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AUTHOR Kay, Peg; Gerendasy, Stanley
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ABSTRACT

In 1974, seven $100,000 grants were awarded for the design of experiments to deliver social and administrative services on interactive cable television. A subsequent study attempted to summarize and compare the seven studies and to place them in the context of the field's significant literature and current use. This report summarizes the results of the follow-up study, including the following elements: (1) a chronological review of significant literature; (2) an overview of the social and administrative uses of cable television; (3) a review of the design and current status of each of the seven projects; and (4) recommendations. (EMH)

SOCIAL SERVICES AND CABLE TV

The Cable Television Information Center

Peg Kay: Principal Investigator
Stanley Gerendasy: Project Manager

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CONTENTS (Cont.)

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This report represents a team effort on the part of the entire CTIC staff, although I am alone responsible for the opinions expressed in the concluding section. Paul Fox, of CTIC, contributed the entire substance of the section on technology and Thomas White, of the Program Evaluation Group, The Urban Institute, performed the cluster analysis.

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Peg Kay

INTRODUCTION

In 1974, the National Science Foundation (NSF) awarded seven grants of about $100,000 each for the design of experiments to deliver social and administrative services on interactive cable television. Those awards marked the first systematic attempt by a federal agency to explore the potential of what the Sloan Commission has called "The Television of Abundance."

Other federal agencies had previously funded projects to test cable television as a delivery mechanism for social service projects. The NSF approach was unique in that the objective was to examine what functions cable television could perform in the overall design of social service packages; how cable's unique capabilities could be exploited in the development of a system to improve social service delivery.

While previous experimentation had resulted in proposals from municipalities, cable systems or research groups, NSF required that a consortium of these three types of groups work together to design a system--perform technical analyses of systems and components, plan applications, and devise appropriate evaluation techniques.

The seven grantees proposed over 20 separate applications. Together, the design studies comprise the richest body of literature dealing with cable communications.

The Cable Television Information Center (CTIC) felt that the very detail that made the studies so valuable would cause them to go unread. CTIC, therefore, requested that NSF sponsor a study that would 1) Summarize and compare the seven studies, and 2) Place the studies in the context of the field's significant literature and current use. NSF agreed. This report contains the results of the study.

Chapter I is a chronological review of the significant literature in the field. It traces the general trends of thinking on the subject.

Chapter II presents an overview of the social and administrative uses that have been or are being made of cable, and attempts to relate the literature to reality.

Chapter III deals with the design studies themselves. The first section describes each of the applications proposed. Included in each description is a short discussion of the context that spawned the experiments and a report on the current status of their implementation. The second section is a description of the technological components of the experiments. A third section describes the design of the proposed evaluation research.

Chapter IV contains recommendations for further research along with some general observations.

It was anticipated that a report of this nature would be of value to four groups. They are:

1. Potential users of cable, such as citizens' groups, local government units, or educational organizations that want to know what use has been made of cable television and/or how a particular system can be used;

2. Funding organizations, either governmental or private, which want to know if a proposal they have received suggests an application that is feasible and original;

3. Academics who need bibliographic materials in addition to the information desired by potential users;

4. Policymakers, federal and local, who want a general but comprehensive summary of the field.

I. LITERATURE REVIEW

A. AN INTRODUCTION

1. 1968:

Nineteen sixty-eight saw the publication of two keynote reports dealing with cable television. One, by the New York City Mayor's Advisory Task Force on CATV and Telecommunications (The Friendly Report),stated the interest of larger cities in the development of cable television and referred to many of the futuristic applications that make up cable's "blue sky"--the awaited communications revolution that promised to alter not only the way we transmit messages but also the way in which we live. The task force urged that the city move rapidly to design and institute a city-wide complex of cable systems because the task force believed cable television "offers the most promising solution to a number of difficult communications problems facing our larger cities...[by providing] a multiplicity of channels to help meet the expanding needs of a modern urban society for channel space. "[1]* The report pointed out that eventually this new urban communications system would be able to carry signals in two directions, permitting the electronic interchange of data, facsimiles, and video pictures. This might ultimately,

> Revolutionize the ways in which the business of a city is conducted. A business concern, for example, such as a bank, a brokerage firm, or a department store, could link its various offices, stores, or warehouses by cable for the conduct of much everyday business that cannot be conducted by telephone. The concern could also establish a ready link with its primary clients, customers, or suppliers within the city. And with the development of computer technology, this complex could be linked with a computer, the computer receiving and transmitting data and commands...And if every city in the nation had such a system, these telecommunications links could be regional and national.

*Complete references for footnoted sources are listed at the end of Chapter I.

> A telecommunications system of this order of technological sophistication could also serve the government of a city in a variety of significant ways. It could interconnect hospitals and public health facilities for diagnostic conferences and for conferences on treatment. It could be linked to cameras that scan hundreds of public areas for protection against crime, for the detection of fire, for the control of traffic, and for the control of air pollution. [1. PP. 12-13]

Speculation about the feasibility of these and similar applications has dominated the cable television literature since the Friendly Report was published.

Shortly after the Friendly Report enunciated the interest of the cities in the development of cable, the President's Task Force on Communications Policy (The Rostow Report)[2] defined the place of cable television within the context of national communications policy. The Rostow Report noted that Congress, in the Communications Act, directs the Federal Communications Commission to "encourage the larger use of radio in the public interest." [2, III-2] This mandate, the report continued, has been interpreted to include six objectives:

> First. The structure of the industry should make it possible to cater to as wide a variety of tastes as possible, the tastes of small audiences and mass audiences, of cultural minorities and of cultural majorities....
>
> Second. Television should serve as varied as possible an array of social functions, not only entertainment and advertising, important as they are, but also information, education, business, culture, and political expression.
>
> Third. Television should provide an effective means of local expression and local advertising, to preserve the values of localism, and to help build a sense of community, both locally and nationally.
>
> Fourth. To promote these ends, the cost of access to the broadcast medium for individuals or groups who desire access to viewers should be as low as possible.

> Fifth. Television has become so fundamental a medium of communication in our society that we must seek to make it available to as many people as possible, rural as well as urban, poor as well as affluent....
>
> Sixth. The fundamental values of a democratic, pluralistic society require that, within the limits of the spectrum, and of economic realities, policy should guard against excessive concentration in the control of communications media. [2. PP. VII-3-4]

Each of the six objectives deals with an aspect of diversity--diversity of program offerings, of message function, of users, of audience, and of control. The Rostow Report saw the distribution of television to the home via cable as a promising avenue to diversity. The report stated that cable could provide an abundance of channels at relatively low cost; that the system's configuration was well suited to selective distribution to target audiences; and that cable's financial base--the subscribers' dollars--was an effective vehicle for raising money to support its offerings.

The report also foresaw an expanding interest on the part of cable operators in local program origination. The incremental cost of utilizing extra channels would be low, the report argued, and a varied program mix would attract additional subscribers. The cable operator, therefore, has a positive incentive to shoulder at least a portion of programming costs even when no commercial sponsor appears.

The Friendly and Rostow Reports, taken together, stated the major themes that have provided the underpinning for most of the subsequent literature. The themes are:

1. In the future, cable television will be able to provide an entirely new range of communications services that can ultimately change the way citizens communicate with one another and even the way society's institutions are structured.

2. Because cable television will play a vital part in the cities' attempts to deal with increasingly complex communications

needs, the cities must explore its potential and foster its public service capabilities.

3. The federal government has a significant stake in the growth of cable television, since that medium might well be the vehicle needed to implement our stated national communications objectives.

4. Cable operators, in their own economic self-interest, will/should develop innovative and diverse forms of public interest programming.

Although some exceptions exist, these themes have been developed in the literature by social theorists operating in academic or "think tank" milieus. Again with some exceptions, the themes were developed in field tests by the cable operators and public agencies.* It was not until 1974, when the National Science Foundation issued its program solicitation for design studies for two-way social service delivery, that the cable operators, the public agencies, and the social theorists began working together in a systematic manner, attempting to exploit the unique aspects of cable television, i.e., its interactive capabilities and the abundance of channels.

The remainder of this chapter will review chronologically some of the major literature.

B. SUMMATION OF THE LITERATURE

1. 1969:

The Rostow Report contained a summary of the findings of an exploratory research study of the role of telecommunications in urban development. The study, performed by Herbert Dordick, et al., of The Rand Corporation, was published in its entirety in 1969 as the memorandum, Telecommunications in Urban Development [3]. It suggested areas in which potential benefits might accrue from various programs for communication in an urban ghetto. The

* Chapter II contains an overview of field tests.

authors argued that a study such as theirs was of limited value by itself. Important questions would remain unanswered until a reasonably long-term demonstration was implemented and evaluated. The research team suggested a pilot project for the south central Los Angeles ghetto areas. Basing their recommendations on information gleaned during a four-month research period, the Rand team suggested several specific types of television programs. The suggestions included direct service delivery (employment information and counseling); educational programming (high school equivalency programs, industry training, programs for parents of school-age children); information programs on government and business (transportation, health services, special news for black entrepreneurs); and community interaction programs (teleconferencing among communities).

The memorandum also discussed the technological alternatives for implementing a demonstration program. The major technologies considered were: 1) Conventional broadcast facilities, 2) Instructional television fixed service microwave (ITFS), and 3) Cable. Reference points for further feasibility and cost studies were given, including rough cost estimates for the three technologies and various levels of service. Recommendations for the research program stressed the need to consider the relative merits of all competing forms of communication, e.g., bulletin boards, newspapers, and the telephone.

A second major document published in 1969 was the Industrial Electronics Industries Association's (IED/EIA) The Future of Broadband Communications [4]. The FCC, in 1968, had asked for comments on proposed rules (Notice of Proposed Rulemaking, 15 FCC 2d 417, Part V (1968). The commission was inquiring into the long-range development of cable television. Its specific purpose was to explore:

> How best to obtain, consistent with the public interest standard of the Communications Act, the full benefits of developing communications technology for the public, with particular immediate reference to CATV technology and potential services...*

The IED/EIA publication was a response to the request for comments. It was notable in at least two regards: 1) Atypically, it was not the product of social theorists but instead came from industry; and 2) The process of classification of technological requirements for various services was begun. The taxonomy begun in the Response and further refined in subsequent literature has defined the services that can be delivered by given equipment sets. From that, levels of service can be identified and priced, and estimates made of availability dates.

IED/EIA predicted that, given a favorable regulatory environment, two broadband communications networks would develop by the 1980s.

> First, a video telephone system which may be quite similar to the proposed PICTUREPHONE* system of AT&T described in depth in the May-June 1969 Bell Laboratories Record. The two-way video network should have additional, but optional features:
>
> a. The ability to act as a video output terminal with limited keyboard access to computers, and
> b. Transmission and reception of high-speed (e.g., one-second per page) facsimile information.
>
> Second, a broad-band communication network (BCN) that would, in effect, be a minimum 300-megahertz bandwidth "pipe" to provide many information services for home, business, and the government such as broadcast video, first-class mail, and educational material....The BCN should provide limited return bandwidth for receiving and tabulating specific requests and responses by individual users of the cable or cables. [4. P. 2]

The Response postulated an expanding economy, from 1969 to the early 1980s particularly insofar as services are concerned. The writers expected

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* Cable Television Report and Order, 36 FCC 2d 141, par. 1 (1972).
** Registered Service Mark, AT&T.

that developing social patterns would create significant demands for a variety of services made possible by broadband communication networks, such as:

1. Work activity - speeding information flow (e.g., mail)
2. Communication - providing for interactivity with computers
3. Transportation - untangling travel congestion
4. Life support - combatting crime, urban congestion
5. Education/culture - extending availability and support
6. Recreation - providing variety in entertainment to the home
7. International business - sharpening our competitive edge [4. PP. 6-7]

IED/EIA then classified services according to who receives the message. Three categories emerged: 1) Discrete-address point-to-point service, such as a telephone conversation; 2) Multiple address point-to-point service, similar to a lecturer addressing a class; and 3) Broadcast service as transmitted by traditional television or radio. Overlapping those categories were two others, i.e., switched and nonswitched systems. The former is one in which messages are originated by a sender and transmitted only to the designated address. A nonswitched system maintains fixed channels and all messages are transmitted to all receivers. That does not imply that all receivers actually receive a comprehensible message. Various technological devices such as scramblers and descramblers or digital addresses permit selection.

IED/EIA did not attempt to cost individual services. However, crude estimates were made for the two networks in toto—about $13 billion for the video telephone and $11 billion for the BCN. The Response pointed out that huge savings could be realized in such areas as travel and public safety which would encourage public sector participation in the initial investment. Additionally,

> The overall growth of the economy between 1969-1979 should be similar to that for the preceding decade, the current gross national product expanding at about 6.3% annually. This is slightly lower than the 6.5% rate during the 1958-1968

> time frame and would result in a GNP of approximately $1.7 trillion in current dollars by 1979. [4. P.31]*

This expanding economy, with fiscal and monetary policies "directed toward the maintenance of employment and growth while avoiding an unacceptable rate of inflationary price adjustments" [4. P.30] would create ever greater amounts of personal disposable income. One would expect that the affluent individual consumers, along with businesses and governments, would furnish a ready market for broadband services. IED/EIA expected that full service could be in place by the 1980s.

2. 1970:

Ralph Lee Smith's "The Wired Nation" [5] originally appeared in the May 18, 1970 issue of The Nation. This article introduced the futuristic applications of cable television to the general public.

"The Wired Nation" summarized the history of cable television and explained the basic technology. Smith cited the optimistic financial projections of the investment firm of Drexel, Harriman, and Ripley contained in the "Industry Report on Community Antenna Television (CATV)," and warned the nation's city fathers "to stand guard over the citizens' pocketbooks....insist on reasonable subscription fees, put a liberal but definite ceiling on profits..., and require a large array of services." [5. P.587]

The article heavily stressed the need for public interest legislation and regulation of the new medium but was less optimistic about getting it, stating:

> When every allowance has been made, the FCC's activity in the field of cable TV must be regarded as a serious failure. The problem stems principally from the fact that the Commission has defined the public interest as the perpetuation of the over-the-air television industry as it now exists. [5. P. 594]

* In the years 1969-1974, the GNP increased as much as 6.3% only once--in 1972.

> In dealing with cable TV, the nation's regulators and legislators continue to devote large amounts of time and effort to refereeing the short-range struggle for economic advantage. Meanwhile, cable technology grows swiftly, and the long-range issue of securing from it maximum public benefit remains unfaced. [5. P. 599]

Smith was concerned that the abundance of channels might be consumed by more of the same kind of programs offered by the major broadcasters and educational TV. He examined one of the early pay TV ventures, Gridtronics, and concluded that its selection differed very little from that found on conventional television.

"The Wired Nation" reviewed the earlier IED/EIA Response, reporting such potential cable uses as home library services, facsimile data services, delivery of mail, and crime detection and prevention. Smith reiterated the IED/EIA conclusions that all of those features are "within easy reach of existing technology..."[5. P.603] and "the network for a wired nation is well within the capacity of the economy." [5. P.604]

Smith was also concerned with the problems that might arise when the nation is wired. He did not assume that all the social effects would be good. Would the cable-permitted ability to work at home keep the affluent suburbanites from ever entering the city? What violations of civil liberties and privacy might arise from police surveillance and the compilation of financial credit, and other personal information in credit banks? He suggested the creation of a presidential commission on the "wired nation" responsible for the development of a plan for creating a national broadband communications system during the 1970s. The article ended with a warning:

> Further delay at this juncture will forfeit great opportunities for shaping the swiftly approaching communications revolution for the public benefit. Leadership is required, and the time is now.[5. P.606]

3. 1971:

An effective moratorium on cabling the large cities had existed since 1966. In that year the FCC imposed procedural restrictions on the importation of distant signals by cable television systems in the major television markets. In 1968 the procedural restrictions were made more severe. Since a strong inducement to subscribe to cable television is the ability of the system to deliver more channels than can be received through normal over-the-air transmission, it was unlikely that a cable system would be financially successful in an area where additional signals could not be imported.* Therefore, construction in most of the larger markets came to a halt.

The commission indicated that the moratorium would be in effect until the available regulatory alternatives had been studied and decisions made. The 1969 IED/EIA Response was a direct answer to the commission's request for comments.

In addition to soliciting direct response, the FCC's public discussion of cable stimulated a number of other investigations. Within two years, several important studies had been launched, and in 1971 four major documents were published: The National Academy of Engineering's Communications Technology for Urban Improvement; The Sloan Commission's On the Cable: The Television of Abundance; Charles Tate's Cable Television in the Cities: Community Control, Public Access and Minority Ownership; and Walter Baer's Interactive Television: Prospects for Two-Way Services on Cable.

* The following two studies support that conclusion: Rolla Edward Park, Prospects for Cable in the 100 Largest Markets (Santa Monica, Ca.: The Rand Corporation, R-875-MF, October 1971). William S. Commoner and Bridger M. Mitchell, The Bell Journal of Economics and Management Science (Spring 1971) pp. 154-ff. Because both of those studies address themselves exclusively to the areas of economics and regulation, they are beyond the scope of this review of the general and social service literature. It should be noted, however, that both had considerable impact on cable television regulation and on the shape of the industry itself.

Early in 1970, a consortium of federal agencies, led by the Department of Housing and Urban Development (HUD), requested that the Committee on Telecommunications of the National Academy of Engineering (NAE) study the application of telecommunications technology to urban functions. In mid-1971, the NAE report to HUD, Communications Technology for Urban Improvement [6] was published.

The academy report envisioned the development of four types of basic networks:

1. An expanded telephone network able to transmit pictures, voice, and written material between two points
2. A network based on the conventional "tree and branch" cable system, with a capacity of 30 channels and a limited callback capability for polling or requests
3. A bi-directional, 30-channel cable network interconnecting the major public institutions and large commercial organizations in the city
4. A multi-purpose sensing network to collect data on such items as weather, pollution, and power status

The academy proposed several pilot projects, each depending on the existence of at least one of the four basic networks. The proposed pilot projects included:

a. CITIZEN-GOVERNMENT INTERACTION

This called for the design and demonstration of a Community Information Center (CIS) supplied with video, facsimile, and telephone systems. The CIS would perform two types of functions. First, it would act as a referral facility which would provide citizens with information about where to call or go to receive a needed service. Second, when possible the CIS would satisfy the inquiry request, e.g., provide forms, specific information, or even physical services. The pilot project would concentrate on the first function.

b. EDUCATION

Three educational projects were proposed. The first would explore the effectiveness of various forms of two-way instructional television (ITV) such as audio return channels from small classrooms or polling-type digital response from larger audiences. The second would provide information retrieval services to the schools and homes. The third was the development of computer assisted instruction (CAI) for both software development and widespread distribution.

c. HEALTH

Again, three projects were suggested. The first would examine the medical services that could be provided by existing telecommunications systems. The second would establish and operate telemedicine systems between hospitals and satellite clinics. The third would demonstrate telecommunications for medical care in nursing homes, particularly in relation to geriatric care and the more effective use of paraprofessionals.

d. POLLUTION

This called for the development and testing of sensing devices for remote air pollution monitoring.

e. TRANSPORTATION

The projects proposed dealt with 1) The design and operation of an automated transit user information system, 2) The development and demonstration of an automobile-mass transit interchange station, and 3) A study of the trade-off between communications and transportation.

f. CRIME PREVENTION AND EMERGENCY SERVICES

These proposed projects included the implementation of a 24-hour television surveillance system to help protect citizens from crime on city streets and, in particular, to deter such crimes. The academy pointed out

that the adverse social implications (i.e., invasion of privacy) of electronic surveillance should be fully considered. The report recommended that this use be implemented only on a selective and carefully controlled basis. [6. P.121]

While the report considered network costs in only general terms, some of the proposed projects included personnel, hardware, and software development budgets. Thus, the cost structure of a social service delivery system was beginning to emerge.

