclude serving distant learners.

The data were analyzed to determine if an institution's FTE enrollment, population of its service area, or its rural/non-rural location relates to the probability that it will *not* have a distance learning program in 1994. The data show no relationship based on the population of the service area. Institutions with an FTE enrollment under 2,500 are less likely to have distance learning programs in 1994 than those with larger enrollments. Similarly, rural institutions are also less likely to have programs than

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non-rural institutions. However, both relationships are small, and cannot be used for any general conclusions.

In summary, it is clear that the primary remaining reason why community colleges will not have distance learning programs in the 1990s is the perceived imbalance between costs and income. For universities, it relates more to the institutional mission, although cost remains an important factor.

PART 9

Degrees to be Offered
by Distance Learning Programs

What degrees will institutions offer distant learners via telecommunications technologies? Some of the answers can be found in Table 9.1 (see next page). To avoid any misinterpretation of the data, the contents of the table need to be defined. The term Degree Level generally refers to the level of the courses, not necessarily to the degree awarded for these courses. In particular, associate degree level courses for upper level institutions are at the freshmen and sophomore levels.[1]

Do community colleges use telecommunications technologies to offer courses at the baccalaureate and graduate degree level? All but one percent of these institutions offer lower level courses. However, many also reported baccalaureate and graduate degree programs. These data can be explained by looking at the type of relationship that exist among community colleges and universities in many parts of the country. In some cases, community colleges own or control the technologies used for distance learning (e.g., ITFS licenses or cable television educational access channels). They provide access to these technologies for upper level courses provided by universities that are located in either nearby or in the same towns. Such arrangements can benefit community colleges in several ways: shared construction and/or operating costs, better utilization of the technology, increased income, and larger enrollments at the freshman and sophomore levels because students continue on for higher degrees.

Universities will use technologies to serve all degree levels. Baccalaureate is the most common (94%), followed closely by masters. The data for the table is congruent with the missions of the two institutional types.

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[1]The questionnaire should have determined the grade level (freshman, etc.), instead of degree level.

Table 9.1

Level of Instruction In 1994

Degree Level	Two Year	Four Year
Associate	99%	77%
Baccalaureate	10	94
Masters	4	85
Doctorate	17	69
Non-Credit	35	89
Avg. Number of Responses:	1.7	4.1

The data in Tables 9.2 and 9.3 list the most common degrees, or instructional levels, to be offered by community colleges and universities. For example, forty-nine percent of community colleges will offer only associate degrees. Twenty-seven percent will offer associate degrees and non-credit courses. Associate degrees and Ph.D.s will be offered by thirteen percent. By 1994 twenty-four percent of all two year institutions plan to have a cooperative arrangement with at least one upper level institution that will offer upper level courses via technologies owned or controlled by the two year institution.

These data indicate that cooperative arrangements between community colleges and universities will be an important feature of distance learning programs. These agreements will have an important impact on the accessibility of graduate degrees throughout the U.S. This is further evidence of the role that telecommunications and distance learning will have on U.S. society during the 1990s.

Table 9.2

Degrees Offered by Community Colleges
with Distance Learning Programs in 1994

Associate only	49%
Associate and Non-Credit	27
Associate and Ph.D.	13
Associate, Bachelors & Non-Credit	4
All levels	2
Associate and Bachelors	1
All But Non-Credit	1
	97%*

*The remaining three percent are other possible combinations
of degrees.

Universities are much more likely to offer a wide variety of degrees via telecommunications because of the number of undergraduate and graduate degrees that they offer.[2]

Table 9.3
Degrees Offered by Universities
with Distance Learning Programs in 1994

Bachelors, Masters, Non-Credit	21%
Associate, Bachelors, Masters, Non-Credit	14
Bachelors & Masters	13
Bachelors & Non-Credit	11
Associate, Bachelors & Non-Credit	9
Bachelors, Masters, Ph.D. & Non-Credit	6
	74%*

*The remaining sixteen percent are other possible combinations
of degrees.

