DISTANCE EDUCATION FROM A NON-DIGITAL SOURCE: SOME SUGGESTIONS FOR DIGITAL DESIGNERS

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1. Abstract

California State University, Chico has been involved in distance education since 1969, when faculty began driving throughout the region offering External Degree programs. In 1975 a television network was established in northern California and in 1984 CSU, Chico began broadcasting, live via satellite, an entire M.S. degree program in Computer Science to North American locations.

2. Introduction

"...I don't envy anyone who has to advise his [or her] country what to buy—or to accept as a gift—in the telecommunication field during the next few years. Or, for that matter, for the rest of the century. By 2001 everything we have now will still be operating somewhere. And it will all be obsolescent" (1).

This statement by Clarke is appropriate for a telecommunications meeting. Chances are that some decisions made throughout this meeting will be wrong, but we attempt to make intelligent decisions for the future based on the most current information we have. It is nice to remember that where foresight can be considered a 50/50 decision-making process, the wisdom of hindsight is always 20/20.

Wedemeyer wrote that "the future is not something waiting to happen; it is not something preordained; it is within the power of the membership [of the PTC] to create it" (2). As a new member of PTC, we wish to share some experiences for planners of the future of PTC. As Franco has pointed out, "the Pacific region may well become the most advanced in its applications of communications technology, hence the considerable interest in PTC's activities by governments as well as by enterprises" (3).

In placing PTC86 into perspective, we are reminded that on Tuesday, January 13, 1903, an earthquake in the Tuamotu Archipelago killed more than a thousand people. The Tuamotus, in French Polynesia, as well as other island groups, have had their share of devastation as a result of natural events. A disaster of eighty-three years ago or a hundred and eighty-three years ago would have taken months, if not years, to reach concerned individuals. When disasters do occur around the world, we are literally tied together as a result of world-wide telecommunication networks. This is the point that the Director General of INTELSAT, Richard R. Colino, made at a San Francisco meeting in October 1985, referring to the disastrous Mexico City earthquake in September: "...If ever there was a demonstration of the essentiality of modern communications in the life of a great nation, it was during that unhappy week" (4).

3. Evolution as adaptation through time

"The unit of survival [or adaptation, one might add] is organism plus environment" (5).

The Pacific Anthropologist Bateson would certainly see the current and planned electronic environment causing rapid changes throughout the world, especially in the nations of the Pacific Basin. Buczkowski's 1982 PTC paper, "Towards 2000...." (6) points out that predictions can be hazardous. PTC85, centering around the technology whereby voice, data, and video are encoded for transmission purposes, also pointed out the problems when one gets into predictions. We are reminded of the following statements of DeForest and Zanuck: one was a noted inventor and the other a television producer. They both made interesting predictions on television:

"While theoretically and technically television may be feasible, commercially and financially I consider it an impossibility, a development of which we need waste little time dreaming" (7).

"Video won't be able to hold onto any market it captures after the first six months. People will soon get tired of staring at a plywood box every night" (8).

Predicting is hazardous and we would like to dwell on that which is known and move from the past into the present and then into the future.

At PTC84, Challenor et al., gave an excellent broad overview of "International Tele-Education" (9). Various articles over the years at PTC and other meetings have dealt with specific
telecommunication case studies around the globe: Crowder et al. dealing with Canada (10), Northcott on Fiji (11), and of course Welp's 1982 volume on Alaska (12). Literature on telecommunications is increasing at an accelerating pace. Tong and Grantham have provided us with information on "The Telecommunications Revolution and Higher Education" (13) and Agrawal has dealt with the Indo-U.S. SITE Project (Satellite Instructional Television Experiment) (14), and Hurd's analysis of communication needs for Pacific Islanders is well known (15 and 16).

While one is trying to do something in the current situation, one must also continually keep abreast of what other individuals and organizations are doing.

4. The California Case Study

"In citing Chico as number one, respondents repeatedly cited the university's instructional television program that serves rural communities throughout northeastern California, its continuing education program and external degree program and computerized library" (17).

CSU, Chico is part of the 19-campus California State University System. In 1984, Chico was rated the most innovative campus in the system. The other segments of public higher education are the 106 community colleges and the nine campuses of the University of California. Telecommunication at Chico has been described in various sources (18, 19, 20, 21, 22, and 23). Chico has been involved in distance education with closed circuit television since 1975. Site has been established throughout northern California and the system has evolved into an integrated network of 16 sites [Figure #1] with various degree programs [Appendix I] and individual courses delivered via television.