While the body of the academy's recommendations focused on contemporary problems, the"city of the future" was also considered. The report suggested an exploratory program to examine how telecommunications might offset the trend toward the greater concentration of population in urban centers. Basing their arguments on the results of several British studies [6. PP. 173-174], the authors concluded that the imaginative use of broadband communications would permit both individuals and institutions to exercise greater choice in their selection of living environments.

Communications Technology for Urban Improvement has had a pervasive influence not only on the literature that followed but on much of the subsequent experimentation. The recommendations for telemedicine projects, for instance, have provided a basis for a number of demonstrations (see Appendix A, Topical Bibliography) and several of the proposed pilot projects served as points of departure for the applications developed in the seven NSF-funded design studies.

The Sloan Commission, in On the Cable [7], made two basic assumptions: 1) That cable technology would not change substantially during the 1970s and 2) That cable development would not be subject to severely restrictive legislation or regulation. In the context of those assumptions, The Sloan Commission ventured four predictions. First, by the end of the decade, most

cable systems would have at least a 20-channel capacity. Second, by the late 70s or early 80s, between 40 and 60 per cent of American households would be connected to the cable, and when the total penetration reached about 20 per cent (about 12 million households), the economic base would be sufficient to provide completely new programs and services.* Third, for the foreseeable future, digital response would compose most of the return signals and would be feasible by the end of the decade and cable systems would be able to form regional or national networks.

On the Cable discussed cable television from a number of perspectives including regulation, programming, technology, and ownership and control. One chapter, "Public Services on the Cable" is of particular relevance to this literature survey, touching, as it does, on social service delivery.

The Sloan Commission distinguished between public services and those determined by the marketplace. Public services, the report stated, are those that "deal with the need to communicate rather than the desire to profit from the by-products of communication." [7. P.97] Cable television had been used for public service programming--notably for health services, employment, consumer education, formal instruction, and community development--but then as now, those efforts were sporadic and no conclusions could as yet be drawn. The large cities, where the commission felt that public service uses of cable would be most valued, were still largely uncabled. The Sloan Commission expected that public service uses would ultimately be established through the method of trial and error.

The Sloan Commission reviewed some applications in detail. Health services were discussed in terms of health care assistance, preventive programming,

* As of 1975, about 10 million households are cabled.

medical practice orientation, and a broad range of community health information. The report pointed out that such programming is unlikely to attract large audiences. The worth of public interest programming, it argued, should not be measured by the size of the audience but by the value of the services to those who benefit from them, against the cost of providing the services.

The chapter also discussed continuing education for doctors, formal education, and closed circuit possibilities. The Sloan Commission believed that the full potential of cable is best exploited by bringing services, information, and entertainment into as many homes as possible. However, it noted that until full use is made of all the available capacity, whole channels may remain empty. Until such time as sufficient programming exists to fill all channels with messages to the public, the unused channels can be used for closed circuit functions such as links between police precincts and headquarters, schools and a central educational facility, or among day care centers. In the long term, however, the commission felt that such uses would be "more economically served by...closed circuit systems...or...point-to-point microwave services." [7. P.109]

On the Cable commented on the National Academy of Engineering's recommendation for an exploratory program to investigate the "city of the future." The Sloan Commission, while impressed with the remarks of Dr. Peter C. Goldmark (chairman of the NAE Panel on Urban Communications), felt that "The sheer size of the capital investment that would be required assures that no such major broadband network is likely to come into being within the decade, or even within the century." [7. P.114]

The chapter also dealt with obstacles to realizing the public service potential of cable television:

1. There was no highly penetrative large-capacity digital response cable system in existence.

2. It was moot whether public service messages would be sufficiently well prepared to command audiences large enough to make the venture worth the investment of scarce resources.

3. There are risks involved with government control of television channels, i.e., cablecasts could become advertisements for incumbent administrators.

Despite those obstacles, the Sloan Commission believed the development of cable television to be worthwhile and that a precondition of the successful development of public service cable is a "coordinated federal initiative, including special funds for experimentation and use...." [7.P.112]

A by-product of On the Cable was a series of 20 background papers developed to inform the Sloan Commission. Four of the papers were included as appendices to the main report. The others were published separately. Two of those, Cable Television and Public Safety [8], by Gilbert Cranberg, and Cable Communications and Social Services [9], by Robert O'Brien are particularly pertinent.

Cranberg discussed a number of ways in which cable television could support public safety activities. Among the potential uses mentioned were:

- Cablecasting the daily lineup of arrested persons, crime scenes, wanted subjects, missing persons, and so on to all officers at roll call
- Police and firefighter training
- High-speed transmission of computerized crime information in digital form
- Video pictures of police reports made into hard copy
- Transmission of fingerprints
- Improving police community understanding through the cablecasting of neighborhood meetings, coupled with citizens' telephoned comments and questions
- Public education to alert citizens on how to avoid becoming victims of crime
- Closed-circuit FM radio merchant-alerts
- Closed-circuit public address system to summon off-duty officers for emergencies

- Closed-circuit connection between the police station and the court to speed administration
- Emergency signalling devices in subscribers' homes to call for aid
- Sending rehabilitation services to jails
- Use by parole and probation officers to address caseloads grouped according to the similarity of their problems, such as drug users

O'Brien's Cable Communications and Social Services examined the social services provided by typical communities and suggested how the use of a broad-band communications network might improve the delivery of those services. He pointed out that 1) A large majority of social service transactions are basically information exchanges, 2) Social services are characterized by labor-intensity, and 3) The rate of increase in the demand for social services has been accelerating and will continue to do so. Thus, the availability of cable television, since it affords a significant increase in communications capacity, should help to reduce the cost of delivering social services both because the technological requirements can be met more cheaply and because it permits an increase in the productivity of personnel.

The paper identified four areas where cable might have impact on social service delivery. They are 1) Providing information to people who could use social services by explaining what services are available and how to obtain them; 2) Providing information directly relevant to the solution of problems; 3) Acting directly to solve a problem, e.g., issuing a Medicaid card; and 4) Managing the service function, e.g., communicating documents or data among institutions.

O'Brien defined "social service" in terms of what it is not. Remarking that the definition is confused by the fact that social services are closely related to other professional services such as education and health, he concluded that social services are "the services of the community 'left out'

of the services provided by doctors, teachers, lawyers, and other professionals." [9. P.1]* He provided a partial inventory of social services (supported by either public or private sources) available in all urban areas:

- day care
- counseling for children with problems
- marriage and family counseling
- addiction and alcoholism services
- temporary homemaker services
- job training and job placement activities
- supportive services of a variety of types for the chronically ill and disabled citizens
- programs for the elderly [9. P.2]

Most of the agencies handling these services, O'Brien stated, devote a substantial part of their resources to the "brokering, arranging, and advocating services...needed to make other institutions more responsive to persons with problems." [9. P.3] The paper went on to say that it is difficult to estimate how much social services cost a community--partly because of the ambiguity of definition and partly because of the great variety of public and private institutions involved. It is safe, however, to estimate that "the total cost of social services is on the order of one-third as much as is spent for school education, and about one-quarter of the amount

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* The definitional ambiguity has some severe operational consequences because the various funding sources award grants and contracts for categories of activities. Ambiguities in definition can lead, on the one hand, to a failure to support worthwhile programs because they don't "belong" anywhere or, on the other hand, to a wasteful redundancy of support where interpreted purviews overlap. Ralph Bledsoe, et al., "Productivity Management in the California Social Services Program," Public Administration Review (Nov./Dec. 1972) p. 802, remark that California has arrived at a good working definition, i.e., "A 'social service' is anything that HEW will match on a three-to-one basis."

which the community spends for health services." [9. P.5] Of the social service functions, O'Brien estimated that at least three-quarters are of a person-to-person and person-to-data communication nature. The technologies currently used to support those functions--e.g., telephone, video tapes and films, computers to store case information--have been primitive compared with the possibilities of cable and peripheral technology.

He envisioned two-way video services as offering the same potential to social services as it has to health services; that is, allowing time-sharing of the knowledge of a specialist among people at different locations, better resource allocation, and allowing remote groups to "meet."

He expected that cable technology would combine with several other engineering advances. The most important of those are:

1. Display and input terminals with associated computers to give a service-user the same type of service information and automatic appointment-making (reservations) that an airline customer enjoys today
2. One-half and one-quarter inch video tape equipment
3. Dial-access audio and video cassettes
4. Scrambling and blocking to permit confidential video transmission and limited-group cable communications [9. P.18]

Based on his analyses of need and feasible technology, O'Brien suggested a model social service communications system for a city of one million. The system would include: 1) One-way conventional cable service to all homes, with the subscription fee subsidized for low income families; 2) A system of forty channels, with five channels devoted to social service use; 3) Fifty "social service centers" (e.g., day care centers, correctional institutions, addiction and alcoholism centers), each with a "head end;" 4) Narrow-band video input devices in about 1,000 homes and work places for the use of severely disabled persons; 5) Ten thousand homes with digital terminals for use by handicapped

persons; 6) Computer-based information, referral and appointment system; 7) A "control and branch library" system that provides either on-demand cable transmission or delayed transmission to viewing centers; 8) Inter-district, inter-city, and regional and national networking of cable systems. [9. PP. 18-21]

O'Brien devoted the rest of the paper to more detailed discussions of specific applications such as day care, services for the chronically ill, handicapped and elderly, community development, and management facilitation.

A major contribution of the O'Brien paper was the cost estimates, however primitive, of social service delivery by traditional means. When compared with the cost estimates for the telecommunications systems, the bases for cost-effectiveness determinations began to emerge.

Charles Tate, in Cable Television in the Cities [10], looked at the medium from the perspective of the black community. He stressed applications that would be of particular use to the ghetto communities (e.g., sanitation information, legal services, rumor control). Like Ralph Lee Smith, Tate saw the ownership of cable television systems as a significant source of revenue. He, therefore, advocated that minority communities develop their own systems through several feasible ownership options: community profit, community non-profit, a combination of profit and nonprofit, private turn-key ownership, and cooperative. The report discussed each option in turn. Tate specifically warned against municipal ownership which might be used as a tool to perpetuate what he termed white control. Tate joined Ralph Lee Smith in his concerns about the potential dangers to civil liberties, stating:

> If the "wired nation" becomes a reality, clandestine electronic surveillance will be greatly simplified. Experiments involving the use of video cameras mounted on poles in the business district of several cities, including downtown Washington, D.C., are already underway. By the use of a central television monitor, one policeman can patrol the entire area

> and alert prowl cars by radio of suspicious activity. This system of electronic snooping is easily transferred to residential areas, apartment buildings and businesses without the knowledge or cooperation of the occupants or owners. [10. P. 37]*

Walter Baer's Interactive Television: Prospects for Two-Way Services on Cable [11] is probably best known for its detailed table of taxonomy of services and technology, which is reproduced in the literature (see P. I-22a). The report also provides, however, an analysis of both whole-system and component costs and technology, projects the time-line for near-term services, and discusses major policy issues.

Baer pointed out that most of the services proposed in the literature are technically feasible with cable television. Many of them, however, are not economically feasible; some of them can be better handled on the telephone network; and some of them might not be socially desirable at all.

In his initial summation of the growth of cable, Baer highlighted the proposed FCC requirement that new cable systems in the top 100 markets have the capacity to provide two-way services. (In 1972 the proposed rule became an actual rule.) He speculated that this capacity might turn out to be a commercial necessity for the success of urban systems. Baer quoted Irving Kahn,**then-president of the country's largest cable system, TelePrompTer, as saying, "Five years from now we'll be getting less than 25 per cent of our cable revenue from the services we're providing today." [11. P. 3]

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* The use of electronic surveillance became an issue in Olean, New York in 1968. See Public Safety in Chapter II.

** Throughout the late 1960s and early 70s Kahn was the leading industry proponent for advanced cable services. His speeches to the National Cable Television Association conventions and his frequently quoted remarks to the press were probably as influential as any of the theoretical literature in spreading the excitement of cable's "blue sky."

Baer argued that the profitability of urban cable systems is of concern to people other than entrepreneurs, stating that "no public benefits can accrue until the community is wired to receive them." [11. P.5]

Baer grouped a wide range of proposed applications according to their technological requirements, arriving at six broad groupings:

- one-way broadcast services
- one-way addressed services
- subscriber response services
- shared voice and video channels
- subscriber initiated services
- point-to-point services [11. P.8]

On the basis of estimations and comparisons of subscriber equipment costs, he concluded that one-way broadcast services, subscriber response services, and shared channel services were the most likely to be implemented for mass home audiences in this decade. The more sophisticated services, like information retrieval and other subscriber initiated services, would be longer in coming.

Baer presented cost data--actual when available, estimated when not--to support his conclusions. He presented a summary of his conclusions in the table reproduced below.

Baer discussed representative applications for each major group in terms of the potential demand and alternate methods of delivery as well as the technological requirements and costs. The report was by far the most comprehensive analysis to appear up to that time. It has been used as a springboard for much of the subsequent development of cable applications.

The report also touched on policy issues--the potential invasion of privacy in particular. He separated that issue into two parts. The first

TABLE 1. CATEGORIES OF NEW CABLE COMMUNICATIONS SERVICES [11, pp. 18-18]

Service Category	Downstream Signals	Upstream Signals	Equipment Requirements	
			Headend Equipment	Subscriber Equipment
I. One-way broadcast services	6 MHz broadcast video channels (FDM)	None, except for local origination which may require one or more video channels from origination points to headend	Additional signal processing and multiplexing equipment; origination equipment	Converter or switch to receive 12 channels
A. Additional channels TV entertainment programs instructional programs coverage of local events local program origination community bulletin board municipal services information (health, housing, welfare, etc.) local ombudsman				
FM radio foreign radio recorded music	200 KHz radio channels (FDM)			
B. Subscription channels movies entertainment programs instructional programs sports and special events			Signal scrambler or encoder	Unscrambler, decoder or special converter
II. One-way addressed services electronic mail delivery newspaper and periodical delivery selective video	Individually addressed wideband signals (FDM or TDM)	None	Information storage facilities; document scanner; address generator; communications controller	Address decoder and logic unit; video tape recorder, facsimile or other recording unit
III. Narrowband subscriber response services	Broadcast video (FDM), plus individually addressed narrowband polling signals (TDM) of 100 or fewer bits	Narrowband response digital data (TDM of 100 or fewer bits from individuals to headend	Central polling scanner, and communications controller (minicomputer); files, displays and other peripherals	Basic control unit (receiver, digital decoder, control logic, digital encoder and transmitter) buttons or keyboard, channel monitor

TABLE 1. CATEGORIES OF NEW CABLE COMMUNICATIONS SERVICES (2)

Service Category	Downstream Signals	Upstream Signals	Equipment Requirements	
			Headend Equipment	Subscriber Equipment
A. Interactive television entertainment programs instructional programs opinion polling remote shopping municipal services information				A. Identification or authorization key
B. Sensor monitoring audience counting alarm monitoring meter reading cable system maintenance				B. channel sensor fire and intrusion sensors meter encoders amplifier and other component sensors
C. C. Control of remote devices alarm sounding utility load control				C. switches and links to controlled devices
D. Subscription television			D. Signal encoder; billing mechanism	D. decoder or special converter; authorization key
IV. Shared two-way channels	Same as III.	III,plus	III, plus equipment to recognize and queue requests, enable and disable subscriber equipment	III, plus
A. Voice response instructional programs entertainment programs community service information special interest group conversations local ombudsman		A. 3-4 KHz voiceband channel(s) (FDM)		A. Microphone, speaker and associated equipment
B. Video response instructional programs remote medical diagnosis neighborhood program origination		B. 4-6 MHz video channel(s) (FDM)		B. Camera and associated equipment

TABLE 1. CATEGORIES OF NEW CABLE COMMUNICATIONS SERVICES (3)

Service Category	Downstream Signals	Upstream Signals	Equipment Requirements	
			Headend Equipment	Subscriber Equipment
V. Subscriber initiated services catalog shopping stock quotations ticket and reservation services information from various directories and references computer time sharing checkbook balancing and other banking services dial-up video library business credit checks	III, plus individually addressed information (alphanumeric message or picture); bandwidth depednent on type of information, but usually voiceband or greater	III, with narrowband (but sometimes 100 bit) response	III, plus source data bases (digital data, pictures, etc.) connected to central controller; billing mechanism	III, plus extended keyboard, local storage (buffer or refresh) and output display device (character generator, strip printer, frame freezing device, video tape recorder or facsimile)
VI. Point-to-point services	Individually addressed, variable bandwidths for data, voice and video transmission; primarily FDM with TDM for data	Individually addressed, variable bandwidths for data, voice and video transmission; primarily FDM with TDM for data		
A. Message-switched services message transmission business transactions computer input/output			A. Store-and-forward processor	A. III, plus buffer storage and keyboard printer
B. Point-to-point circuits high speed data exchange facsimile fingerprint or photograph identification teleconferencing closed circuit TV videophone			B. Equipment to set up private or multiparty channels	B. Data, voice, and video terminals as required; special frequency converters and associated logic for channel selection

consideration was how a signal addressed to a single individual or group will be denied to others (e.g., electronic mail delivery). He concluded that the remedies would be the same as those applied to other communications channels--a combination of legal and technical safeguards.

The other consideration was the potential invasion of privacy arising from the data about an individual that can be accumulated through subscriber response services. For instance, with automatic polling and recording equipment, a data file on each subscriber can be amassed. Baer surmised:

> There seems no way to avoid the conclusion that cable television response services could be used to generate sensitive data on individual subscribers and households. [10. P.83]

He suggested that wide public discussion is the best way to ensure that new cable services will be developed in the public interest.

4. 1972:

Both the cable industry and the cities themselves were anticipating the relaxation of FCC restrictions on the importation of distant signals to the major markets. At least five municipalities within the top 100 markets had begun studies in preparation for the arrival of the cable. In 1972 the restrictions were relaxed to permit the importation of two distant signals. The same year, the five studies--commissioned by or on behalf of the municipalities--were published. They were: Detroit (the 5th largest market); Washington, D.C. (9th); Cincinnati (17th); Dayton-Miami Valley (41st); and Jacksonville, Florida (68th). The large urban centers were beginning to explore their stake in cable.