[2]It is not known what percentage of the institutions included under the heading of universities do not offer graduate degrees. However, it is likely to be small.

Tables 9.4 and 9.5 provide additional insight into the relationships among technologies and degree levels. Community colleges are more likely to use technologies for recorded programs instead of live instruction for freshman and sophomore level courses and non-credit courses. For baccalaureate programs, community colleges are very similar to universities in their use of these technologies. The two types of institutions are also quite consistent in how they envision graduate level instruction will be offered.

As shown previously, the preponderance of institutions will be using both recorded and live programming in 1994. The data in Tables 9.4 and 9.5 indicate that there will not be much variation between community colleges and universities in their use of both technologies by degree level except for associate degree level courses and, to a lesser extent, Ph.D. programs. Community colleges are much less likely to use both recorded and live programming for associate degree level courses (69% to 89%) while universities are more likely to use both types of programming for Ph.D. programs (93% to 73%).

Table 9.4

Technology and Degree Level for Community Colleges in 1994

	Assoc.	Bachelors	Masters	Ph.D.	Certificate
Recorded Only	25%	12%	3%	10%	11%
Live Only	6	8	14	16	3
Both	69	80	83	73	86

Table 9.5

Technology and Degree Level for Universities in 1994

	Assoc.	Bachelors	Masters	Ph.D.	Certificate
Recorded Only	7%	10%	7%	2%	9%
Live Only	4	11	12	5	8
Both	89	79	81	93	83

Community colleges intend to increase the postsecondary education options for people in their service areas by providing access to baccalaureate and graduate degrees via telecommunications systems. The colleges will own or control these systems. Consequently, the colleges will form alliances with upper level institutions that will offer such courses and award credits and degrees. The data also show that community colleges and universities will use recorded and live instruction for associate degree level courses to different extents. There is little difference between the two types of institutions in their use of live and recorded instruction for any other level of instruction.

PART 10

Request for Information on Developing Distance Learning Programs

The last part of the questionnaire allowed respondents to request information from suppliers of services to institutions with distance learning programs. Table 10.1 compares data for institutions with distance learning programs in 1991, those planning to add them by 1994 and those without such programs in 1994.

One-third of all community colleges with programs in 1994 requested information on at least one topic. Although they were least likely to request information on telecourses, there is actually little difference in the percentage requesting information on the five topics: telecourses, courses via national cable television systems, programming for educational cable television access channels, national and regional meetings for faculty and staff, and consortia supporting distance learning programs.

That institutions planning to start programs are more likely to request information than those currently with programs is to be expected. These former ask for information about one-half again as often as the latter. However, that only forty-four percent of institutions planning programs did so indicates either that they already have staff who are knowledgeable about distance learning programs via telecommunications systems, they know where to obtain the information when needed, or they have yet to consider this need.

Seventeen percent of institutions without programs in 1994 also requested information. Some of them are probably institutions that indicated they might be starting a program, but not within the next three years. However, this is a greater percentage than what would be expected from data discussed previously, and it may indicate people in these institutions want to stay abreast of these activities. This observation would lend support to the argument that although eighty percent of all community colleges in 1994 will have distance learning programs, the percentage will continue to increase throughout the 1990s as some of the remaining institutions add programs.

Table 10.1

Request for Information by Community Colleges

Want Information On:	Program In 1991	New Program By 1994	No Program In 1994
Telecourses	18%	36%	11%
Course via satellite	23	31	13
Ed. access cable programs	20	29	11
Staff development meetings	19	31	8
Consortia	21	35	10
Avg. No. of Requests:	1.0	1.6	0.5
% requesting information:	33%	44%	17%

The probability that a community college would request information may be related either to its size or type of service area. There are no discernible differences between these variables for institutions with programs in 1991. However, there is a major difference in the percentages of institutions requesting information for those starting a program by 1994. This is shown in Table 10.2 (see next page). Rural only institutions were more than twice as likely than their non-rural counterparts to request information (74% to 36%). Rural colleges were much more likely to ask for information in two areas: telecourses and consortia.