The author of the quote which began this section wrote that Chico, "makes the most of an isolated environment." Chico has the largest service area of the various campuses: 35,000 square miles (or 85,470 square kilometers or approximately 21% of the State) with a population of 600,000 individuals (or 2.1% of the State). The question which had to be addressed was "how to provide quality education to the individual not on campus?" In 1969, CSU, Chico began offering fully authorized "External Degree" programs at community college locations in northeastern California. Cycles of programs were offered by faculty driving to various locations over the years. Hundreds of degrees were awarded in this manner.

In 1975, through various funding, including system-wide monies and federal dollars from the United States Department of Commerce (NTIA), an Instructional Television Fixed Service system was established between CSU, Chico and the University of California at Davis, 92 miles (148 kilometers) south of Chico. The system was started between Chico and Davis, because Davis wished to use Chico Computer Science courses for their Ph.D. program in Computer Science. From that initial ITFS link, the Chico system has expanded to the current network of 16 sites. At CSU, we take ITFS to stand for "Instructional Television For Students."

The most distant ITFS site is in a high school in Yreka, 173 miles (278 kilometers) north of Chico. The eastern leg goes 140 miles (225 kilometers) over the Sierra Nevada into the United States Sierra Army Depot. The southwest leg goes to a county schools office in Colusa, 49 miles (79 kilometers) and the southeast link goes 114 miles (183 kilometers) to Hewlett Packard facilities in Roseville, California.

The first television classroom had hanging microphones and one camera. Today, the ITFS classroom, where on-campus students take their regularly scheduled classes with off-campus students, is a state-of-the-art facility. The courses on ITFS are taught by regular on-campus faculty to on-campus students. The off-campus student pays the exact same fees as if she or he were attending class in Chico. CSU, Chico provides a one-way video, two-way audio system which is live and interactive. The ITFS classroom, with four television cameras, can seat 32 individuals. The instructor has a wireless microphone and there are sixteen microphones so the on-campus students can interact with the off-campus students.

The classroom, operated by one individual, transmits 8AM to 10PM every Monday through Friday and Saturday from 9AM to 3PM. Classes are broadcast 2,160 hours a year (2 semesters x 24 courses a semester x 45 contact hours/course) providing electronic reception for 34,560 instructional hours at the 16 sites. Last year, had courses been offered by faculty driving to various sites, it would have cost Chico $250,000 in auto expenses and 9,000 travel hours.

Through ITFS, CSU, Chico has created 16 classrooms without (a) increasing the faculty, (b) constructing 16 rooms and (c) incurring maintenance for those 16 rooms. Because of programmatic demands, a second origination room will be available by September 1986. In addition to the electronic delivery of courses and degree programs, the University's entire library card catalog (in excess of 1,000,000 items) is in machine-readable format, accessible throughout the region (and nation) via computer. Not only do we provide courses via the electronic medium, but also the necessary support services for fully-rounded programs.

As the terrestrial system was being completed, Chico began to look to satellite-delivery of degree programs. In 1984 the University installed a 10 meter uplink on campus and in September of 1984, Chico began offering an entire Master's degree program in Computer Science, live, via satellite, for 12 hours a
Figure 1: The CSU, Chico ITFS Network in Northern California

Figure 2: Locations of Courses Received Via Satellite From CSU, Chico
week to industrial sites in five Western States, including California. Eight graduate courses were offered from September 1984 through May 1985 with 100 enrollments each semester.

The live satellite program has been expanded to 15 hours per week (every Tuesday and Thursday from 8AM PST to 3:15PM PST) and now includes Texas Instruments and Bently Nevada. In September 1985 there were 140 enrollments in five courses at 13 corporate locations in 6 states (California, Washington, Oregon, Idaho, Nevada, and Tennessee) (Figure #2). In the Fall of 1985, Chico also had 376 enrollments in the 27 courses on ITFS in northern California.

As with ITFS, the faculty are teaching their regular on-campus students at the same time they are teaching professionals via satellite. In the satellite program, companies do pay fees and tuition to cover faculty salaries, satellite transmission, and administrative charges. Negotiations are under way with other corporations to expand the satellite program and discussions have been held on offering the degree via satellite beyond North America.

A cycle of 20 courses has now been prepared [Appendix II], running from 1985 to 1987, which will enable individuals to complete an M.S. degree in Computer Science without coming to the CSU, Chico campus. As the Continuing Education Manager for Corporate Engineering at Hewlett Packard has pointed out: "Technology can help compensate for the shortage of engineering and math faculty and can make education accessible to isolated areas. But to maximize these opportunities, careful planning and resource sharing are absolutely necessary" (24).