In 1971, Detroit's Common Council created the Cable T.V. Study Committee, composed of 27 representatives of various ethnic groups, the business community, public agencies, labor organizations, and religious and educational institutions. The committee members themselves were not familiar with cable

television and therefore held a series of briefing meetings with experts in the field and with the public at large. In this series of meetings the committee introduced cable to the citizens of Detroit, and solicited opinions about the future of cable in the city. In 1972 the results of the committee's deliberations were published as Cable Television in Detroit: A Study in Urban Communications.[12] In it the committee stressed that the potential of cable lay beyond commercial purposes. The medium offered services that would respond to such urban needs as communication among geographically separated communities of interest, municipal administration, and educational outreach. Given the potential of cable television, it was imperative that the city ensure those services for its citizens.

The committee felt that the public services should be provided at the inception of the cable system. However, because of the huge capital investment required (estimated at between $30 and $120 million), and because of the time it would take to develop a profitable penetration level, the system would operate at a loss for several years. Thus, it was not realistic to expect that a commercial operator would provide the public services advocated. Therefore, the system should be publicly owned and managed by an authority created for that purpose. Special purpose bonds would be sold to finance the initial construction and operation during the early unprofitable years. The debt would be repaid from profits earned as the system developed. The committee further recommended that the city declare a moratorium on any further action until an engineering and financial study was done to investigate the practicality of its (the committee's) recommendations.

Unlike the city-created citizens study committee of Detroit, the Washington, D.C. study was commissioned by an outside organization, the John and Mary Markle Foundation, and performed by the professional personnel of the MITRE

Corporation. The study was reported in Urban Cable Systems. [13] Using Washington as a sample site, it was meant to serve as a prototype for urban centers in general.

MITRE designed a system with two overlapping networks, similar to the two cable networks envisioned by the National Academy of Engineering. One, the public telecasting network would consist of two cables. The first cable would be activated immediately for the delivery of one-way services. Later, after a body of knowledge and experience was accumulated through a program of demonstrations and tests, the second cable would be activated for the delivery of subscriber response services. Still later, when terminals and program materials were available, the second cable would carry electronic information handling services, giving subscribers direct individual access to output from high-capacity computers.

Four point-to-point networks were to overlap the telecasting network. One network would interconnect federal offices, another would interconnect the municipal offices, a third would link business and commercial users, and the last would connect institutions of higher education. Signals originating at any point in these networks could be transmitted to any other point.

The telecasting and point-to-point networks would be interconnected so that material originated anywhere on a point-to-point network could be transmitted over the telecasting network.

MITRE discussed the levels of service from the standpoints of engineering design, technological requirements, whole-system and component costs, potential demand, and the services to be offered. It was expected that the system would be built over a five-year period, with services expanding in steps during that time.

Visions of Cablevision [14] was the product of one man, Robert L. Steiner, the retired president of a major toy manufacturing company. The study was commissioned by the Stephen M. Wilder Foundation. Its primary purpose was to provide forecasts and recommendations for the benefit of the Cincinnati Cable Task Force.

Steiner began his report with a summary of twelve common "visions" of cable television. These were:

1. Cable promises a quantum jump in access to knowledge.
2. Cable offers the most promising solution to the difficult communications problems facing the cities.
3. Cable will provide a cornucopia of special interest, public interest, educational, institutional, and commercial services, flowing on a bi-directional system.
4. The more "narrowcasting" (special interest programming) offered by the system, the more subscribers will sign up.
5. The "more of the same" (sports, movies, entertainment) offered by the system, the more subscribers will sign up.
6. Unless the privacy issues are understood and faced, 1984 may come in advance of George Orwell's predictions.
7. Municipally constructed and owned systems will ensure public interest development of the medium and return a financial reward.
8. Minority owned and operated cable systems will give blacks a needed second chance at gaining a voice on the public media.
9. Urban cable systems will be either machines to print money or hopelessly unprofitable; predictions differ as to whether profitability will be achieved only with the introduction of futuristic two-way systems or if futuristic systems will prove too expensive to be practical.
10. Pay TV will drive the existing broadcast networks out of business.
11. Cable television will provide the means for conserving natural resources while still improving the flow of service and consumer needs.
12. So many services will be offered to the home subscribers that people will virtually never have to leave their terminals.

After reviewing the various--and sometimes conflicting--"visions" of cablevision, Steiner excused himself from offering a vision of his own, stating that there are not enough cable systems in the major markets to permit predictions based on observation. He did not believe that there would be sufficient observable systems until about 1977. He therefore based his recommendations to Cincinnati on the premise that futuristic two-way and computer services would not be important components of Cincinnati's early cable system. Thus, a system should be built that would deliver the full range of one-way services, but that

> It would be unwise to place an extra financial burden on the cable operators and higher subscriber fees on the public by opting for a more elegant or higher capacity system, given the rapid pace of technological improvement and the vast unknowns concerning cable television in the major markets. [14. P. 110]

Steiner enumerated full one-way service as being 1) Broadcast retransmission; 2) Local origination by the cable operator; 3) An educational channel; 4) A municipal channel; 5) A public access channel; 6) Channels for FM radio; and 7) Channels available for lease by private groups, institutions, and entrepreneurs on a first-come basis. In order to ensure that a Cincinnati system would have the capacity to deliver these services, Steiner recommended a dual cable system with a forward capacity of around 50 channels plus return capacity. He did not think that the second trunk should be activated immediately but that, assuming reasonable plans for utilization, it should be seriously considered as an institutional network serving schools, hospitals, and other public institutions.

Despite Steiner's skepticism about the near-term advent of two-way cable, he summarized the potential interactive services, basing his summary on MITRE's Urban Cable Systems. And, despite his feeling that conclusions

cannot be drawn from the experience of a small number of urban systems, he presented two case studies, Akron and Canton, Ohio, concluding that Canton's relative financial success can be attributed to its "grandfathered" status which enabled it to import the distant signal that carries the Cleveland Browns football games.

Steiner discussed the allocation of channels for educational and medical purposes from the point of view of the economist.

> There is no demand unless there are buyers willing to purchase the output at prices which at least cover the cost of production. Unlike the demands for cable service heretofore discussed, it is apparent especially for educational services, that users will require public funding on some basis before they can exert effective demand. The extent, therefore, to which cable channels are allocated for these purposes is a function of a community's priorities, rather than the buying decisions of homes and businesses.
> [14. P. 74]

He went on to point out that two closed circuit systems already exist in the Cincinnati area. The University of Cincinnati Medical Center is linked, via bi-directional cable to five hospitals, two colleges, and three other institutions. It is used for student training and for continuing professional education. Steiner felt that interconnecting this closed circuit system with an area-wide cable system would enhance its effectiveness. More importantly, he felt that the interconnection will come to pass since "...as a group, doctors will pay for what they require!" [14. p. 75]

The other closed circuit system in the Cincinnati area is the Norwood, Ohio school system network, interconnecting 10 public and parochial schools. Steiner was less sanguine about the marriage of education and cable than he was about the medi-cable union, remarking:

> Two nagging doubts becloud this happy vision of coaxial bliss. Will the educational boards and institutions really produce first rate, saleable plans in time? Even if they do, where is the money coming from? [14. P.77]

Steiner also discussed the potential invasions of privacy inherent in the growth of computerized two-way services. He noted that the computer could scan and record what each subscriber was viewing and, moreover, could record the nature of individual subscriber responses to polls. He warned that such information could be used by unscrupulous politicians to discover which friends to reward and which enemies deserved punishment. [14. P.96]

The importance of Visions of Cablevision lay in its ruthless realism. The conflicting predictions of the social theorists were laid out for purposes of contrast. The confident technological statements of the engineers were greeted with the implicit question "Who is going to make it work?" [14. P.23] And the increasingly comprehensive cost studies were subjected to the question "Who is going to pay?" Those three concerns, i.e., the social implications, the technical uncertainties, and the economic realities, have assumed major importance in both the subsequent literature and in franchising and regulatory deliberations at all levels.

Cable Communications in the Dayton-Miami Valley [15] is similar to MITRE's Urban Communications in that an independent research organization, The Rand Corporation, was commissioned by outside agencies, The Ford and The Charles F. Kettering Foundations, to study the potential of cable communications in an urban area.

However, Rand took a very different approach than MITRE. First, Rand considered a regional system in which six cable systems would interconnect 13 incorporated cities in the Dayton metropolitan area; second, 11 local committees, ranging from a Citizens Advisory Committee on Religion to a Technical-Engineering Committee, worked with the Rand researchers in preparing the final report. The basic report itself consisted of 10 individually written papers grouped into three areas: 1) Technology and economics; 2) New

and expanded services, and 3) Franchising and ownership. Where appropriate, alternative options are explored and recommendations made.

The papers of special relevance to this review are those dealing with new and expanded services; in particular "Cable Television and Public Interest Programs," by Robert K. Yin, and "The Potential Uses of Cable in Education and Training," by Rudy Bretz.

Yin's paper pointed out that the potential for public interest programming was far ahead of its actual production. Program diversity, he said, does not necessarily increase significantly as the number of over-the-air television stations operating in a given market increases, and regulation may be needed if greater diversity is to be ensured--even in the case of cable television. Yin thought that the situation might be mitigated in the case of cable "since cable provides better quality television reception and entails lower costs for producing programs than UHF television." [15. PP. V-8-9]* Yin also pointed out that historically public interest programming has not been automatically included in cable television programming. He stressed that if cable is to be used effectively for that purpose, the local community should assess its needs for public interest programs--an assessment that might include a review of over-the-air broadcast, and a survey of television viewing habits and attitudes toward television.

* This mitigating factor does not necessarily exist. There is nothing inherent in cable technology that permits lower production costs. It is simply a function of regulation, choice, and unionization. First, the FCC requires higher standards for broadcasters than for cablecasters. Second, broadcasters in general do not feel that minimum quality production will attract sufficient audience. Thus, they eschew the porta-pak for more sophisticated and more expensive production equipment. Third, broadcasters are tied to more expensive union labor. While some cable systems have unionized studio crews, most do not. It is entirely possible that the cost differential between "broadcast quality" studio production and cablecasting may disappear as cable origination matures.

Yin then discussed possible public interest programming for the Dayton area, basing his suggestions on the potential of cable to improve existing services. The programming discussed included:

1. Ombudsman. The main function of the ombudsman is to act in the interest of private citizens in their dealings with government. Cable television would enhance the ombudsman's ability to communicate with the public and might encourage the development of a multi-ombudsman program, each oriented toward specific neighborhoods.

2. Information and Referral Service. As in the case of the ombudsman service, information and referral might increase communications capability.

3. Public Health Education. In particular dental health education and education for expectant parents were discussed.

4. Special Interest and Neighborhood-Focused Programs.

In this section, Yin included a list of potential programs being studied by the Joint Office of Citizens' Complaints:

- Leadership development programs in the ghettos
- School board and city commission meetings
- School-community meetings
- Meetings and training sessions especially for dealing with conflict situation
- Encounter groups with the police force
- Programs devoted to explaining municipal and agency services and actions
- Public education for home maintenance, health and sanitation, money management, and credit responsibility
- Interagency case conferences [15. P. V-22]

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* In another basic report paper, "Television and the Dayton-Area Resident: The Results of a Public Opinion Survey," Yin presented the results of a viewing habit-attitudinal survey taken by Rand in the Dayton area.

Much of the discussion in Bretz' "The Potential Uses of Cable in Education and Training" is beyond the purview of this paper. In regard to in-school use, it is sufficient to note here that Bretz recommended an educational network that would interconnect clusters of schools. Each cluster would have its own sub-network wherein schools, with their own local origination studios, could share resources. Central switching points would permit the sharing of programs among clusters. The system could also be used for on-demand film or tape presentations and for in-service training. Bretz also suggested a program for homebound students.

Bretz' discussion of adult and career education is more directly pertinent to a review of the general and social service literature because of its overlap with employment-related social service programs. Bretz pays particular attention to courses offering credit toward a high school diploma. Drawing on material presented in the earlier Rand report, Telecommunications in Urban Development [3], the paper suggested a schedule for a high school equivalency course. Also discussed are home or industrial plant-based courses for vocational retraining. Bretz described the over-the-air experience of Chicago's TV College and Germany's Telekolleg. He also discussed the possibility of using cable for non-television uses such as slides, facsimile, and radio signals.

The Cable Television Information Center's (CTIC) study for Jacksonville, Florida, Cable Television: Options for Jacksonville [16] was similar to the Detroit study in that it was initiated and supported by the local government. Like the Dayton-Miami Valley study, the research was undertaken by an outside, professional organization with the extensive participation of local community groups. The Jacksonville study was a joint effort by CTIC and the city, with each organization supplying a project director to coordinate its role in the project.

The report itself did not make recommendations, but explored alternatives in terms of the level of service possible; the options of a single system or multiple zones; and the choice of private or public onwership. Each alternative was discussed in detail and the financial projections for various combinations of alternatives were assigned probability rankings.

Like Steiner's report on Cincinnati, the Jacksonville study is specific to a given city. Again like Steiner's report, many of the results are generalizable. In particular, CTIC developed a procedure for use by municipalities as they make the policy decisions relevant to cable television. [16. PP. 206-216]

The Jacksonville report contained an extensive discussion of the uses of cable. While pointing out that the vast channel capacity of cable provides a unique potential for serving individual or special interests and needs, the report cautioned that "far more is being researched, considered, and discussed than is yet being attempted." [16. P.37] The report went on to discuss cable's potential for delivering commercial services. The entertainment section discussed local origination, pay TV, interconnection, and networking. CTIC saw the entertainment possibilities as feasible and likely to materialize quickly. However, it noted:

> Further away are more exotic services offered at a fee to businesses and public institutions. Eventually cable may provide data distribution and handling of services for businesses and institutions...All of this is possible, and is part of the vague and futuristic image evoked by the term "the wired city." But technology, economics, and the absence of established markets make forecasting the development of such services a risky venture indeed. [16. PP. 41-42]

The report also discussed cable television as a delivery system for public services, making the distinction between public information programming (e.g., informing the public of the availability of services or eligibility requirements)

and service delivery itself (e.g., training of paraprofessionals or telemedicine). CTIC concluded that:

> Programming which directly affects how a public institution delivers services is more difficult to develop--[than information programs] generally more elaborate, seeming to require more complex equipment and advanced technology. [16. P. 57]

The report pointed out that three barriers exist to the development of cable's possible public benefits:

1. Not everyone will subscribe to the system.
2. Two-way services--which seem to have great public possibilities--will be activated on a large scale only upon evidence that they can make money.
3. Implementation of two-way service requires expensive terminal equipment in the homes of subscribers. [16. P.68]

The report suggested that Jacksonville consider the possibility of establishing community information centers as a means of solving those problems.

The five municipal reports, taken together, consolidate and elaborate on much of the preceding work. They also represent some significant differences from the bulk of previous approaches. First, they discussed cable television in the context of the real needs of real cities. Second, an increased skepticism about the near-term arrival of the advanced technology was voiced. Third, several types of working relationships among research organizations and service agencies were tried. Fourth, the question "Who will pay?" surfaced as a major issue. And fifth, the modus operandi for decision making began to develop.

Nineteen seventy-two saw several other publications of interest. The Yale Review of Law and Social Action devoted an entire issue to "The Cable Fable." [17] In the title article Kas Kalba asked the rhetorical question, "...can we apply a social development model to this new technological phenomenon or must we be subject solely to the traditional exigencies of hurried economic growth?"

[17. P. 198] If the former is to happen, Kalba said, three steps are necessary:

1. A process of disseminating information about cable and of citizen participation in related policy decisions must be instituted.

2. We must improve our experimental and predictive capacities about cable technology. For example, be able to predict whether remote shopping will further undermine the interdependence between city and suburb.

3. Specific policy instruments, including positive regulation and financial support, should be applied where the application of cable technology clearly serves a public purpose.

In another article, "The Coaxial Wiretap: Privacy and the Cable" [18. P.282], Jerrold Oppenheim stated his concerns about cable's potential for the invasion of privacy. Conceding that telephone subscribers are subject to the same risks of privacy invasion, Oppenheim made two points: First, telephone subscribers should also be protected from wiretaps; and second, the cable subscriber may come to depend on his new instrument for functions (e.g., medical examinations) that the telephone cannot perform. The article recommended both technological and legal protection.

In Policy Sciences, Amitai Etzioni published "Minerva: An Electronic Town Hall," [19. P.457] in which he specified an electronic technology that would permit masses of citizens to have discussions and reach group decisions without leaving their homes. Etzioni stressed that his town hall was more than a simple public opinion poll, stating:

> One attribute of the system that is considered essential if it is to have the said consequences, and which should be highlighted because it deeply affects the design of our system, is that dialogue among citizens and between them and their leaders precede the polling of views. The system being sought is one of mass dialogue and response, not one that merely tallies votes. [19. P.459]*

* The subject of polling is discussed in relation to several of the NSF-funded studies in Chapter III, and in policy terms in Chapter IV.

Etzioni would accomplish this by dividing the citizenry into small groups which would send delegates to a larger forum, and so on until the entire society was engaged. Each group would utilize a specific, optimum technology in its discussions.

1. For small groups (up to 30 persons), via automated telephone conferencing;

2. For small communities (300-2,000 persons), via two-way cable TV, where available;

3. For intermediate communities (6,000 to 40,000 persons), via a combination of radio or over-the-air TV with regular telephones;

4. For still larger entitites, including national and international ones to be referred to as societal entities--via networks that link the communication systems of intermediate communities: cable, microwave, TV relay stations, or satellite. [19. P. 461]

Two further 1972 publications should be mentioned--McLaughlin's Educational Television on Demand [20] and Gailitis' The Costs of Information Retrieval Television.[21] In 1968, an information retrieval television (IRTV) system was installed in several public schools in Ottawa, Ontario. Each classroom had a private-line telephone and a television monitor connected by coaxial cable to an originating center. A teacher could call the originating center and request a particular program (almost 3,000 films or tapes were available). The librarian at the center would tell the teacher on which of the system's 12 channels the program could be received and when it would be transmitted. If necessary, transmission could start within a minute of the teacher's initial call.

The experiment underwent extensive evaluation by the Ontario Institute for Studies in Education (OISE) and in 1972 the results were published. McLaughlin's conclusion was that at present

> The costs of IRTV are out of proportion to the benefits that can be expected from the system in the near future.... In order for IRTV to come into its own, there will have

> to be a change in three important conditions. First, cost reductions must be achieved to enable IRTV to compete with other media in a cost-conscious educational environment. Second, enough programmes of the right kind will have to be made available; at present, neither the quantity nor quality of available programmes is sufficiently high for IRTV to be utilized effectively. Finally, new means of using IRTV will have to be employed to take over some instructional tasks so that the teacher is productively occupied elsewhere while television is in use. The potential of television as an educational medium is indisputable, particularly in the case of a system such as IRTV, but new concepts of use will have to be developed if it is to fulfill this potential [20. P.143]

The in-school uses of cable television are beyond the purview of this paper. However, since dial-access retrieval systems appear so frequently on lists of social and public service uses, the two OISE reports are useful additions to the social service literature--even given the caveat that the operating environments would be substantially different.