Table 10.2

Request for Information by Community Colleges
Starting a Program by 1994 by Type of Service Area

Want Information On:	Rural Area Only	Non-Rural Area
Telecourses	62%	29%
Courses via satellite	49	26
Ed. access cable programs	38	27
Staff development meetings	47	26
Consortia	64	27
Avg. Number of Requests:	2.6	1.4
% requesting information:	74%	36%

PART 11

Summary

The data indicate that the number of colleges and universities with distance learning programs will increase during the 1990s. By 1994 eighty percent of community colleges and seventy-eight percent of universities will have distance learning programs. Instruction based on recorded materials and live interactive classes will be offered by the technologies reported by these institutions.

Institutions with Distance Learning Programs in 1991

* In 1991 the average number of technologies used to distribute recorded programs to students was 2.9 for community colleges and 1.8 for universities.
* By 1994 institutions will add on the average one new technology to deliver programs.
* Video cassettes, public television stations and cable television are the three most frequently used technologies for recorded programs in 1991 and will remain so in 1994.
* New technologies, such as video disc, CD-ROM and CDI/DVI will become much more important in 1994, particularly at universities.
* Community colleges will more than double the average number of telecommunications technologies used for live instruction, from 0.8 in 1991 to 1.9 in 1994. Universities will almost double their number, from 1.6 to 2.9.
* The total number of technologies used by community colleges will increase fifty-one percent between 1991 and 1994 (3.7 to 5.6). For universities it will increase seventy-nine percent (3.4 to 6.1).

Institutions Starting Programs Between 1991 and 1994

* These institutions intend to use almost the same number of technologies by 1994 as the institutions with programs in 1991.
* Public television stations will be used substantially less often by institutions starting programs as compared to those with programs in 1991.

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Institutions Without Distance Learning Programs by 1994

*Only eleven percent of these community colleges stated that off-campus instruction was not part of their mission. The number for universities was forty percent.
*Opposition by faculty, administrators and boards of trustees is not an important impediment to starting programs.
*The cost of starting programs was the most often reported obstacle by community colleges.

APPENDIX A

DISTANCE EDUCATION VIA TELECOMMUNICATIONS IN THE 1990S

A. The highest degree your institution awards:

___ associate   ___ master's
___ bachelors   ___ Ph.D. or professional degree

B. The institution's full time equivalent enrollment for fall 1990 (credit hours divided by 15) is: _____.

C. Is the institution public or private?

___ public   ___ private

D. The 1990 population in your institution's service area is:_____.

E. The institution provides college credit instruction in the following areas (check all that apply):

___ city   ___ large region of state(s)
___ suburban   ___ single state
___ metropolitan   ___ national
___ small towns and/or ___ international
     rural areas

F. The percentage of students living on-campus is ___ .

G. Does the institution have a college credit distance education program that delivers instruction by telecommunications systems? Do not include print only courses.

___ Yes. Please go to question H, page 2.

___ No, but we are planning to offer one within three years.
    Please go to question I, page 3.

___ No, and we are not planning to offer one because of the reason(s) listed below.

    Please do not answer any more questions after this one and go to page 4.
    ___ off-campus instruction is not part of our mission
    ___ it is too expensive to start up and operate
    ___ opposition by faculty
    ___ opposition by administrators
    ___ opposition by board of trustees or regents
    ___ state provides too little or no funding for distant education courses
    ___ other_____

H. Which types of telecommunications technologies are currently used by your institution to deliver college credit distant learning courses? Check all that apply.