The 1985 Compendium entitled Uses Of Instructional Television in Engineering Education in The United States pointed out the activities of CSU, Chico and also the televised courses of Stanford University, the University of California at Berkeley, Purdue University and Oklahoma State University, just to mention a few. Several institutions are using the latest technologies to deal with the distant learner and a recent article pointed out the following:

"Perhaps most ambitious of all, Chico State University in California has begun offering some of its graduate-level classes to students as far away as Johnson City, Tenn. In fact, Chico's satellite hookup could allow the school to transmit courses throughout the Pacific Basin--a third of the globe" (25).

The Center for Regional and Continuing Education is the major outreach office of CSU, Chico, charged with coordination and development of teleconferencing. A "4-C" framework has been established to deal with telecommunication: the coordination of a project, either via ITFS or satellite, is handled by Continuing Education. The conduit or delivery system is maintained by the University's Instructional Media Center. The client or the customer makes a determination, with the University's experts, what content is to be delivered via the appropriate electronic medium (Figure #3). This framework applies to numerous situations, and if all of the variables (and sub-variables) do not work together, one quickly gets an additional unwanted "m" variable, namely chaos!

The Center oversees numerous aspects: student admissions and registration, material distribution between faculty and students, examination proctoring, and providing materials and training for off-campus site coordinators. The Center is the focal point between the site coordinators and students and the various CSU, Chico on-campus offices. All telecommunications programs have total University support and numerous offices are involved in the program.

The Office of Admissions and Records has simplified the normal six-month admissions and registration process into one envelope, available at all off-campus sites at the beginning of each semester. A Student Handbook for the off-campus student has been prepared and the Instructional Media Center, which maintains all of the on-campus and off-campus telecommunication equipment and facilities, provides faculty orientation workshops each semester for faculty teaching in these programs. A publication entitled Teaching Over Television has also been created for this purpose (26).

For the M.S. In Computer Science Program, the Center has developed an "Instructional Manual" for the training coordinators at the various locations which details the program's various policies and procedures. Because this program spans the North American continent (encompassing three time zones), the manual also covers such things as the University calendar, how to order books, how to access the on-line University catalog via computer terminal, which on-campus office should be called to get answers to various questions, and even what particular equipment is needed in the individual receive classrooms across the nation. Because this live satellite program is handled by a single University offering a single accredited M.S. degree in Computer Science, most problems and administrative concerns can be handled by one phone call to the Center.

Discussions are currently under way concerning the establishment of an electronic mail system between CSU, Chico and the various corporate sites involved in satellite program. This electronic bulletin board would be in addition to the access the off-campus students already have to the campus computers. CSU, Chico's long-term involvement with ITFS in northern California and the live and interactive M.S. degree in Computer Science available via satellite, combined with various support services, is a clear indication of the University's commitment to higher education.
Figure 3: CSU, Chico "4-C" Framework
5. What we would have done if.....

"The major objectives of industry are to reduce expenses, maintain competitiveness, and increase profits. Sub-objectives include the need to optimize communications among sites, to increase productivity of international operations, and to reduce the time spent in travel and meetings." (27).

Lissandrello's statement is excellent for many occasions. In order to "maintain competitiveness" one must be aware of what is currently going on in the area of distance education via telecommunications systems. It is interesting to note that The RAE Table Of Earth Satellites 1957-1982 by King-Hale et al. (28) pointed out that between the years 1977 and the end of 1982, there were a total of 2,389 known launches of various satellites. This works out to a launch on the "average" of every 3.82 days over the twenty-five year period. In November 1985, Hudson wrote that "there are now more than 150 commercial satellites in geostationary orbit (GSO), 60 percent of them launched within the past five years" (stress added) (29). Changes are occurring very rapidly.

What have we learned throughout the years of telecommunications activities at Chico? One must be aware of what has already occurred and what is currently going on in order to plan for the future and long-range planning is a must.

Not only do potential clients need to know what your plans are, but in order for you to continue to expand your own programs, you need to know where you might want to be in the next five years. Although long-range planning and committee work is not the most exciting thing to most people, we would simply like to stress this: no one single individual nor any single unit on a University campus, or in an industrial organization, knows everything. In order to make the absolutely-perfect correct decision about the future! One must be willing, however, to make decisions, but with the full realization that some of those decisions might in fact eventually be the wrong ones.

What would we have done differently? Even given the 20/20 vision of hindsight analysis, probably not very much. We had to adapt to the northern California environment with the appropriate technology of the day, which was an extensive ITFS/Microwave system. Satellite delivery to rural California would not have proven cost-effective or feasible in 1975.