5. 1973:

Two major publications of 1973, Cable Television Information Center's The Uses of Cable Communications [22], and Walter Baer's Cable Television: A Handbook for Decision Making [23], were continuations and generalizations of the process that was evidenced in the municipal studies the year before. Both were designed to provide local officials with bases for decision making. The CTIC publication was directed specifically at how the technology could be used. Procedural and regulatory matters were covered in the context of ensuring optimal use of the system. After discussing the services that could be provided on the FCC mandated channels (i.e., local origination, public access, educational access, local government access, and leased access), The Uses of Cable Communications went on to discuss the future of two-way communications.

Examining the then-existing prototype systems,* CTIC concluded that they were all focusing on new subscriber services--that is, services that can be provided by two-way communications between the headend and subscribers. Using the taxonomy developed earlier by Baer, the subscriber services were divided into subscriber response and subscriber initiated services. Like Baer, CTIC expected that the development of subscriber initiated services would take considerably longer than response services.

CTIC then went on to discuss the other category of two-way communications, institutional services, in which contact with subscribers is not only unimportant but, in some cases, undesirable. Institutional services, according to CTIC, are less compatible with conventional system design than subscriber services because first, there may be substantial requirement for "point-to-point" communications (e.g., among schools), and second, there may be as much information flow in one direction as another.[22. P. 38] CTIC noted that virtually no cable systems had been designed with institutional services in mind and advised local officials to consider such services during the franchising process so as not to foreclose their development.

> In many localities, particularly those where undergrounding of cable is required, the installation cost of a cable system is so staggering that almost any alternative is preferable to having, in effect, to dig up the community twice. Here the provision of extra cable (even three and four spare cables in some instances) may be a wise expenditure. If, however, such spares are intended for public services in the future, it appears equitable that local government be prepared to underwrite the incremental costs rather than expect them as a gift from the franchisee. [22. P.44]

The institutional services described in The Uses of Cable Television included interactive educational uses, such municipal services as hospital interconnection, pollution monitoring, and manpower training, and business

* It should be noted that none of the systems examined advanced beyond the prototype stage.

uses such as computer time sharing. The institutional services explored are similar to those described in the bi-directional network proposed by the National Academy of Engineers [6] and the point-to-point nets of MITRE's Urban Cable Systems.[13] The importance of The Uses of Cable Television lay not so much in its development of particular applications but in its specific recommendations to local officials regarding the use of cable for entire classes of applications.

Cable Television: A Handbook for Decision Making provided a summary of virtually everything that preceded it. The handbook contained a detailed discussion of cable technology, economics, and ownership options. Several chapters were devoted to decision making and franchising procedures. The last part of the handbook was concerned with public services. Baer pointed out that cable offered three principal advantages over other communications links, i.e., large channel capacity, private channels as a means for audience selection, and eventual two-way interaction.

After exploring some possible public service applications (e.g., in-service training of police and fire fighters, community information centers), Baer listed several problems associated with implementing public services on cable:

1. Almost all of the new applications will require additional local expenditures, particularly for programming. Few, if any, will yield long-term savings; ...

2. Many applications will not dramatically improve municipal services. They may improve communications between municipal officials and citizens, and make public services more accessible, but improving the services themselves is more difficult.

3. To be effective, municipal information and services must reach people who may be difficult to reach by cable television....

4. Most proposed new applications have not been tested....

5. Some of the most useful cable television applications depend on the development of two-way interactive services....

6. Many services can be carried better or more cheaply on other communications media....

7. The uses of cable television for municipal services will raise controversial social issues. Privacy questions raised by video surveillance systems are a prime example.

8. The use of cable television for municipal services inevitably will produce unforeseen secondary consequences....[23. P.169]

Baer ended the handbook with a look toward cable's future, discussing the possibilities of regional and national interconnection, cable as a common carrier, and the question of privacy, saying that "some balance must be sought among privacy, ease of use, and cost." [23. P.175] Baer briefly considered the social impact questions raised by Kalba [17]:

> How would pushbutton voting via a two-way cable system affect the political process? Do we really want immediate, quite possibly impulsive, electronic referenda on sensitive local and national issues, instead of our present inefficient but more deliberate procedures? Could public access inspire too much localism and create new, electronic barriers as ethnic and racial neighborhoods become absorbed with their own affairs? Might the notion of community be lost in a Babel of diverse voices? [23. P.178]

Baer's handbook was a tour de force of comprehensiveness and clarity. With its publication, local decision makers had in hand a powerful aid in developing cable television when it came. The unanswered question was "Would it come?"

6. 1974

Many of the major cities had begun to explore cable's potential (e.g., New Orleans, Louisiana; Portland, Oregon; Minneapolis-St. Paul,

Minnesota) and by 1974 explicit procedures, forming a basis for municipal decision making, had been formulated. Two 1974 publications, CTIC's Local Government Uses of Cable Television [24] and the Johns Hopkins Cable Project's Municipal Service Applications for Baltimore City [25] narrowed the focus of decision making. The former publication recommended general procedures to determine whether a city should activate the local government access channel on an existing cable system. The latter publication explored "the prospects for public participation in ownership as a means of subsidizing....a cable system in [Baltimore]" [25. P.1]

Not nearly as much progress had been made vis-a-vis the federal program. However, in 1974, the Cable Report to the President [26], extending and reappraising the material contained in the Rostow report, was issued.

A fourth significant publication, Walter Baer's Cable Television in the United States--Revolution or Evolution? [27], was published by the Rand Corporation. Baer's work provided an assessment of the "entirely new range of communications services" and a realistic prognosis of the possibility that cable operators would develop "innovative and diverse forms of public interest programming."

Local Government Uses of Cable Television was the result of participant-observer research performed with the Arlington County, Virginia Task Force. The resulting publication provided generalized answers to specific

questions that arose during the task force meetings. The booklet contained a "laundry list" of contemporary local government cable programming and included a model program schedule. Cost data concentrated on studio and operating expenses rather than construction and headend costs. Procedures, running from the initial study phase through program evaluation, were detailed. Questionnaire forms for equipment and departmental needs surveys were suggested. The Local Government booklet was a sharp departure from the body of literature preceding it. Concentrating entirely on the broadcast-like capability of cable television, it was a tacit recognition that, barring the unexpected, the vast majority of municipalities would not utilize interactive cable television in the near-term.

Two other 1974 publications by CTIC explored a new topic--interconnection of cable systems to form a regional network. The primary motivation for regionalism is that the number of subscribers in any one cable system is often insufficient to justify special purpose, e.g., social service programming, but the combined audience formed by interconnecting cable systems might justify the special purpose programming. The CTIC publication, Cable Television Interconnection, was a general discussion of the problems and benefits of interconnecting local cable television systems.

The second CTIC publication, Planning Interconnection Systems: Options for the Twin Cities Metropolitan Area, was a specific discussion of the possible uses and costs in the Twin Cities, Minnesota area. Included in the report is a list of almost 50 possible uses suggested by organizations in the Twin Cities area. The report produced detailed communication cost estimates for providing the suggested uses. While the cost estimates are specific to the particular plan, they can be generalized to form a sound basis for preliminary

communications cost estimates of other projects.

The Hopkins Cable Project report was both narrower and broader than the CTIC publications. Hopkins was broader in the sense that it considered city investment in a multi-channel system and applied sohpisticated economic techniques to an examination of a wide range of municipal uses including extensive interactive applications. Hopkins's approach was narrower in the sense that it considered only currently delivered municipal services and did not touch on services that the city departments would like to deliver if an appropriate delivery system were available.

Given the extensive municipal financial investment envisaged by the Hopkins Cable Project, the limitation on expansion of services was necessary since:

> In our view...continued pressure on the fiscal resources of the City makes it extremely unlikely that a technology which offers new ways to spend more money will be seen as an attractive municipal tool. Rather, the emphasis must be on ways to sustain current commitments in the face of continued inflation and stable labor productivity in the public sector. [25. P. 149]

The Hopkins team examined 16 potential municipal applications of cable television and concluded that, on the basis of annual yearly cost savings, only five of those applications would be cost effective (see Table 2 below). The aggregate cost saving, however, would not be sufficient to justify a projected municipal investment of over $50 million in a cable system.

The Hopkins report noted that 1) Benefits accruing directly from cable were, in general, improvements in the internal operation of city agencies rather than in direct client relations; 2) Many identified benefits were private in the form of cost or time savings to individuals currently paying for services; and 3) Alternative technologies, such as the telephone, can provide nearly all the same benefits at lower cost. [25. P. 151] The report

TABLE 2. POTENTIAL MUNICIPAL SERVICE APPLICATIONS OF CABLE TELEVISION EVALUATED FOR COST-EFFECTIVENESS IN BALTIMORE CITY [25, P. 150]

Fire Department	Education	Health Services	Social Services & Housing & Community Services
1. Fire alarm comms.	1. Instructional television	(*)1. Remote lab analysis	1. Linkage of DSS neighborhood centers
2. Reception-dispatching	*2. Computer-assisted instruction: for Baltimore public schools, private schools, and colleges	(*)2. Continuing medical education	2. Internal communications, HCD
*3. Training		3. Tele-consultation	3. Direct client information, DSS and HCD
		*4. Tele-clinics	
		*5. Public health information	
		6. Patient records	
		7. Medical libraries	

* Major cost-effective applications....(*) indicates primarily private benefits.

noted, however, that the results of the Baltimore study could not be generalized to other locales since, first, it was based on services already offered in Baltimore--other cities may offer other services, and second, it considered cost savings only to the city of Baltimore, excluding savings that might accrue to other governmental units. For a model justifiably to take the latter point into consideration, it must be assumed that the concerned governmental unit (e.g., the Maryland State Department of Education in the case of a widespread adult education program) would share the cost of the cable delivery system. The Baltimore study was not based on that assumption.

The Cabinet Committee's Report to the President [26] was the result of deliberations begun in 1971. At that time President Nixon directed a committee consisting of three cabinet members, two presidential advisors, and chaired by the director of the Office of Telecommunications Policy, to develop proposals for a comprehensive national policy on cable communications. The report contained 12 specific recommendations under the titles of 1) Industry Structure: Distribution; 2) Industry Structure: Programming, 3) Institutional and Jurisdictional Framework for Cable Regulation; and 4) the Consumer and the Cable. In toto, the recommendations strongly urged de-regulation, particularly at the federal level, with the exception that strong legal and technical safeguards be retained to protect individual privacy; and that there should be assurance that cable service (or a surrogate) be guaranteed to residents of rural areas and to the poor.

The committee explicitly stated the interest of the federal government in the medium. The report noted that cable is potentially more than an extension of broadcast television. However, if it is to develop to its potential, the technological innovations cannot be left to chance and their adverse effects "regulated away." Such a policy would endanger the full

flow of diverse information and ideas. Thus, the overriding national interest in freedom of expression dictates a "far sighted policy for cable technology on the Federal level..." [26. P. 14]

The report rejected ad hoc regulation on the one hand and, on the other, the earlier Rostow Report's expression of faith that subscriber dollars would provide a positive incentive for cable operators to develop extensive and varied public interest programming.

The committee proposed that, in order to optimize the possibilities of both technical and public service growth of the medium, a systematic demonstration program should be begun. The program should involve all layers of government, professional groups, and the cable and electronics industries.

> We are concerned that relying solely on the commercial marketplace for the development of cable services may cause commercial applications to outstrip the development of public services. Unless cable's use for public services is thoroughly explored and developed early in cable's growth, the introduction of such services may be greatly delayed or thwarted....
>
> The Committee believes the Federal Government has a responsibility to help identify the public services that can best be provided via cable communications and to evaluate appropriate privacy safeguards. The Committee has concluded that the most effective way to achieve these objectives would be through a Federally-supported effort. [26. P.59]

The committee did not spell out particular demonstrations. It did, however, mention such examples as adult education courses, public health information, storage and retrieval of government information, and monitoring air pollution.

Baer, in Cable Television in the United States--Revolution or Evolution? did not agree with the Cabinet Committee that cable's growth trends would "continue or even accelerate." He pointed out that the American mood had swung from "unreflective optimism to...downright pessimism about the future

of cable." Baer himself displayed a reflective optimism, predicting that "The communications revolution promised by cable has not been thwarted, but rather slowed to a more evolutionary pace." [27. P.2]

Baer based his more cautious stance on the fact that future cable growth must take place in the major population centers where "construction costs are high, competition with broadcast television keen, and government regulation more restrictive....Even a 25 per cent estimate for cable penetration in 1980 may be too high." [27. P.4]

That Baer expected cable to grow even at an evolutionary pace was based on its three principal technical advantages over broadcast television. They are 1) The dramatic increase in the number of television channels; 2) Cable's ability to restrict audiences for specific channels or programs; and 3) The potential use of cable for two-way communications.* Baer pointed out, however, that formidable engineering obstacles remained in the way of progress toward two-way delivery. Overcoming those obstacles will be expensive. And, he said, "The U.S. cable industry...today does not project sufficient revenues from two-way cable services to justify this added investment in two-way facilities." [27. P.8]

"One way to break this...barrier, " he went on, "would be to provide public funds for the development of two-way cable services." [27. P.8]

Baer then discussed four general categories of cable service: 1) Specialized television programming, which he maintained could only develop along with the economic support of pay TV; 2) Local television (e.g., public access) which may redress the imbalance between local and national television

* The first advantage, the increase in channel capacity, permits local governments, for instance, to cablecast informational programs. The second advantage, the ability to restrict audiences, permits the use of cable for pay TV. The potential of two-way communications is now being explored by several federally-funded programs.

production, but only if training, organization, technical assistance, and promotion are available to it; 3) Commercial services which must develop in competition with similar services offered by AT&T among other services; 4) Public services including applications to education, health care delivery, and various municipal functions including the televising of local government activities, in-service training, information programming to the home ("...cable's development on a commercial basis may mean that low-income families, who presumably should benefit most from this information, will be among the last to subscribe" [27, P. 15]), neighborhood information centers, and communications among government agencies.

7. 1975:

The two major questions confronted in 1975 were "What went wrong?" and "Where do we go from here?"

Anne W. Branscomb, in an article in the Journal of Communications remarked that:

> The cable industry was oversold to itself, to the public, and to the investment community. What started as a simple extension of antenna capacity to receive or improve television signals became the communications utility of the future, the umbilical cord through which every person would be plugged into the world. A communications revolution of two-way interactive cable, it was predicted, would bring the dawning of a new day of the individualized computer terminal through which all citizens would communicate with their peers, merchants, banks, elected representatives, libraries, investment counselors, and doctors, as well as receive a smorgasbord of specialized choices from the entertainment media. [28. P.46]

She speculated that "blue sky" was dreamed, in the main, by scientists and philosophers--not by the pole climbers and television salesmen who put the industry together. Cable television, she said, is a "mom and pop" industry with real, rather than contrived, financial difficulties.

Exacerbating the problems caused by the industry's limited vision, Branscomb said, was a three-tiered regulatory system "which can only be described as excessive" [28. P.50], that saddled a new technology with too much public responsibility before it was able to develop the economic base necessary to sustain such public commitments. "If the public wants to participate in the message," she remarked, "then the public...must be willing to pay the price in time, energy, and allocation of financial resources...." [28. P.55]

Another writer, W. B. Jones, summarizing the state of "Telecommunications in Urban Public Services" for the IEEE Transactions on Communications, [29] pointed out that the constraints on the near-term development of broadband bi-directional communications systems included the lack of adequate financing ("Although once thought to be the most lucrative market, the larger areas are now seen as problematic" [29. P. 18]), lack of public interest, the perceived threat of certain applications to persons in positions of power ("Given resistance to open-meeting rules in some quarters...it is unlikely that there will be a universal embracing of the proposal to televise...political decision-making arenas--especially ones which might allow audience participation" [29. P.18]), and organizational inertia. ("Immediate crises usually demand attention ahead of planning and innovation".[29. P.18])

Jones felt that because of the conflicts between some political interests and some public interests, the public could not depend completely on political leaders to represent the public interests. The broadband communications systems of the future, he said, would not be "created by engineers alone, or by businesses, or municipal governments, or federal bureaucracies, but by all of these, and others, acting together".[29. P. 19]

Roman Mrozinski, in the Cable Handbook [30], cited a number of reasons for the slowdown in cable's subscriber growth rate.* These included the downturn in the economy, the overselling of cable's potential, over-regulation, and a lack of demand for the new social services that cable might provide. Citing the National Science Foundation support for experimentation in social service delivery via interactive cable television, Mrozinski pointed out that:

> A major influence tending to advance innovative social uses of of cable television has been the support and funding from several agencies of the Federal government. Generally, the agencies have suported such innovations where they have tended to complement the mission of the agency. [30. P.254]

And Delbert Smith at a Georgetown University conference stated that:

> A major obstacle to the future development of broadband services, in spite of studies done by various government and non-governmental agencies, is the lack of a definitive national policy delineating goals in the context of projected needs and demands. The question of who is responsible--government agencies, private corporations or foundations--for research and development in cable, continues to plague the evolution of a medium which could revolutionize mass and interactive communications. Currently the cable industry, beset by economic concerns of various sorts, determines what, if any, new areas of service cable will provide. Cable corporations basing their decisions on economic factors, largely near term market demand, understandably hesitate to experiment in providing services and programming which may appeal only to a small or highly segmented market. Unfortunately the only way to judge whether the public will use and pay for speculative services made possible by a new technology is to offer them on an experimental basis. [31. P.104]

Smith also referred to the NSF program which, he said, marked the beginning of extensive national input into planning interactive cable systems. But what will happen, Smith asked, when the foundation money terminates?

> If the experimental systems are not self-supporting at that time, will they terminate or will the local community be expected to assume the costs immediately? It is suggested that there is a need for a more substantive federal commitment to developing and funding social-service oriented,

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* Currently 12% annually.

interactive broadband projects that will allow for a transition period from experimentation to operation. [31. P. 113]

C. SUMMARY

To sum, by mid-1975, the trends in the cable literature were following four paths:

1. Municipal Applications. This literature was well advanced and detailed guidelines were available for the use of local governments.

2. The Federal Role. This literature was in an earlier stage of development, showing general dissatisfaction with the regulatory climate and the lack of significant financial participation on the part of the federal government. However, no clear consensus had emerged as to what limits should be placed on the federal government's support (e.g., technology development, operational support for public services, program development).

3. What Went Wrong. There was general agreement that the early "blue sky" was unduly optimistic. The causes of cable's relatively slow development were assigned variously to technological difficulties, the economic downturn, and over-restrictive regulation. The consensus had emerged, however, that public service use of cable would not develop if the medium remained a completely commercial venture. Federal involvement was a necessity.

4. What May Go Wrong. Both the speculative and "hard" literature reflected a growing concern with potentially adverse social impacts, particularly in the area of privacy invasion. No real solutions other than "technical and legal safeguards" for privacy protection had been advanced.

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II. OVERVIEW OF USES

A. INTRODUCTION

Almost without exception, the books and articles about cable television have contained "laundry lists" of suggested public service uses of the medium. The literature reviewed in the preceding section constitutes only a fraction of the material written about cable. Yet even that sample produced over 50 separate suggestions for public service use. However, the generation of ideas has far outstripped their implementation.