1. Recorded instructional course packages produced either by other organizations for national distribution or by your institution for its own use, such as telecourses, interactive video discs, and personal computer software. These courses are made available to students by the technologies checked below.

broadcast television
_____ PTV station
_____ Low Power Television station
_____ commercial broadcast television

cable television
_____ your institution's educational access channel
_____ national cable television network (e.g. The Learning Channel and Mind Extension University)

video cassettes
_____ video cassettes for viewing in libraries
_____ video cassettes for student check-out/rental

other technologies
_____ inter-active video discs
_____ CD-ROM systems
_____ CDI/DVI
_____ other_____

2. Live interactive instruction via telecommunications systems:

___ cable television (local educational access channels)
___ instructional television fixed service (ITFS - point to multi-point)
___ point-to-point microwave
___ satellite - full motion video
___ satellite - compressed video (VSAT)
___ compressed video via telephone lines
___ audio teleconferencing
___ audiographics via telephone lines
___ other_____

I. Which types of telecommunications technologies is your institution considering using for college credit distance education within the next three years that are not currently being used? This question has two parts. Part (1) concerns technologies that do not use live instruction via telecommunications; part (2) concerns technologies that do use a significant amount of live instruction.

1. Which technologies are being considered for courses with-out a live interactive component? Check all that apply:

broadcast television:
___ public television station
___ low power television station
___ commercial broadcast television station

cable television:
___ your institution's educational access channel
___ national cable television network (e.g. The Learning Channel or Mind Extension University)
___ other

video cassette tapes:
___ video cassettes for viewing in libraries
___ video cassettes for student check-out/rental

other technologies:
___ interactive video discs
___ CD-ROM systems
___ courses on personal computers
___ CDI/DVI
___ other_____

2. Live interactive instruction via telecommunications systems. Check all that apply:

___ cable television (local educational access channels)
___ instructional television fixed service (ITFS point to multi-point)
___ satellite - full motion video
___ satellite - compressed video and/or VSAT
___ compressed video via land lines
___ audio teleconferencing
___ audio-graphics via telephone lines
___ point-to-point microwave
___ other_____

J.   The institution uses or is interested in using telecommunications systems for distance education at the following instructional levels. Check all that apply:

___ associate   ___ masters
___ baccalaureate   ___ doctorate
___ non-credit courses or professional certification

Thank you for answering these questions. Please complete this page and indicate if you would like either information from any of the organizations supporting this research project or want to order a copy of the report.

I WOULD LIKE INFORMATION ABOUT THE FOLLOWING:

___telecourses available for leasing.
___organizations that deliver college level courses to institutions via satellite.
___organizations that provide programming for college educational access channels on
   cable television systems.
___national and regional meetings on telecourses for faculty and staff development.
___state, regional and national consortia supporting the offering of telecourses and
   distance education programs that my institution could join.

Other _____

Person completing questionnaire:

Name: _____.

Address:_____

        _____

        _____'_____
             City   State   ZIP

Telephone: (____)_____

____ I want to order a copy of the final report at this time. The cost, including shipping, is $8.00 for people completing the questionnaire, a 33% discount from the $12.00 list price. An invoice will be sent with the report. It will be shipped during spring 1991.

APPENDIX B

COMPARISON OF DATA FROM INITIAL AND FOLLOW-UP RESPONDERS

This is an explanation of the format used to display data for tables. The "Mail" column is for those institutions responding by mail for community colleges (367) and universities (183). The "Telephone" column contains the 102 responses obtained from telephone calls to a sample of community colleges that did not respond initially by mail.[1] "Weighted" is the total of mail responses (367) plus the number of telephone responses (102) adjusted (708) to represent all non- responding community colleges. This creates a database with 1075 records representing all two year institutions. "2YR" indicates the data for community and junior colleges and technical institutes. "4YR" is for institutions offering a baccalaureate or higher degree. As mentioned previously, the research project did not have sufficient funds to conduct a follow-up survey of upper level institutions.

Cindy Elliott is using this database to conduct a statistical analysis that will determine whether there are significant differences in the responses from those community colleges responding by mail and those by telephone.

There is virtually no difference in the average number of technologies used for recorded programs by community colleges with distance learning programs in 1991 between the mail and telephone responses - 3.0 versus 2.9. For most of the technologies there are no major differences with the exceptions of low power television, videotape check-out and interactive videodiscs. The data indicate that for this table there are no systematic differences between these two types of institutions.