Our satellite activities are keeping us busy, and given the wisdom of hindsight, perhaps we should have looked at a Ku-uplink system as well as our C-band uplink system. We are, however, right now exploring the possibility of a Ku-band uplink on campus. We are also looking at, and recommending that individuals and organizations, analyze the various codecs that might be appropriate for their unique situations. There have been many changes since we first became involved in telecommunications in 1975 and often one wonders what the next decade (or next five years) will bring to the educational arena.

6. Recommendations and General conclusions

"I have yet to see any problem, however complicated, which when you looked at it in the right way did not become still more complicated" (Paul Anderson).

If California State University, Chico, were planning its ITFS/Microwave system right now and its satellite activities, our recommendations would be (a) continued master-planning/long-range planning, (b) development of the ITFS/Microwave system for the area of 33,000 square miles of northern California, and (c) investment in the necessary up-link equipment for both full-motion video and compressed video in both the C-band and Ku band frequencies.

As programs grow, so does the need for physical space, including classroom and studio space as well as office and storage space and we would recommend keeping this in mind. Keeping track of classes, students, enrollments and all of the elements of a distance education program is a large and time-consuming effort and we have found our own in-house computer system an essential item for both the ITFS and Satellite program and strongly recommend such a system.

The University is a member of the Pacific Telecommunications Council and we also hold memberships in the National University Teleconference Network (NUTN), the Public Service Satellite Consortium (PSSC), and the National University Continuing Education Association (NUCEA). The activities of each of these organizations helps us keep abreast of the changes in telecommunications and gives us an added perspective of our role in this field.

There is a great deal of printed matter that must be consumed (or absorbed or at least glanced at) in order to attempt to keep up with the "analog and digital deluge" that threatens to engulf us all: Aviation Week And Space Technology, BME, the CITE Newsletter, Communication Age, Communication News, EITV, IEEE Spectrum, Telephony, Satellite News, Satellite World, Space Calendar, Telecoms, Telephony, and Telespan just to mention a few! And, of course, there are the various PIC publications that are necessary readings.

Keeping up with what is happening in this rapidly changing field is extremely important. This means that time and money must be allocated to key personnel (both technical and non-technical) to attend professional meetings and visit other institutions and organizations involved in telecommunications activities. Not only does this bring new information to your own activities, but it also helps to reaffirm people's professional commitment; and people who
work in telecommunications activities, be they
digital or non-digital, need to be dedicated
individuals.

Wide-spread reading and travelling, attendance
at professional meeting, and judicious
"borrowing" of ideas to incorporate into the
"local" environmental situation is the best way
to handle various telecommunication situations.
There is no way that any one single individual
can keep abreast of everything and a spirit of
cooperation and not competitiveness is needed
within the organization that is attempting to
bring about telecommunication activities.

Our activities represent a teamwork effort:
faculty or content experts are needed to develop
programs, technical people are needed to build
and maintain systems, and administrators are
needed to coordinate and facilitate both the
development and the delivery of the program to
the client and the expansion of the program to
potential new clients. Communication channels
between individuals in these areas must be kept
open and used frequently.

Individuals of this planet no longer live in
isolation; we all co-exist in an increasingly
integrated information environment. The
depopulated inhabitants of the
are woven together into an "information society" that is in fact making the world a
smaller place. At CSU, Chico we are in the
business of sharing information and interested
readers of this chapter are encouraged to
contact us for any further information.

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Appendix I: ITFS Programs at CSU, Chico

1. California Studies Minor
2. Career & Life Planning Minor
3. Economics Minor
4. Family Relations Minor
5. Geography Minor
6. Paralegal Certificate
7. Political Science Minor
8. Psychology Minor
9. Sociology Minor
10. B.A. in Social Science
11. B.A. in Sociology

Appendix II: Computer Science Courses

Fall 1985
CSCI 151 Data and Program Structures
CSCI 152 Operating Systems Programming
CSCI 171 Computer Architecture
CSCI 231 Computer Graphics
CSCI 397C Seminar: Security & Privacy

Spring 1986
CSCI 152 Operating Systems Programming
CSCI 172 Systems Architecture
CSCI 256 Theory of Computing
CSCI 322 Artificial Intelligence
CSCI 372 Operating System Theory

Fall 1986
CSCI 151 Data and Program Structures
CSCI 171 Computer Architecture
CSCI 227 Discrete Simulation Systems
CSCI 320A Digital and Analog Transform Theory
CSCI 350A Language Theory

Spring 1987
CSCI 152 Operating Systems Programming
CSCI 172 Systems Architecture
CSCI 273 Data Base Management
CSCI 370 System Design Theory
CSCI 397C Seminar: Computer Architecture

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