This is not a surprising phenomenon since it is unlikely that the cable industry itself would make a major investment in the development of social service uses. Cable television is a capital intensive industry, with the percentage of fixed costs to total costs ranging between 65 per cent and 80 per cent for major system operators. This compares to a ratio of 41 per cent for General Motors Corporation and 35 per cent for General Electric. Put another way, the cable industry invests about $3.00 in plant for every annual sales dollar. Liquid dollars are a very scarce resource.

Among the alternatives competing for that resource are: 1) New systems, 2) Expansion of existing systems, 3) More intensive marketing of existing systems, 4) Pay TV equipment, 5) Cable programming, and 6)Commercial service equipment. Most of the alternatives offer a potentially attractive return on investment. All of them represent known quantities.

On the other hand, to the cable operator, social service delivery is an unknown. There are two consequences of cable operators' unfamiliarity with social service: 1) It is unlikely that operators could conceive projects in a totally unfamiliar area and 2) Even if the operators did

conceive social service projects they would be unlikely to implement them on any significant scale since projected returns are an unknown quantity not amenable to comparison with competing alternative investments.*

In addition, the questions raised when considering the delivery of social services on cable television require social research. Although the communications element is essential to the system, it comprises only a small portion of the total program required to implement a service. As a result, the cable companies would have to make a large investment in social research to gain small amounts of communications business. Clearly, the impetus to deliver social services on cable television--either interactive or one-way--will not come from cable television operators.

Nor is it likely to come from local governments. There are 3,190 cable systems in the United States. Their median size is 1,500 subscribers. The largest system, in San Diego, has about 78,000 subscribers. Only 20 systems have more than 25,000 subscribers. It is evident that, for the most part, cable systems are not located in large cities, but rather in small towns where the available resources of money and research capability do not exist. In the few large cabled cities where such resources might exist, the penetration of the system does not justify significant expenditures. It is unlikely that a municipality would make a commitment to a delivery system that serves only a small fraction of its population--and probably not the fraction that relies on social services at that.

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* It should be noted that public benefits of more efficient service do not create motivation for cable system investment. Only the increased use of communications services does that.

Apart from the hard facts portrayed by the statistics and exacerbated by technological limitations, there are the "softer" but no less real problems of institutional and political constraints. Most social service delivery projects require intergovernmental (state-county-local) and inter-agency coordination. New procedures in government are rarely instituted on the basis of cost/efficiency criteria alone. This is particularly true in social service agencies. Each agency has its own priorities, its own procedures. Unless the priorities of the agencies happen to coincide, the initiator of a cooperative project must use up large amounts of political capital in order to get the requisite cooperation. It is difficult to justify the expenditure of this political capital when the one common priority--a favorable cost/benefit ratio--is unlikely to be realized in the immediate future.

In fact, the cost/benefit rewards are more likely to accrue to imitating, rather than initiating municipalities who bear the relatively high research and experimental costs. In other words, a municipality cannot be expected to research, initiate, develop, and evaluate a project whose benefits are amortized nationally.

It was not until the federal government turned its attention to cable that social service delivery via that medium began to be meaningfully developed. Several agencies have funded special-purpose projects, e.g., the improvement of adult basic education, and those projects will be described under the relevant headings in this section. The NSF program began a merger of technical and social service research in an effort to develop prototype delivery systems. The results of that research will be described in Chapter III.

The intent of this section is to provide an overview of actual public service uses of cable television. The Cable Television Information Center has, for the past four years, maintained a Clearinghouse for the purpose of collecting and disseminating information about the uses of cable television. Much of the information reported here was developed from materials in the Clearinghouse. Additional information was obtained from the National Cable Television Association and from various social service agencies, both governmental and private.

Both because the cable industry's reporting mechanisms are primitive and because of the abruptness with which local programs appear and disappear, this overview does not attempt to be comprehensive. Instead, the report will describe representative uses, concentrating on those applications suggested in the literature reviewed in Chapter I.

The overview is ordered by subject with a cross-reference table appended. When appropriate, the descriptions of individual projects will be accompanied by evaluative remarks. They will be integrated and summarized in the conclusion to this chapter.

The status of the projects reported are as of October 1975.

B. CITIZEN-GOVERNMENT INTERACTION

1. Apple Valley, Minnesota; Metro Cable, Inc.

Typical of a class of government-citizen programs, the Apple Valley format uses a telephone call-in as the interactive component of the delivery system. Four towns are within the cabled area and local officials appear on "Of, By and For the People" to field questions on local issues. The

mayors of all four towns, school board officials, police officers, and a fire chief have appeared. The program began as a weekly presentation, but has been curtailed to once a month. Taped shows on local topics have replaced the live segments. The producer explained that the program was unable to maintain a high level of interest, and community call-ins had declined to practically none. Once the prime topics had been covered the program was forced to rely on repetition or subjects of a low interest level. The new taped portions do not focus on governmental activities, but rather activities of general community interest.

2. Other Examples

Two other citizen-government uses were suggested in the literature: a cablecast ombudsman and opinion polling. CTIC was unable to uncover such actual uses of the medium, although Madison, Wisconsin has an ombudsman-like program, dealing with citizens' complaints and showing the city's response. Of the NSF-sponsored design studies, those submitted by Denver Research Institute, the University of Southern California, Lehigh University and the Cable Television Information Center contain Citizen-Government Interaction components. Those applications will be described in Chapter III.

C. COMMUNITY DIALOGUE

Many "laundry lists" mentioned community dialogue as a valuable use of interactive cable television. That is, neighborhoods separated geographically or ideologically from one another could converse via the medium and become better acquainted. The writers felt that dialogue of this sort would ease some of the tensions of modern urban living. CTIC was unable to identify

any such actual use of cable. The New York University-Reading, Pennsylvania design study described a related use--interactive dialogue among three geographically separated senior citizen groups. Chapter III will describe that project in detail.

1. Haverhill, Massachusetts; Stan-Fran Cable Co.

Another related use is the one-way program presented by the Haverhill Public Library. In Haverhill, the cable acts more as a catalyst for community dialogue than as a medium for it. Two years ago the public library invited representatives from Haverhill's ethnic communities to several inter-community meetings at the library. Their purpose was to plan a program series which would display the city's rich cultural ambiance. The meetings were, for many of the groups, the first opportunities to meet and work with people of different ethnic backgrounds.

The inter-community meetings produced a plan to assign a one-month salute to each ethnic community. During its assigned month the community would present, at the library and in the community, a salute-to-itself consisting of such things as folk songs and dances, costume displays, discussions of the ethnic group's history in Haverhill, and whatever else grew naturally out of the group's ethnic background.

As each community approached its assigned month, activity grew more intense involving social clubs, schools and churches within the community. The interface with the video unit grew more pronounced. During the month preceding its festival, the community's representatives and the library's production staff met and agreed on a specific segment of the festival to cablecast. The participants in the chosen segment, still working with the

production staff, then planned their presentation to fit a one-hour format. A single videotaped hour from each festival, once during the relevant month, was the only actual use of the cable system in the process. The tapes form part of the permanent collection at the library.

It is a remarkable fact that Haverhill, a city of about 45,000, has so many ethnic groups that this series has been running for two years without exhausting the supply of identifiable communities. Library personnel expect that the series will continue to run for several months longer.

D. COMMUNITY INFORMATION CENTER

1. Chaska, Minnesota; Community Information Services, Inc. (CIS)

This demonstration of interactive cable television was carried out in the "new town" of Jonathan, Minnesota, the first "new town" to receive loan guarantees under Title IV of the 1968 Housing Act. Jonathan, together with the small rural town of Chaska (population 4,350) form Chaska City, located twenty-five miles southwest of Minneapolis.

The first phase of the demonstration, funded by the U.S. Department of Housing and Urban Development (HUD) in 1970, established a demonstration center where area residents and visitors could have "hands-on" operating experience with such interactive services as opinion polling, home security, information retrieval, and data communications. A 14-mile interactive, experimental plant was constructed in and around the "new town," connecting several schools on one leg, and two medical clinics and a community hospital on another. A consumer demand survey was conducted to assess the demand for basic CATV and extra services. The survey indicated a substantial, relatively

inelastic demand for education and training, pay TV, and alarm services.

Phases II and III of the project were not implemented. Those phases would have initiated several full-scale demonstration sites in a number of communities and would have evaluated alternate methods of financing and various combinations of public and private participation and management.

As it was, HUD withdrew its support in 1973 after the two-year Phase I. At this writing, no homes have been connected to the cable, and the demonstration center has been dismantled. At Jonathan's inception, its population was expected eventually to reach 50,000. At the end of 1975, the population was 2,100, a size that considerably diminished the area's usefulness as a demonstration site.

2. Other Examples

The NSF-sponsored design studies by Denver Research Institute and the University of Southern California included community information centers. They are described in Chapter III.

E. COUNSELING

The literature frequently mentioned counseling services as a desirable application for cable television. The term "counseling" covered both a range of subjects (i.e., marriage and family, alcohol and drug addiction) and a range of delivery methods (one-way video with return telephone, one-way cablecasts of counseling groups).

In this section, several delivery methods will be reported. The subject matter will be confined to the general areas of mental health and family life. Vocational counseling and counseling for the elderly will be discussed below under the topic headings of "Employment" and "Specialized

Audiences".

1. Jackson, Tennessee; Community Antenna, Inc.

For several years, the director of the Jackson Mental Health Center appeared on the local cable television station with "House Call," on which he discussed such topics as marital crises, child raising practices, and the pros and cons of the women's liberation movement. Viewers could call in and discuss their problems with him--an option taken by dozens of viewers each week, according to an employee of the cable system. Six months ago the system moved its offices and suspended all local origination, including "House Call," until the new studio is built, probably within the next few months. This kind of interrupted--or even discontinued--service is not unusual in the cable television industry where programming decisions are commonly made in the context of very scarce resources.

2. Willingboro, New Jersey; General CATV, Inc.

The Willingboro Public Schools, in 1970, cablecast several of the Social Action Committee meetings at each of the districts' two junior high schools. The SAC's are groups of students who have frequently been in trouble because of their behavior. They are brought together with a guidance counselor to talk over their problems. This program, along with many others produced by the Willingboro System, was discontinued when federal support for Willingboro's cable production evaporated.

3. Janesville, Wisconsin; Total TV, Inc.

Nine months of local programming have been completed by the Rock County Health Care Center under a two-year demonstration grant of about

$100,000 from the National Institute of Mental Health (NIMH). Subject matter of the programs was mental health and related areas, e.g., boredom, retirement, death in the family. The purpose of the project is to provide preventive mental health medicine through peer education. Subjects for the programs are chosen by the project staff (media experts rather than mental health professionals) in consultation with the chief of the education-information section of the Health Care Center's Mental Hygiene Division. At the inception of the project, a survey was taken to determine topics of general interest. The results of the survey guide, but do not entirely determine, the chosen topics.

The 1974-1975 productions were not wholly satisfactory to the staff. The intent was to identify people in the community who had experienced the problem to be discussed and to cablecast interviews with them. In order to identify appropriate people, the project staff asked the various social service agencies for names. Agency personnel, sometimes through reluctance to infringe on the privacy of their clients, often declined to supply names. Rather, they preferred to discuss the agency itself on cable in order to publicize the agency and its mission. Thus, the first series of 30 programs were usually "talking face" live presentations from the studio, with taped inserts of relevant material. The studio presentations had a call-in component. Five or six calls were received, on the average, during each show, most of them inquiring about agency services.

The staff felt that the programs, despite their usefulness, did not conform with the purpose of the grant--peer education. Therefore, the next series will utilize a different format. Volunteer agencies, rather than government sponsored ones, are being used to identify appropriate people.

The staff intends to tape most of the programs in the field, edit and play back over the cable system. At the time that the staff was interviewed by CTIC, however, no funds were available to purchase or lease editing equipment. The staff was hopeful of getting a small grant supplement from NIMH for that purpose. They are also planning to request funding for project continuation. If that is not forthcoming, the project will end with the 1976 series.

In common with some other funded demonstration projects, the Rock County project seems to have suffered from the lack of an initial, workable plan to implement its goal. Several formats were tried during the first months of the project. By the time a preferred format was chosen, the project was entering its second, final year, with insufficient time to test impact or to build a constituency. Unless the NIMH continuation grant is forthcoming, because of the time limitations, the project probably will not continue even if it is successful by all evaluation measures. There will simply not be enough lead time for a local organization, such as the Health Care Center, to include the project in its budget.

4. Cheyenne, Wyoming; Frontier Broadcasting Company

The new program in Cheyenne, Wyoming is of interest not only because of its subject matter but also because it is an effort by an ad hoc consortium of the cable company, the local commercial broadcast station, the Laramie County Public Library, and Laramie County Community College.

Divorce is the subject of a series which, at the time of CTIC's interview with the curriculum designer, was scheduled to include such topics as the "why" of divorce, the child as hostage, woman alone, no-fault divorce, and remarriage. A pre-series questionnaire was sent to various

organizations concerned with divorce (e.g., Parents without Partners) for circulation among their members. A post-series follow-up questionnaire will be used to assess impact.

Laramie County Community College sees this program as growing out of the needs of its own student body. The average age of the Laramie student is 25, considerably higher than the national mean. All aspects of family life are important to that age group. The college hopes, through this program, to reach not only area divorcees but to attract prospective counselors. The college designed the curriculum, provided speakers, and will conduct the evaluation. This will be one of the few local efforts to attempt even a crude evaluation.

The cable company, operated by a long-time local resident, sees itself as a vital part of the community. Its 9,000 subscribers represent a 60 per cent penetration. The system provides the local school system with channel capacity. However, school use has been largely confined to in-school programming. While the cable operator has not discouraged such use, he feels that the optimum use of the system is for community, rather than institutional, service. He has therefore encouraged other educational users, provided free engineering support and additional cable feeds when necessary. The local commercial station also provides free technical expertise.

The Laramie Public Library has had its own station since April 1974. It operates by virtue of public donations--projected at $4,000 annually. The station has a direct feed to the cable system's headend. The library has five programming sections (education, history, information, recreation, and culture) staffed by volunteers working under the county-supported TV director.

5. Dayton-Miami (Ohio) Valley Consortium, REACH; Continental Cablevision

Project REACH, a Fund for the Improvement of Post-secondary Education (FIPSE) supported project, uses video material delivered via one-way cable to trigger workshop discussions (cassettes or broadcast television are acceptable alternative delivery systems). This combination of one-way video delivery in conjunction with community-based in-person workshops is consistent with the project staff's position that interactive television for the able-bodied may lead to undesirable isolation of individuals. Instead, REACH prefers to use cable as a method of bringing people together.

A series of surveys indicated that there was considerable interest in family psychology in the Dayton-Miami Valley. REACH responded to the survey with the creation of a series of workshop-video courses including "Positive Parenting," "Communicating with Your Teen-Ager," "Coping with Stress" and "Getting it Together" (an introduction to transactional analysis). Each course includes five to ten half-hour tapes. The community-based workshops are led by a REACH-trained group-leader.

Like the Janesville project described above, REACH spent its first year attempting to find the operational path that would permit implementation of its goal. A satisfactory format was developed in the second year and this year, its third FIPSE-supported year, has been spent polishing production techniques and building a constituency. The project staff expects that REACH will be entirely self-supporting by the time its current grant expires.

6. Other Examples

Some other discussion-type counseling series were once produced by "Mother Sunshine," a drug rescue group, for the public access center in

DeKalb, Illinois (ended because it "took too much time"); a series produced by the Snohomish County Family Counseling Service for the Lynwood, Washington system (ended because of lack of response); and "Reaching Out," a biweekly panel discussion of personal problems produced by the Charlottesville, Virginia station in cooperation with local counseling and teaching centers (ended when the host moved out of town).

F. EDUCATION

This section will illustrate two uses of the medium that extend educational programming beyond school walls and into the community: 1) preparatory programming, such as training to pass a high school equivalency examination or "Headstart"-type education for pre-schoolers, and 2) traditional academic training to the homebound. Related educational uses such as In-Service Training or information to Specialized Audiences, such as the handicapped, will be discussed under separate headings.

1. Meriden and Wallingford, Connecticut; Cable-RAVE; Telesystems and and Community TV Systems

In 1969, five Connecticut towns joined together to build a regional film library, with seed money provided by a Federal Title III grant. Two of the five towns, Meriden and Wallingford, are in cabled areas. The project, Regional Audio Visual Education (RAVE), cablecasts material from the library as well as RAVE-produced programs in the two towns. Among the programs cablecast are "Parents as Partners" in which parents are given guidance on helping their children to learn to read, and a high school equivalency series.

2. Willingboro, New Jersey; General CATV, Inc.

The Willingboro Public Schools cablecast two series to preschoolers; one a reading readiness course, the other, a course in basic mathematical concepts. Both projects were discontinued when their Elementary-Secondary Education Act (ESEA) funds expired. The school system has continued to use cable for in-school use. School officials believe in-school instruction "where we have a captive audience" is a more effective use of resources than to-the-home transmission where the audience is uncertain. Because of a change in personnel, the expected evaluation of the preschool program was not done.

3. Salem, New Jersey; Tri-County Cable TV Company

The Salem Adult Learning Experimental Model (SALEM), funded by the U.S. Department of Health, Education and Welfare (HEW), Office of Education, Division of Adult Education, was begun in 1974 for the purpose of exploring cable as a delivery system to improve adult basic education for people with less than a fifth-grade reading or seventh-grade mathematics level. The project produced teaching tapes which were used as primary vehicles of instruction. These tapes were cablecast to homes in the rural, predominantly black, Salem area. Paraprofessional tutors supported the televised lessons, either watching the cablecast with the student and reviewing the lesson immediately or visiting the student after the scheduled cablecast for review. In practice, the tutorial system often broke down, either because the student did not watch the lesson or because the tutor failed to appear.

SALEM is one of the few social service cable projects that have

been evaluated. Among the comments of the project evaluator were 1) Adequate formative evaluation* was not possible because of the lack of start-up time, and 2) Relative treatment and control groups should have been established.

We have discussed some of the problems of inadequate lead time in another context, (Janesville, Wisconsin's Counseling program, See p. II-9). The second comment cited is virtually a generic problem of certain classes of cable television uses. It is extremely difficult to construct a rigorous research design for social service projects on cable television.

One of the major advantages of cable television over broadcast is cable's multiplicity of channels. The availability of spectrum makes it possible to narrowcast--that is, to aim programs at relatively small target groups. Broadcast television, in contrast, is a mass medium.

As noted in the introduction to this section, cable television systems are not, for the most part, located in large cities, but in small towns. Thus, innovative uses of cable directed at a special target group will almost certainly be confined to a small sample group. In the SALEM project, for instance, 37 enrolled and 26 completed the course. It is doubtful that 1) Four groups of six to seven apiece would permit meaningful comparisons, or 2) All enrollees would have cooperated with random assignment.

Given the above, it would seem that, at least for the special-target-group class of innovation, rigorous experiments are unlikely to be performed.

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* Formative evaluation produces information that is fed back during the development of a project and helps shape the final product. It is distinguished from summative evaluation which is done after the service is offered and describes what happened.