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[1]Four additional responses were received after the report preparation began.

Table B.1

Technologies Used for Recorded Programs in 1991

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
PTV Station	64%	61%	63%
Low Power TV Station	9	3	4
Commercial TV Station	6	8	8
Educational Cable Channel	47	52	49
National Cable Network	12	7	9
Videotape In Libraries	74	77	75
Videotape Check-out	56	37	43
Interactive Videodiscs	14	23	20
CD-ROM	8	15	13
CDI/DVI	1	2	1
Avg. Number of Technologies:	3.0	2.9	2.9

The data for community colleges using telecommunications systems for live instruction in 1991 is similar to that for recorded programs. The data is very similar for both mail and telephone responses, except those responding by mail indicated, on the average, a greater use of these telecommunications systems.

Table B.2

Technologies Used for Live Programs in 1991

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
Cable Television	14%	14%	14%
ITFS	19	14	16
Microwave	11	12	12
Satellite - full motion	21	12	15
Satellite - VSAT	<.5	0	<.5
Compressed Video	6	2	3
Audio Teleconferencing	13	12	12
Audio Graphics	4	5	5
Avg. Number of Technologies:	0.9	0.7	0.8

Tables B.3 and B.4 compare the data for the technologies that community colleges with programs in 1991 will add within the next three years. Once again there do not appear to be any consistent differences between mail and telephone responses. However, those responding by mail reported adding, on the average, a greater number of technologies for delivering recorded programs.

Table B.3

Technologies for Recorded Programs to be Added by 1994 by Institutions with Distance Learning Programs in 1991

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
PTV Station	5%	3%	4%
Low Power TV Station	8	5	6
Commercial TV Station	4	0	1
Educational Cable Channel	15	13	14
National Cable Network	8	10	9
Videotape In Libraries	9	5	5
Videotape Check-out	17	15	16
Interactive Videodiscs	27	15	21
CD-ROM	16	12	13
CDI/DVI	4	2	3
Avg. Number of Technologies:	1.1	0.8	0.9

Table B.4

Interactive Technologies to be Added by 1994 by Institutions with Programs in 1991

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
Cable Television	23%	20%	21%
ITFS	24	15	18
Microwave	14	15	15
Satellite - full motion	12	17	15
Satellite - VSAT	9	7	8
Compressed Video	19	10	13
Audio Teleconferencing	9	15	13
Audio Graphics	4	10	9
Avg. Number of Technologies	1.1	1.1	1.1

The remaining two tables show the data for institutions starting distance learning programs within the next three years. For both mail and telephone responses for recorded and live instruction, the average number of technologies to be used by each institution are the same — 3.1 for recorded programs, and 2.0 for live instruction. As is the case in the previous tables, there are differences between mail and telephone responses for individual technologies even though the average number of technologies may be the same. However, there are no consistent patterns.

Table B.5

Technologies for Recorded Programs for Institutions Starting a
Program by 1994

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
PTV Station	48%	26%	35%
Low Power TV Station	16	16	16
Commercial TV Station	8	0	3
Educational Cable Channel	53	74	66
National Cable Network	14	11	12
Videotape In Libraries	53	68	63
Videotape Check-out	46	63	63
Interactive Videodiscs	34	26	29
CD-ROM	33	26	29
CDI/DVI	7	0	3
Avg. Number of Technologies:	3.1	3.1	3.2

Table B.6

Technologies for Live Programs for Institutions Starting a
Program by 1994

Responses:	Mail 2YR	Telephone 2YR	Weighted 2YR
Cable Television	49%	42%	45%
ITFS	34	32	32
Microwave	20	16	16
Satellite - full motion	36	32	33
Satellite - VSAT	12	21	18
Compressed Video	18	21	20
Audio Teleconferencing	25	21	23
Audio Graphics	8	16	13
Avg. Number of Technologies:	2.0	2.0	2.0