4. Overland Park, Kansas; Telecable Corporation

This project involved teaching a regular school curriculum to two homebound children. The technical feasibility of the interactive video-audio equipment was demonstrated but no other conclusions could be drawn. The demonstration, which lasted about a year, was terminated when one of the students died and the other recovered sufficiently to attend school.

5. Louisiana Educational Television Authority

The LETA tested an adult educational series, "Your Future is Now," on several Louisiana cable systems prior to broadcasting them on the new educational network. The purpose of the pre-broadcast run was two-fold: to "smooth out the administrative kinks" and to supply the service to as many people as possible as soon as possible. Cable was supplanted by broadcast when the network became operational.

6. Other Example

In its NSF-sponsored design study, the Rand Corporation proposed an Adult Education application. It will be described in Chapter III.

G. EMPLOYMENT

1. Malden, Massachusetts; Warner Cable

Once a month the local office of the State Division of Employment Security cablecasts a listing of jobs available in the Malden area. The program formerly was carried weekly. The Malden system, however, is one of several in the area operated by the same multiple system owner. The systems were recently interconnected and programming is shared by the several

localities. This has tended to discourage localism.

2. Ann Arbor, Michigan; Michigan Cable Communications

The Ann Arbor Public Schools' Instructional Materials Center cablecasts regularly on the public access channel. The center both produces its own series and prepares for cablecast programs produced by other groups. Among the productions was a seven-part "Careers for Women" series consisting of interviews between a student and professional career women.

3. Columbus, Indiana; Cox Cable Communications

The Video Access Center responded to the economic recession--felt severely in Columbus--by running the series, "Your Family Matters." Public officials described the employment situation in the area, explained who was eligible for unemployment benefits and the procedure for applying.

4. Sedalia, Missouri; United Cable (formerly LVO Cable, Inc.)

State Fair Community College, in cooperation with ten neighboring school districts, developed six, 60-second television commercials used for job development and placement activities. Each of the school districts had been participating in a federally funded career education project. The commercials, cablecast on the local Sedalia system as well as two area broadcast stations, were directed at 1) Students, who were encouraged to use the Career Education Job Placement Office and 2) Employers, who were encouraged to hire the students.

5. Other Examples

The NSF-funded design study proposed by the University of Southern California proposed an employment-related use. It will be described in Chapter III. Another employment-related used was suggested in the literature--

the use of cable to serve as a conduit for apprenticeship training programs sent directly from the plant. CTIC could find no existing application of that kind.

H. IN-SERVICE TRAINING

1. Danville, Illinois; Warner Cable; and Westville, Illinois; See More T.V. Corporation

The Learning Resource Center of the Danville Public Schools cablecasts in-service training material to [illegible] homes and over 600 classrooms via two cable systems. The programs are fed to the Danville system and are microwaved to nearby Westville, where See-More TV retransmits them. The training material, shown on an as-needed basis, are both pre-packaged and center-produced. The center director feels that TV is most effective for teaching concepts, such as Danville's recently shown series on individually guided education. That series combined material produced by the University of Wisconsin and talks by faculty members from the University of Illinois. For more sophisticated in-service training, the school system prefers face-to-face workshops.

2. Lynnwood-Everett, Washington; Viacom Cable

The Parks and Recreation Department in Everett, Washington is a frequent user of the cable system. The department's video course on baby-sitting, while possibly not what the cable literature had in mind, is certainly an in-service application.

3. Other Examples

The NSF-funded design studies of the Rand Corporation, Michigan State University, and CTIC all proposed in-service training applications.

They will be discussed in Chapter III.

I. LIBRARY SERVICE TO-THE-HOME

1. Casper, Wyoming; United Cable

The Natrona County Public Library operates a video reference service. If cable subscribers need visual information, such as a map or illustration, they may call the library and, when the channel is not being programmed for something else, the librarian will show the needed material on the screen.

The library has its own channel, leased from the cable company for $1.00 a year. In addition to the video reference service mentioned above, the library has cablecast a 21-part series, "Public Forum," which featured public figures discussing issues pertinent to Casper. Also, the Natrona library has compiled a collection of preschool story tapes made by the library staff members and students in the local public school and university drama classes. These tapes are used to program the dial-a-story service. Individuals can call and request a story and, if the channel is not in use, the request will be shown on the channel. The dial-a-story service is seldom used. The library also cablecasts the story tapes at scheduled hours.

J. MANAGEMENT FACILITATION

1. Casper, Wyoming; United Cable

The superintendent of the Natrona County School District uses the Casper cable system for weekly early-morning talks to school system personnel and those cable subscribers who want to tune in. Usually, the talks are reports of the previous evening's school board meeting. On

occasion they are used to discuss school district plans or to clarify rumors.

2. Other Example

Other management facilitation uses suggested in the literature were 1) Computer data exchange, 2) Municipal command center, and 3) Information and referral service. CTIC was unable to locate cable systems providing any of those services. However, Denver Research Institute, University of Southern California, Michigan State University and CTIC designed information and referral services in their NSF-sponsored studies. Lehigh University and Rand included management facilitation applications other than information and referral. They will all be described in Chapter III.

K. PUBLIC INFORMATION

Public information here serves as a "miscellaneous" category encompassing a variety of separate subjects of interest to very large segments of the population.

1. Reston, Virginia; Warner Cable

The MITRE Corporation demonstrated two-way services on a conventional, 12 channel, one-way cable system in Reston, Virginia beginning in 1971. The return link for subscriber interaction was a standard telephone. The program demonstrated was MITRE's TICCIT (Time Shared Interactive Computer Controlled Information Television) system. TICCIT provides computer-generated or computer-controlled information that can be selectively received and displayed by standard TV receivers. The information is displayed in visual/static form, e.g., a page of text, a graph or a photograph. The demonstration was terminated in 1973. Operationally, the subscriber would telephone a central

number, request particular information, e.g., bus schedules, and the information requested would appear on the subscriber's television screen.

2. Santa Monica, California; Theta-Cable

The Theta-Cable system in Santa Monica, California has a custom-made Metrodata character generator which permits the system to run a 24-hour comparison shopping list on one channel. The system has an agreement with a local consumer organization, Vector Enterprises. Vector comparison shops 130 items--including all meat and produce plus some grocery items--in the 17 supermarket chains in the Los Angeles area. Vector feeds the information into its computer which classifies the results and Vector then 1) Prints the listing in its own weekly newspaper and 2) Gives the computer read-out to Theta-Cable. Theta-Cable then feeds the information into its computer, which drives the character generator, and the information is displayed on a special channel 24 hours a day.

3. Concord, New Hampshire; Continental Cablevision

"Health Line" is a weekly series exploring health questions and needs in the Concord area. A typical series was the 8-part program on obstetrics and gynecology, which covered many of the health concerns of women. Area health professionals appeared on all of the programs. The final program had a live call-in component with doctors at the studio to answer questions. Thirty-five calls were received. A series on the health needs of the elderly received very little response.

4. Reading, Pennsylvania; Berks TV Cable

St. Joseph's Hospital, which has its own studio, has produced several cablecast programs including shows on diabetes and arthritis. One of St. Joseph's more successful productions was "Amy's Accident," designed to reassure youngster's about hospital visits.

5. Palm Desert, California; Palmer Broadcasting Company

For the past six years, a local M.D. has taped weekly, "Help Yourself to Health," on which he discusses common health problems. The doctor is not paid for his appearances. No audience or impact assessment has been made. The doctor enjoys making the tapes but says he would "really like to know if anyone is watching out there."

6. Tulsa, Oklahoma; United Cable

The City Health Department, for the past year and a half, has programmed a weekly series on public health issues such as immunization and public eating places.

7. Flint, Michigan; Lamb Communications

In 1973 a series on low-cost housing was cablecast. The series depicted some serious construction flaws. The construction company cablecast its response and ultimately compromises were reached. Local residents stated that conditions in the housing project have improved greatly due to the efforts of both management and tenants. Flint also cablecast a series with a lawyer who answered write-in questions. Flint no longer cablecasts local programs.

8. Ponca City, Oklahoma; CableCom-General, Inc.

"The Garden of Eatin" began as a nutrition education program and became a popular series cablecast to the entire community. The program is part of an attempt by the state education department to upgrade the school lunch program and encourage children to eat vegetables. The 10-part series has a "Sesame Street" type presentation of different vegetables, giving interesting facts on their history and nutrients. Each program presented a different vegetable which children were encouraged to try. High school students helped research, write, and produce the series.

9. Madison, Wisconsin; Complete Channel TV, Inc.

The municipal channel utilizes a character generator to print out schedules of city events, e.g., public hearings. The schedule is shown round-the-clock, subject to interruption by other municipal programs such as the mayor-hosted series about local government activities.

10. Greensboro, North Carolina; American Television and Communications Corp.

The public access center, Community Access TV, has a monthly program, "Jobs Pre-Release and After-Care Programs." Done in conjunction with the State Department of Corrections, the program's goal is to prepare the community to receive parolees and released prisoners back into society.

11. Other Examples

Public information applications proposed by Denver Research Institute, University of Southern California, Lehigh University, and Michigan State University in their NSF-funded design studies will be discussed in Chapter III.

L. PUBLIC SAFETY

The public safety uses of cable television fall into two broad categories: 1) Those uses which are directed toward the general public (e.g., programs concerning household fire prevention), and 2) Closed circuit uses (e.g., fire alarm systems).

Closed circuit uses can be provided on unused channels on the main system of cables; and/or by activating a second, or B cable; and/or by constructing a point-to-point institutional network, depending on the extent and sophistication of the applications desired. The use of several interconnected systems was the basis of MITRE's design for Washington, D. C.* The Philadelphia Police Department's closed circuit network (described below) resembles a full B cable. It is owned and operated by and for the Philadelphia Police Department.

This section will be divided into two sub-headings, the first containing closed-circuit examples, the second illustrating general public use.

1. Closed Circuit

a. Olean, New York; Allband Cablevision

In 1968, the cable television system installed eight cameras, mounted on city light poles, for the purpose of allowing police to monitor a high-crime

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* Mason, William F., et al., Urban Cable Systems. Prepared under a grant from the John and Mary R. Markle Foundation. McLean, Va., The MITRE Corporation. An extensive discussion of the B cable can be found in CTIC's pamphlet Technology of Cable Television, 1973.

area in downtown Olean. Police at headquarters were able to remotely adjust the cameras. The surveillance system "worked" in the sense that the police could monitor the streets. However, the system was dismantled following the city elections. The surveillance system was a major campaign issue and had been dubbed an "eye in the sky" by the eventual winner of the election.

b. New York City; TelePrompter Manhattan CATV Corp.

TPT offered a "guard channel system" to apartment houses. The service was discontinued because the on-site cameras were vandalized.

c. Woodlands, Texas; TOCOM

TOCOM operates cable systems in several planned communities, including Woodlands. According to company spokesmen, the homes are, in the main, occupied by retired, security-conscious, couples. The company spokesmen said that Woodlands was a typical operation.

Two hundred homes have been built in Woodlands; 145 are occupied. All of the homes are pre-wired for cable and equipped with smoke sensors. Occupants are given the option of buying basic cable service at $7.00 monthly. For an additional $2.50 monthly charge, plus $180.00 for the installation of a terminal, the home will also receive fire and burglar alarm protection* and an emergency medical call button which summons an ambulance.

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* The municipally owned Monroe, Georgia system installed alarm terminals manufactured by Scientific-Atlanta several years ago. Signal ingress problems, causing a high false alarm rate, have rendered the alarm capability useless.

The TOCOM system has a central computer that scans the system every few seconds. If any terminal is in an alarm condition, the appropriate alarm is sounded and help is dispatched. (The same computer can monitor pay TV where it is available.) When used in a manual mode, the computer can print out the address of any terminal, with the relevant alarm information and the particular channel to which the set is tuned.

The cable system manager told CTIC that home owners are given a verbal description of the system and, if they opt to take it, an agreement of purchase is signed. There is no printed material that informs the subscribers that the system is capable of monitoring their viewing habits. Several of the writers cited in Chapter I (e.g. Ralph Lee Smith, Robert Steiner) discussed the potential of this monitoring capability as a serious threat to privacy.

d. Weston, West Virginia; Weston TV Cable Corporation

The Weston Volunteer Fire Department uses a combination of cable and FM radio to replace one of the functions of the central telephone operator phased out when the telephones were equipped with a dial system. In the past, when a fire was reported in Weston, the call was taken by a live operator who then called the volunteers at home. The alert system was phased out with the operator.

Since 1965 each volunteer has had an FM radio connected to the cable. It is kept on at all times and set at a given, empty, frequency. Alarm calls coming into the department are tapped directly off the phone lines, modified to the FM frequency and distributed directly to the volunteers' radios from the headend. The announcement of a fire can also be made from the fire station.

e. Philadelphia, Pennsylvania; Police Department Network

The Philadelphia Police network is a dual trunk system with each trunk having a capacity of thirty-four downstream and four upstream channels. The network connects the main police headquarters, city hall, and nine divisional headquarters. The police expect that twelve more districts will be connected in the near future. The system serves the following purposes:

1. Training. The Police Academy presents regular training material both for patrolmen and detectives.

2. Administration. News and special reports (e.g., missing persons) are transmitted.

3. Arraignments. Suspects are interviewed in the district by court personnel located in city hall. This substitutes for suspects being taken, by two policemen, to city hall in a wagon. Department personnel estimate that the saving in police time will amount to about $800,000 annually. This is a court-approved experimental application. A future decision will determine whether it can legally replace face-to-face arraignment.

4. Fingerprint transmission. Permits decentralized identification of arrestees.

5. Document facsimile transmission. Uses a custom-made $14,000 terminal; transmits an 8" x 11" document in 40 seconds.

6. Staff meetings. Permits decentralized meetings in which the chief inspector can see the divisional inspectors; all inspectors can receive full audio.

7. Legal Counseling. The District Attorney's office advises police as to constitutionality of search, seizure, and arrest procedures; screens out some cases based on constitutionality and sufficiency of evidence.

8. Management information.

In the future, the Department hopes to link Philadelphia Hospital to the network so that bedside arraignments can be made remotely. Thus far, about one million dollars has been spent on the system, split about evenly between LEAA and city funds.

2. Open Circuit

a. Tulsa, Oklahoma; United Cable

The Community Relations Department of the Tulsa Police Department presents programs on such subjects as burglary prevention and self-defense for women.

b. Wilmington, Delaware; Rollins Cablevision

The Wilmington Fire Department uses tapes of actual fires as training tools. When the subject was appropriate, the tapes would also be played on the cable system, accompanied by a fire-prevention talk. Rollins has now discontinued all public service programs to concentrate on local entertainment. A company spokesman stated that when the local origination operation begins to collect enough advertising revenue to support a crew, public service programming will be resumed. The system's penetration is over 60 per cent.

c. Decatur, Alabama; TeleCable Corp.

During hurricane watches, a frequent occurrence in Decatur, one cable channel continuously shows a map, with the path of the hurricane marked, and the locations of public hurricane shelters. The cable system has an audio-override which permits ten-second emergency announcements to be heard on all channels. The studio facility is in the Civil Defense headquarters.

d. Other examples

CTIC was unable to find existing applications of other uses suggested in the literature, such as meter reading or air pollution monitoring.

Public safety applications suggested in the NSF-funded design studies by Rand, Michigan State University, and CTIC will be described in Chapter III.

M. SPECIALIZED AUDIENCES

1. The Handicapped

a. Columbus, Indiana; Cox Cable

In conjunction with the Indiana State School for the Deaf, the Video Access produces "Hear with Your Hands," a story-telling program for hard of hearing youngsters. A local sorority buys the completed tapes in order to preserve them for future use.

b. Amherst, New York; Amherst Cablevision, Inc.

Funded by the Bureau of Education for the Handicapped (BEH), Office of Education, U.S. Department of Health, Education and Welfare (HEW), this project uses interactive telecommunications to deliver educational material to multiply handicapped children (ages 4 to 21) at home and in residential centers.

The project is being implemented by the Regents of the University of the State of New York, working with the MITRE Corporation.

TV signals are delivered downstream on ten mid- and super-band channels. The upstream digital return uses telephone lines since the Amherst cable system does not have two-way capability.

The students are equipped with special "menu" keyboards on which they type their request for service and ask and answer questions. (The cost of the terminals is about $300). Despite the scarce supply of adequate software (most is game playing), parents of the students have been enthusiastic about the program.

The number of students that can use the system simultaneously is ten--the number of available downstream channels. When CTIC interviewed the project office, in October 1975, only 11 terminals were in the field. Queuing was not a problem. However, MITRE expected that by mid-December 100 terminals would have been placed. Queuing, and its concomitant frustrations, may become a factor at that time.

c. Lafayette, Indiana; Communications Properties, Inc.
Kokomo, Indiana; TeleCable Corp.

Another BEH funded project, Project FEATT (Facilitating Educational Achievement through Telecommunications) is being implemented by the Purdue Research Foundation. It is designed to instruct parents in teaching developmental skills to their severely handicapped, homebound children (age: up to three). The material is delivered downstream on a mid-band channel. A telephone call-in component permits questions. Additionally, the material is distributed by cassette in areas that do not have cable. In total, about 70 homes are reached. The original plan included microwave transmission to other remote areas. However, transmission difficulties have precluded the use of microwave to date.

The tapes, made by the Purdue Achievement Center for Children, emphasize 80 critical skills (e.g., taking off shoes, drinking from a cup). Methods are presented to help parents recognize their children's capabilities and limitations and determine what skills they are ready to learn.

The programs begin with an informal lecture on the selected subject and move to a demonstration that includes a parent and child and an early childhood development specialist.

CTIC interviewed three parents who were receiving the programs and all volunteered that the television series was more effective than the home-based program provided by the state.* The parents felt that when the children were faced with a stranger (the childhood development specialist) they tended to regress. In contrast, the television delivery permitted the children to learn in a completely non-threatening environment. The parents stated that

* Childhood development specialists visit, on a regular basis, eligible homes and aid the parents to help their children.

skill development was proceeding at a noticeably more rapid rate since the inception of Project FEATT.

The telephone call-in was seldom used. Parents stated that this was not due to a reluctance to use the phone, but reflected the completeness of the material.

2. The Elderly

a. New York City; Gaylord White Project

Funded by the National Institute of Medicine's Lister Hill National Center for Biomedical Communications, the Mount Sinai School of Medicine set up a demonstration project to explore the application of telecommunications technology to disseminate health information to an inner city geriatrics population. A bi-directional cable system was established within an East Harlem housing project (330 tenants, median age 76). Outlets in each apartment were connected to the tenant's TV set. It was possible to produce and cablecast from the basement studio or from any apartment or common building area. Most programs were directed toward 1) The psychosocial isolation of the elderly and 2) Knowledge of health status and familiarity with the health care systems available. Tenants participated in all activities, including planning programs, handling equipment, and appearing on camera. The project was ended in 1975 when funding ran out.

b. New York City; TelePrompTer and Sterling-Manhattan Cable TV, Inc.

"As Old as We Are," a demonstration project sponsored by the Administration on Aging, U.S. Department of Health, Education and Welfare (HEW), was a demonstration project conducted in Manhattan. The series of 23 weekly programs were offered to a group of senior centers and to all individuals with access to cable. The programs used a "magazine" format. The objectives of the programs were to 1) Provide information to increase the self-help

capacity of viewers, (2) Facilitate viewers' contact with service providers, 3) Deliver "quality of life" services, and 4) Extend and enrich the services of senior centers. Results of preliminary evaluation indicate that the programs were most successful in delivering "quality of life" services, as reflected in higher morale and decreased isolation of the elderly. Poor transmission quality and the limited penetration of the cable system are among many problems that have made evaluation of the project difficult.

c. Dover, New Hampshire; Continental Cablevision

"Movin' On," a half-hour weekly series on the elderly includes both informational sequences and features on individuals, e.g., a program on a 72-year-old dory builder. The elderly themselves are involved in camera work, interviewing, and planning.

d. Lynnwood, Washington; Viacom

The Lynnwood-Everett area has made a great effort to bring the elderly and teen-agers together. For instance, the old people are invited to eat lunch at the high school. An outgrowth of that effort is a one-hour weekly series for the elderly that includes a segment of entertainment from the high school as well as informational material and a sequence of exercise for the elderly. The program is among the most popular on the system.

e. Other examples

"Elderview," another Administration on Aging sponsored project has completed producation and will be shown on the Somerville, Massachusetts cable system.

3. Other Special Audiences

a. Bay City and Midland, Michigan: Gerity Cablevision

Michigan State University, working with Delta College, prepared and cablecast a five-part series that provided foster-parent training. The series was an adaptation of a classroom series at Delta. Fifty-six prospective foster parents participated in the entire program. Divided into two relative treatment groups, half the participants were asked to watch the programs in their own homes while the other half watched in small groups. Among the reported results were: 1) The level of interest in becoming a foster-parent correlated with the number of programs seen and 2) The impact of the delivery system was no different for those engaged in individual or group viewing.

b. Hamilton, Ohio; Community Tele-Communications

In January-February 1975, the City Health Department cablecast an experimental smoking withdrawal series with the help and cooperation of the Ohio Lung Association.

The program was publicized in the local newspaper and on the cable. Smokers interested in the clinic were asked to send a newspaper coupon to the health department indicating that they would watch the programs. The 208 people who did so were sent a questionnaire to complete about their smoking habits. Sixty of these were returned. The tapes were shown once a week for five weeks. A follow-up questionnaire was sent out, and 18 viewers indicated that they had watched the programs and had quit smoking.

The program was scheduled to be re-shown in late 1975.

c. Other Examples

The Specialized Audience applications suggested in the NSF-funded design studies of Lehigh University, Michigan State University, New York University and CTIC will be discussed in Chapter III.

CTIC was unable to find examples of two other special-uses suggested in the literature, i.e., ghetto leadership development and rehabilitation training of prisoners.

Nor could we find an example of rural cable as propounded by Peter Goldmark in his presentation to the Sloan Commission. Construction of what we believe will be the first two-way rural system in the United States was to begin in late 1975 in Trempeleau County, Wisconsin. It will be owned and operated by the Western Wisconsin Communications Cooperative. The FHA has committed a loan to the cooperative of $1,238,000.

N. CONCLUSION

The introduction to this chapter outlined reasons why cable operators are unlikely to develop social service uses of the medium. A major cause of the lack of development of more meaningful and long range social service projects stems in large measure from a lack of incentive for its development. Cable operators, who see themselves in a communications business, know little about the delivery of social services and do not have an economic incentive to promote cable's use in this direction. Despite that fact some cable operators are fostering a number of social service delivery projects--albeit on a technologically primitive level. This chapter has described more than a dozen social service programs initiated by cable systems.

An argument developed in most of the literature summarized in Chapter I--that as systems become profitable they will naturally offer public services --simply has not proven true. Many profitable systems have never instituted such programs. Other systems that have penetrations well above the expected

profit-generating point of 40 per cent* have discontinued their programs (e.g., Wilmington, Delaware at over 60 per cent, Santa Rosa at over 80 per cent).

It is clear that if experimentation in social and/or public service delivery is to develop--even in a technologically limited mode--it will have to be developed by concerns other than cable systems.

Municipalities, too, are hindered by economic factors. There is great competition for scarce resources, and social service providers at the local level are skeptical about allocating resources to a delivery system with which they are unfamiliar. This is particularly true when the delivery system does not reach throughout the service area. In general, municipalities with cable systems do not have research and technical capabilities to establish a comprehensive delivery system. At this point, CTIC knows of only four government channels that have been programmed. They are in Tulsa, Oklahoma; Madison, Wisconsin; Somerville, Massachusetts, and Rockford, Illinois. As of this writing municipal support for the Madison and Somerville channels was under review.

The experimentation with social service delivery described in this chapter can be classified into three groups--natural experiments, random innovations, and systematic experiments.**

Natural experiments refer to projects that grow out of existing systems. Most of the cable projects described in this chapter are of this nature. A cable operator, community group, local government or some individual decides that something should be cablecast and proceeds to do so. Much of this programming is dependent on volunteer effort, often terminating when a

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* Cable Television Information Center, Cable Data (Washington, D.C., The Urban Institute, 1974) p. 4.

** See, for instance, Alice Rivlin, Systematic Thinking for Social Action (The Brookings Institution, 1971) p. 87.

participant relocates or tires of the effort. Other projects end when the cable operator finds other uses for the channel. No particular effort is made to evaluate or assess these projects.

Random innovation describes a strategy developed by the federal government in which individual communities are encouraged to try new approaches and "see how they work." Such projects include those in Janesville, Wisconsin; Jonathan-Chaska, Minnesota; Dayton-Miami, Ohio; and Salem, New Jersey. Characteristic of these federal efforts was the lack of lead time for adequate planning and development of materials. Plans for transition when the federal seed money ran out usually were not developed.* Again, none of these "experiments" tested the relative efficiency of the delivery system.

Systematic experimentation requires a carefully designed plan allowing for rigorous evaluation. The NSF experiments described in Chapter III seem to be leading in this direction.

The above categorization, while pointing out limitations in past experimentation, does not mean to imply that nothing has been accomplished by the natural "experiments" that have occurred. It seems likely that the "experiments" which will ultimately have the most influence are those that use cable in unforeseen manners. They are 1) the use of cable as a catalyst, rather than a medium, for community dialog, e.g., Haverhill, Massachusetts; 2) The imaginative use of cable radio, e.g., Weston, West Virginia; and 3) The exploitation of cable's surplus channel capacity as a test bed prior to broadcast delivery, e.g., Louisiana Educational Television Authority.

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* While true of most of the federally supported social service projects, these points do not hold true for all of them. REACH, for example, has a well-developed plan for its transition to self-support.

Table 3 Subject/Project Cross Reference

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page Number
Citizen-government interaction	General public	Local officials	N/A	Current	Local origination	One-way video & One-way video-telephone return	Apple Valley, Minnesota	No	Roger Prois Metro Cable, Inc. 16900 Cedar Ave.S Rosemount, Minn. 55068	II-4
Community dialogue	General public	Public library	N/A	Current	Local origination	One-way video	Haverhill, Massachusetts	No	James Sheldon Haverhill Public Library 99 Main St. Haverhill, Mass. 01830	II-6
Community Information Center	Demonstration site visitors	Community Information Systems, Inc.	HUD	Discontinued	Closed circuit	Complete interactive video, data	Jonathan/ Chaska, Minnesota	Yes	E.D. McCormick Community Information Systems, Inc. Jonathan Village Center Chaska, Minn. 55318	II-7
Counseling	General public	Jackson Mental Health Center	N/A	Suspended	Local origination	One-way video-telephone return	Jackson, Tennessee	No	Jackson Community Antenna, Inc. Box 3070 1019 Campbell St. Jackson, Tenn. 38301	II-9
	General public	Willingboro Public Schools	Title III of ESEA	Discontinued	Local origination	One-way video	Willingboro, N.J.	No	Sidney L. Taylor Willingboro Public Schools Willingboro, N.J. 08046	II-9

*Information is accurate as of October 1975.

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page Number
	General public	Rock County Health Care Center	National Institute of Mental Health (NIMH) DHEW	Current	Local origination	One-way video-telephone return	Janesville, Wisconsin	Expected	Catherine Henry Chief, Education-Information Section Rock County Health Care Center Janesville, Wisc.53545	II-9
	Divorcees	Laramie County Community College	Public donations	In preparation	Local origination	One-way video	Cheyenne, Wyoming	Expected	Judy Pray Laramie County Community College Cheyenne, Wyo.82001	II-11
	Parents	Dayton-Miami Valley Consortium	Fund for the Improvement of Post-Secondary Education	Current	Local origination	One-way video-face-to-face workshops	Xenia and Wilmington, Ohio	Yes	Joseph E. Ornderff, Director Office of Community Services Dayton-Miami Valley Consortium 32 N. Main St. Dayton, Ohio 45402	II-13
Education	Parents	CableRAVE (Regional Audio Visual Education	Title III of ESEA	Current	Education	One-way video	Meriden and Wallingford, Connecticut	Yes	Arnold Posner, Project Director CableRAVE 22 Liberty St. Meriden, Conn.06450	II-14
	Pre-schoolers	Willingboro Public Schools	Title I of ESEA	Discontinued	Local origination	One-way video	Willingboro, N.J.	No	Sidney L. Taylor Willingboro Public Schools Willingboro,N.J. 08046	II-15
	Under-educated adults	Salem High School	Bureau of Occupational & Adult Education DHEW	Discontinued	Local origination	One-way video-tutor face-to face	Salem, N.J.	Yes	Dr. Bayard Clark DHEW, Office of Education Bureau of Occupational & Adult Education 7th & D Sts, Rm.5068 Washington, D.C. 20202	II-15

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
	Homebound Children	Overland Park Park High School	N/A	Discon-tinued	Closed circuit	Two-way video	Overland Park, Kans.	No	Gordon Heering Box 720 740 Duke St. Norfolk, Va.23510	II-17
	Under-educated adults	Louisiana Educational Television Authority	N/A	On broad-cast TV	Local origination	One-way video	Alexandria, Lafayette, & Crowley, Louisiana	No	Pat Morgan, Program Manager LETA P.O. Box 44064 Baton Rouge,La. 70804	II-17
Employment	Unemployed	Mass. Div. Employment Security	N/A	Discon-tinued	Local origination	One-way video	Malden, Mass.	No	Mike Newton Warner Cable of Malden 112 Pleasant St. Malden,Mass.02148	II-17
	Unemployed	Minn. Dept. Employment Services	N/A	Discon-tinued	Local origination	One-way video	Fridley, Minn.	No	Bob Krebs General TV of Minnesota, Inc. Fridley, Minn.55413	
	Young women	Ann Arbor, Michigan	N/A	Completed segment of on-going series	Education	One-way video	Ann Arbor, Mich.	Yes	Dr. Rolland Billings Dir. Instructional Media Ann Arbor Public Schools 2555 S. State Ann Arbor, Mich.48106	II-18
	Unemployed	Video Access Center	N/A	Completed	Public access	One-way video	Columbus, Ind.	No	Virginia Rouse Video Access Center Box 146 Columbus, Ind.47201	II-18

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
	Employers and high school seniors	State Fair Community College	U.S. Office Education, DHEW, Div. Vocational & Adult Education	Completed	Local origination	One-way video	Sedalia, Mo.	Yes	Dr. Jas.L. Navara State Fair Community College Sedalia, Mo. 65301	II-18
In-Service Training	Teachers	Danville Public Schools	N/A	Current	Local origination	One-way video	Danville, Ill.	No	Steve Autor, Learning Resource Ctr,Danville Public Schools 516 N.Jackson St. Danville, Ill.61832	II-19
	Baby sitters	Everett Parks & Recreation Dept.	N/A	Completed	Public access	One-way video	Everett-Lynnwood, Wash.	No	Sharon Portin Channel 3 2507 Broadway Everett, Wash.98201	II-19
To-the-home Library Services	General public	Natrona County Public Library	N/A	Current	Leased	One-way video telephone return	Casper, Wyo.	No	Christopher Jones Natrona County Public Library 307 E.2nd St. Casper, Wyo.82601	II-20
Management Facilitation	Teachers and general public	Natrona County School District 1	N/A	Current	Leased	One-way video	Casper, Wyo.	No	Maurice F.Griffith Supt. of Schools 8th & Elm Sts. Casper, Wyo.82601	II-20

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
Public Information	General public	MITRE Corp. Corp.	N/A	Discon-tinued	Local origination	One-way video telephone return	Reston, Va.	Yes	The MITRE Corp. 1820 Dolley Madison McLean, Va. 22101	II-21
	General public	Theta-Cable	N/A	Current	Local origination	One-way video	Santa Monica, Calif.	No	Ron Stein Theta-Cable of California Box 25990 Los Angeles, Calif. 90025	II-22
	Women	Continental Cablevision	N/A	Completed segment of on-going series	Local origination	One-way video-telephone return	Concord, N.H.	No	Kathy Bogle Continental Cablevision 15 Pleasant St. Concord,N.H.03301	II-22
	Children	St.Joseph's Hospital	N/A	Completed	Local origination	One-way video	Reading, Pa.	No	Joe Masciotti Berks TV Cable Co. Box 107 Reading,Pa.19603	II-23
	General public	N/A	N/A	Current	Local origination	One-way video	Palm Desert, Calif.	No.	Norm Palmer KABL-TV 10 Box 368 Palm Desert, Calif. 92260	II-23
	General public	Tulsa Health Department	N/A	Current	Local government	One-way video	Tulsa, Okla.	No	Tom Ledbetter Tulsa City-County Library 400 Civic Center Tulsa, Okla.74103	II-23

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
	General public	Lamb Communications	N/A	Discontinued	Local origination	One-way video	Flint,Mich.	No	Louis Edmondson Cablevision 3600 S.Dort Hwy. Flint,Mich. 48507	II-23
	Children	Ponca City Public Schools	N/A	Current	Local origination	One-way video	Ponca City, Okla.	Yes	Bob Westmoreland Audio-Visual Dept. Ponca City Public Schools Ponca City,Okla. 74601	II-24
	General public	City of Madison	N/A	Current	Local government	One-way video	Madison, Wisc.	No	Merry Sue Smoller CATV Officer City-County Bldg. Madison,Wisc.53709	II-24
	General public	NC State Dept. of Corrections	N/A	Current	Public access	One-way video	Greensboro, N.C.	No	Rev.James Clark Community Access TV,Inc. P.O. Box 5526 Greensboro,N.C. 27403	II-24
Public Safety	N/A (surveillance)	N/A	N/A	Discontinued	Closed circuit	Two-way video Closed circuit	Olean,N.Y.	No	No contact available	II-25
	N/A (guard-channel)	TelePromp-Ter	N/A	Discontinued	Closed circuit	Two-way video Closed circuit	New York, N.Y.	No	No contact available	II-26

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
	N/A (alarm system)	TOCOM	N/A	Current	Closed circuit	Interactive digital	Woodlands, Texas	Yes	Mike Carboy TOCOM, Inc. 3301 Royalty Row Irving, Tex.75060	II-26
	Firemen	Weston TV Cable Corp.	N/A	Current	Closed circuit	Cable radio	Weston, W.Va.	No	M. William Adler Weston TV Cable Co. Drawer III Weston, W.Va.26452	II-27
	Police	Philadelphia Police Dept.	LEAA Dept.of Justice	Current	Closed circuit	Completed interactive video, data	Philadelphia, Pa.	Expected	Voncile B.Gowdy Courts Branch, LEAA U.S.Dept.of Justice Nat. Institute of Law Enforcement & Criminal Justice Washington, D.C.20531 Joseph Paglia Adminis. Analysis Phila.Police Dept. Broad & Market St. Philadelphia,Pa.19107	II-28
	General public	Tulsa Police Dept.	N/A	Current	Local government	One-way video	Tulsa,Okla.	No	Tom Ledbetter Tulsa City-County Bldg. 400 Civic Center Tulsa,Okla. 74103	II-29
	General public	Wilmington Fire Dept.	N/A	Discon-tinued	Local origination	One-way video	Wilmington, Del.	No	No contact available	II-29
	General public	Civil Defense	N/A	Current	Local origination	One-way video	Decatur,Ala.	No	Curtis W. Bumpus Decatur TeleCable Box 1168 Decatur, Ala.35601	II-29

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
Specialized Audiences	Deaf	Indiana State School for Deaf	N/A	Current	Public access	One-way video	Columbus, Ind.	No	Virginia Rouse Video Access Ctr. Box 146 Columbus,Ind.47201	II-30
	Multiply Handicapped Children	Regents of the University of the State of NY	Bureau of Education for the Handicapped DHEW	Current	Local origination	One-way video-digital return on phone lines	Amherst, N.Y.	Expected	Domenic Mettica Telecommunications Project 4140 Sheridan Dr. Amherst,N.Y. 14221	II-30
	Severely Handicapped Children	Purdue Achievement Center	Bureau of Education for the Handicapped,DHEW	Current	Closed circuit	One-way video-telephone return. Cassettes	Lafayette, Kokomo, Ind.	Yes	Robert J.Currie Exec. Director Purdue Achievement Center Bldg.E, South Campus Courts Purdue University West Lafayette,Ind. 47907	II-31
	Elderly	Mt.Sinai School of Medicine	Lister Hill National Center for Biomedical Communications	Discontinued	Closed circuit	Two-way video	New York, N.Y.	Expected	Edward Wallerstein Div. of Communications, Dept. of Community Medicine Mt. Sinai School of Medicine 19 E. 98th St. New York, N.Y.10029	II-32
	Elderly	O'Brien Communications, Inc.	Administration on Aging	Discontinued	Public access	One-way video	New York, N.Y.	Yes	Robert E. O'Brien O'Brien Communications,Inc. One Broadway Cambridge,Mass.02138	II-32

Subject	Target Audience	Service Provider	Funding Source	Status	Channel Designation	Technology	Location	Report Available	Contact	Report Page No.
	Elderly	Continental Cablevision	N/A	Current	Local origination	One-way video	Dover,N.H.	No	Nancy Bicknell Continental Cable-vision 474 Central Ave. Dover,N.H.03820	II-33
	Elderly	Viacom	N/A	Current	Public access	One-way video	Everett-Lynnwood, Wash.	No	Sharon Portin Channel 3 2507 Broadway Everett, Wash. 98201	II-33
	Foster parents	Michigan State University/ Delta College	National Science Foundation	Completed tapes still in use	Local origination	One-way video	Bay City, Midland, Michigan	Yes	Dr. Thomas F.Baldwin 322 Union Bldg. Michigan State Univ. East Lansing, Mich. 48824	II-34
	Cigarette smokers	City Health Dept.	N/A	Suspended	Local origination	One-way video	Hamilton,O.	No	Andrew Sabol,Jr. Director of Health City Health Dept. Municipal Bldg. Hamilton, O. 45014	II-34

III. THE DELIVERY OF SOCIAL AND ADMINISTRATIVE SERVICES ON INTERACTIVE CABLE TELEVISION— THE DESIGN STUDIES

A. INTRODUCTION

A National Science Foundation request for proposals (RFP) in March 1974 was the first stage of a two-stage process. The Research Applied to National Needs (RANN) program, Division of Social Systems and Human Resources requested proposals for "Design Studies of Experimental Applications of Two-Way Cable Communications for Urban Social Service Delivery and Administration."

The RFP specified that the studies be undertaken by consortia of research organizations, local governments, and cable television companies. Nearly fifty consortia responded to the RFP. Of the fifty, seven were awarded approximately $100,000 each to perform independent design studies.

The seven studies were completed in January 1975. The second stage of the process was the selection of specific applications to be awarded implementation grants.*

This chapter will describe and compare all of the applications suggested in the seven design studies and will report their status as of January 1976.

The results of the studies were extraordinarily varied. They ranged from the New York University/Reading, Pennsylvania study which explored the effects of a single communications technology (multipoint teleconferencing) on a single target population (the elderly); to the Michigan State University/ Rockford, Illinois study which examined combinations of six technologies

* Implementation grants were awarded to New York University/Reading, Pennsylvania; Rand Corporation/Spartanburg, South Carolina; and Michigan State University/Rockford, Illinois.

and five target populations. All told, 24 distinct applications were proposed.*

The remainder of this chapter is divided into four parts. First is a description and discussion of the content of the applications; second is a discussion of the technology; third is a comparison of the research designs; and fourth is a section containing conclusions and recommendations. The factual material was obtained from the design studies supplemented by interviews with members of the seven research teams.

The seven grantees and the applications proposed are as follows:

1. Denver Research Institute/El Segundo, California
   a. Interactive Programming for Home Subscribers
   b. Interactive Information Services in Public Places

2. University of Southern California/Los Angeles, California
   a. The Electronic Public Counter
   b. Community Video-Conference Facility

3. The Rand Corporation/Spartanburg, South Carolina
   **a. Multipoint Data Return and Adult Education
   **b. Multipoint Video for Day Care
   **c. Point-to-Point Video for Inter-Institutional Communications: Coordinated Services
   d. Point-to-Point Video for Inter-Institutional Communications: Psychiatric Testimony

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* For purposes of discussion we have defined "applications" as the uses of communications technologies by specified populations (including the general public) for specified purposes. In two cases, this definition differs slightly from the de facto definitions of grantees. The Rand/Spartanburg study proposed "Point-to-Point Video for Inter-Institutional Communications" as a single application. We have discussed the two component parts, "Coordinated Services" and "Psychiatric Testimony" separately. The Michigan State University/Rockford study proposed a "Criminal Justice, Judicial and Legal Communication System." We have separated that into "Pre-trial Depositions" and "Delivery of Legal Information." In two other cases, Denver Research Institute/El Segundo and New York University/Reading, the components were inseparable parts of complete packages and we have treated them as such, except when comparing alternate means of delivering specific services.

** Funded for implementation by NSF.

4. Lehigh University/Allentown-Bethlehem, Pennsylvania
   a. Interactive Community Information System
   b. Social Service Delivery
   c. Urban Administration

5. Michigan State University/Rockford, Illinois
   *a. Firefighter Training
   b. Interactive Television and Educational Opportunity
   c. Early Screening/Intervention of Childhood Learning Problems
   d. Cable Information and Referral Service
   e. Pre-Trial Depositions
   f. Delivery of Legal Information

6. New York University/Reading, Pennsylvania
   *a. Neighborhood Communications Centers

7. Cable Television Information Center/Peoria, Illinois
   a. Citizen Participation/Polling
   b. Practitioner Consultation
   c. In-service Training for Long-Term Care Personnel
   d. Interactive Programming by Senior Citizens
   **e. Vocational Rehabilitation for the Severely Disabled Homebound

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* Funded for implementation by NSF.

** Funded for start-up by Rehabilitation Services Administration, Department of Health, Education and Welfare.

B. STUDY SUMMARIES

1. CONSORTIUM:

Denver Research Institute
City of El Segundo
KCET (Los Angeles public broadcasting station)
Hughes Aircraft Company
Phasecom Corporation
Theta Cable Television

For additional information contact: Paul Bortz, Denver Research Institute, University of Denver, Denver, Colorado 50210.

Description:

DRI/El Segundo designed an inter-dependent group of applications intended to raise the informational level of the community. The applications were blocked into two major sections, depending on whether the information was to be received in citizens' homes or in public places.

a. Interactive Programming for Home Subscribers

Four channels, operating from 7:30 a.m. to 10:30 p.m., were assigned to in-home programming. One channel would present city news and information about city services. The information included a community calendar (dates, locations, times, and agendas of community meetings and activities), the El Segundo report (local news items), a legislative report, and volunteer and job opportunities. This package of information would be presented as an alphanumeric display with occasional insertions of still pictures, so that viewers could read their television sets in the same way that they read newspapers. The information would be typed on a keyboard at or near city hall and would appear directly on the screens of those sets tuned to the channel. The presentation would take about one hour, would be updated at least once a week, and repeated continously throughout the cablecasting period.

Three hundred and fifty subscriber response terminals would be distributed to homes within the cabled areas. In those homes, people would be able to respond to the messages on their TV screens, i.e., by pushing the appropriate terminal button they could request more information on a subject. The additional information would be mailed or telephoned to them.

Another in-home channel was reserved for scheduled programming. These programs consisted of a mix of documentaries, panel discussions, opinion polling, simulation games, and continuing education, all built around a selected topic to be chosen monthly (e.g., the impact of coastal policy on El Segundo). At intervals during the programs, viewers' opinions would be polled. Those with terminals would signal their answers by pushing the appropriate buttons. The responses would be tabulated electronically and the results of the poll flashed on the screen.* The terminals would also be used to play the related simulation games--in themselves an indirect form of opinion polling.

Continuing education programs would share the channel with the scheduled programs just described. The nature of the programs and the method of interactivity were not specified in the DRI study other than that "Viewers will be tested on educational programming via home terminals." [p. 43].

The third in-home channel was to be used for request scheduling. A library of from 200 to 500 videocassettes would be available for on-demand showing. Viewers would call or write in, asking for particular programs selected from a catalog. The programs would be shown continuously during the cablecasting hours on this channel and, if demand warranted, would also be shown on the channel reserved for scheduled programming when that channel was free. No elements of interaction were planned for this channel.

* Viewers who did not have terminals would respond by phone or mail for subsequent tabulation.

The fourth in-home channel was a schedule channel with programs from other channels scheduled continually. Portions of the library catalog would also be shown, and viewers would be able to use their terminals to vote electronically for programs to be shown on the request channel.

b. Interactive Information Services in Public Places

One channel was assigned to deliver information to 10 public kiosk locations in El Segundo. DRI anticipated that the locations would include such places as city hall, libraries, office buildings, bowling alleys, and supermarkets. The kiosk channel would consist entirely of on-demand programming. The user would select a subject from a number of service areas available (e.g., recreation). A list of available information relating to that subject would appear on the screen (e.g., parks and beaches). In response to the user's command, more specific information would appear (e.g., tide information). Each command would call forth progressively more specific information until the desired level of detail was reached.

The kiosk equipment differed substantially from the in-home terminals. In the kiosks, the users would not respond to the television sets; the users would initiate the conversations. An equivalent program on the home terminals might ask all viewers, "If you are interested in recreational information, push button A." If enough positive responses were returned, recreation programs would be scheduled. In other words, the subscriber-response mode (home terminal) uses programming directed to many locations. The subscriber-initiated mode (kiosks) uses programming requested by and sent to one location. See the technical section below for a more detailed discussion.

Discussion

In 1971, Hughes Aircraft and Theta Cable Television completed tests of prototype two-way equipment in Los Gatos, California and entered a demonstration and market-test phase in El Segundo. They announced plans to place 1,000 terminals in the field and to begin testing such services as merchandising, audience surveys, and credit card verification. Those plans did not materialize. The planned commercial services were not sold and ultimately fewer than 30 terminals were placed.

During the demonstration period, personnel from Hughes, Denver Research Institute and the City of El Segundo worked together to develop potential uses of the system. Some time before the National Science Foundation announced its plans to investigate the delivery of social services on interactive cable television, the El Segundo consortium had come to the mutual conclusion that if interactive cable television was to become a part of urban life, both commercial and public services would have to use its channels. Neither the public nor the private sector alone could support a sophisticated system.

The El Segundo consortium saw the NSF request for proposals as an opportunity to solve the chicken-and-egg problem of whether public or commercial services would go first. According to DRI's Paul Bortz, had its design study been funded for implementation, several private enterprises would have used the cable for commercial services.

The applications proposed in the design study came entirely from an El Segundo citizens' committee. Hughes and DRI provided only technical and research support. According to Bortz, DRI felt that unless the applications grew completely out of the community's perceived needs, the implementation phase would prove uninstructive in regard to the demand for cable services.

The applications proposed by the citizens' committee were all information,

rather than social service oriented. Bortz pointed out that, given the nature of El Segundo, this was to be anticipated. Said Bortz, "The city itself is a blue-collar, middle-class suburb. Like many such communities it is generally antipathetic to the federal government and to 'handouts.' In fact, there is no federal, state, or county social service office within the city limits."

Like many communities similarly located, it is information-poor. Because El Segundo borders Los Angeles, news is received through the larger city's media. El Segundo itself, unlike similar sized towns (population about 15,000) that lie outside the sphere of influence of a major metropolis, has neither a newspaper nor a radio station.

Both of the above characteristics of El Segundo--its antipathy toward social services and its absence of local information--led to the design of an experiment that concentrated on the dissemination of information.

Status:

These applications were not given implementation grants. Hughes Aircraft Company has removed its interactive equipment from El Segundo and has no plans for further demonstrations beyond industrial applications.

2. CONSORTIUM:

The Center for Communications Policy Research,
Annenberg School of Communications,
University of Southern California
City of Los Angeles
County of Los Angeles
Theta Cable Television

For additional information contact: Herbert Dordick, University of Southern California, Center for Communications Policy Research, University Park, Los Angeles, California 90007.

Description:

USC/Los Angeles treated interactive cable television as one component of a multi-mode telecommunications system. The applications proposed were special cases of more general problems and were designed to demonstrate 1) How interactive telecommunications can respond to the needs of a large city and 2) How mixed technologies can be combined for the purpose of reaching a large proportion of the citizenry. Specifically, the two general problems considered were 1) Information and referral, with municipal employment and information as a special case and 2) Citizen participation in municipal governance, with the special case being community information and feedback to the planning process.

a. The Electronic Public Counter

The technology options used in the employment application were two-way video via cable and microwave, digital and audio transmission on telephone lines, and one-way video via cable. See the Technical Section below for a detailed discussion.

The one-way video would carry a job channel to all cable subscribers. An updated list of municipal job openings would be run continuously on that channel. If viewers wanted information in more detail, they could telephone a central point and the details would be sent out on a second to-the-home channel.

The digital/telephone would carry the same information to "Electronic Public Counters" (EPC's). Job seekers could come into one of six fixed locations. There, they could see the same job listings as were shown in the home and could call in requesting that additional information be displayed on the screen. In other words, insofar as the user was concerned, there would be no information difference between the telephone line transmission and the cable transmission.

At the EPC's, the job seekers would decide whether they wanted job counseling. If so, counter attendants would help them send the relevant facts, via teletype, to the personnel department at City-County Hall. The job seeker then would enter a carrel for a two-way video conference with a personnel counselor.* During the interview, a decision would be made as to whether a formal job application should be submitted. If so, the application could be made immediately. If, after submission, an additional interview were required, that too could be done via video from an EPC.

b. Community Video-Conference Facility

The technology options used in the citizen participation application were one-way video via cable or, in non-cabled areas, on-site videotape recorders (VTR's), audio-transmission Code-a-Phones, and two-way video via cable or microwave.

The city of Los Angeles requires that its master plan be evaluated and updated at periodic intervals. Citizen participation in the process is required. In this application, one-way video would be used to disseminate both the proposed revisions and citizens' responses to those revisions.

* The applicant would participate from a fixed location. The counselor would be supplied with a portable videocart. See the technical section, below, for a description of the two types of equipment.

In the first instance, the City Planning Department would prepare video tapes that explained the proposed revisions and their potential impacts on the communities. These tapes would be shown repeatedly on the cable. In non-cabled areas, the tapes would be shown on-site at public viewing centers. Citizens could respond by making their own tapes, using portable equipment supplied by the city. The citizen-prepared tapes would be played as frequently, and in the same manner, as the planning department presentations. Citizens could also call the planning department's Code-a-Phone and record their reactions to the proposed plans or request personal contact with the planner.

The two-way video would be used for teleconferencing among several community locations and the city planner.

Prior to presenting the proposed master plan, the City Planning Department draws up a preliminary plan, revising and refining it based on comments from outside sources. The purpose of the teleconferencing application was to elicit citizen input at an early stage of the planning process so that the master plan, when finally proposed, would reflect the needs and opinions of the various communities. Teleconferences would originate from several public sites, including city hall. When public hearings on the master plan were scheduled, the planning staff would be at one of the sites for the presentation. Portable videocarts would be brought to two or three other sites in a selected community where citizens would be able to participate in the hearings via the cable. Citizens at any participating site would be able to interact with the planning staff and with citizens at the other participating sites.*

The entire teleconference would be sent via one-way cable throughout the cabled area. Therefore, citizens receiving the program but not at a participating site, could contribute to the conference by telephoning in their comments.

* The technical description of multipoint, two-way systems, p. III-62 discusses how the interaction works.

Discussion:

The contrasts between the two contiguous cities of El Segundo and Los Angeles are marked. El Segundo is a homogeneous community that numbers its population in thousands, its area in square miles. Los Angeles is a heterogeneous community that numbers its population in millions, its area in hundreds of square miles.

Thus, where the proposed application in El Segundo focused on the problem and suggested a solution based on a delivery system, the complexity of the large city demanded other alternatives.

A single delivery system does not reach all of Los Angeles, nor is one likely to in the near future. Added to that technical problem is a social one--the communications needs of Los Angeles' heterogeneous population are so diverse that it is simply not feasible to apply technological solutions to them all at once. The USC/Los Angeles design reflected those two facts.

Insofar as the technology was concerned, the design utilized what was available. Specific technologies were chosen in order to satisfy the demands of the applications. There was an implicit understanding that if and when more suitable (e.g., less expensive, more far-reaching) technology became available, functions would be transferred.

Insofar as the telecommunications needs were concerned, it was necessary to isolate the representative uses for purposes of experimentation. Had an attempt been made to cover all (or even a substantial part) of Los Angeles' requirements, the result would have been logistically chaotic and experimentally difficult to evaluate. Therefore, the consortium took the "special case" approach. There was an implicit understanding that as the "bugs" were worked

out of the system, new applications would be incrementally added.

Status

No implementation grant was awarded. The applications are in a state of suspension while Los Angeles reviews its telecommunications position. The city's cable television franchise is approaching its expiration date, and several task forces are developing recommendations for inclusion in the new franchise. In particular, the local government's Agency Task Force, including both city and county departmental personnel, is attempting to define both the current use and future needs for all telecommunications (e.g., mobile radio, cable, telephones, public address). No decisions had been reached as of this writing.

3. CONSORTIUM:

The Rand Corporation
City of Spartanburg, South Carolina
TeleCable Corporation

For additional information contact: William Lucas, The Rand Corporation, 2100 M Street, N.W., Washington, D.C. 20037

Description:

The Rand/Spartanburg design presented a series of applications intended to test various combinations of technology and target audiences within a framework of rigorous research. The technology to be tested included subscriber response terminals, two-point two-way video, and multipoint two way video. These will be discussed in detail in the technical section.

The target audiences included a large segment of the public (adult education), a small segment of the public (day caregivers), and inter-institutional personnel.

a. Multipoint Data Return and Adult Education

The subscriber response terminals would be used in conjunction with the adult education application. The courses to be offered were adult basic education and high school equivalency education. These courses are currently part of the on-campus curriculum of Spartanburg Technical College's* adult education section. The cable courses would be taught by the same personnel.

The lectures would be given "live" and sent out on a dedicated channel to about 40 at-home students. Each home would be equipped with a subscriber response terminal. By pushing the appropriate terminal buttons, the students could indicate their attendance, answer true-false or multiple choice questions, show that they understood, or ask for review of a point. The consortium

* Spartanburg Technical College is part of the state system. The South Carolina "Technical Colleges" correspond to "Community Colleges" elsewhere.

intended to run several 15-week versions of the experiment. The first version, to be shown to two randomly assigned groups, would compare adult education delivered via interactive cable with conventional classroom teaching. The second version would compare randomly assigned students in an interactive cable class with those in a one-way cable class. Both of those experiments were intended to examine the cost effectiveness of interactive cable. The third version had a different focus. Here, both televised and classroom courses would be offered and students would select one or the other. This version was designed to test the demand for televised courses. If the experiment becomes permanent, this version would be continued.

b. Multipoint Video for Day Care

The second application used multipoint two-way video in conjunction with the training of day caregivers. This application was a response to the rapidly increasing demand for daytime child care services. This increase in demand has put a severe strain on the supply of caregivers, with the result that a greater number of children are being cared for outside their homes by caregivers who have had little or no training than was formerly the case. The consortium designed an experiment intended to deliver the desired training directly to the child caregivers at times when attendance would be convenient for them.

The participants in the experiment would be day care centers (with 12 or more preschoolers, usually not in the caregiver's home); family day care homes (with one to six preschoolers, usually in the caregiver's home); and group day care homes (with fewer than 12 preschoolers, usually in the caregiver's home). Participating institutions would be randomly assigned to three groups. Group One, made up of about 25 facilities, would be assigned five cameras, which would rotate at specified intervals among the facilities.

The training sessions, in the form of hour-long workshops, would originate from a central studio. Caregivers at the five camera-equipped facilities would be able to interact via two-way video with a day care professional at the studio. They could thus ask questions and share experiences. If caregivers wanted to say or show something, they could signal the professional. The professional would control the switching equipment determining who would be shown on the TV screen at a given time, and could activate the caregiver's camera and switch to that location. Those participating facilities that had not been assigned cameras for a given workshop would be able to receive one-way transmission and therefore watch the proceedings.

Group Two would consist of day care facilities without access to the camera and would be able to receive only the one-way transmission. Group Three, the control, would not be given the converters necessary to receive the workshops. It was anticipated that the control group would ultimately be provided with either one-way or two-way video workshops, depending on which proved more successful during the initial experiment.

c. Point-to-Point Video for Inter-Institutional Communications: Coordinated Services

A third application would establish a two-point video link between the office administering the Work Incentive (WIN) program and the Department of Employment Services. This would be a straightforward teleconferencing link between two state offices. Currently, all applicants for Aid to Families of Dependent Children (AFDC) assistance come to the WIN office in order to apply. Under certain conditions, the applicant must register for the WIN program in order to be eligible for AFDC assistance. Determination of eligibility for the WIN program is made after the applicant has a joint interview with WIN and Department of Employment Services personnel. Subsequent to the

interview, if eligibility has been established, the applicant must make several trips to both the WIN office and the employment office--located about a mile apart--in order to complete the necessary forms. In some circumstances, the applicant must also go to the local office of vocational rehabilitation.

The planned teleconferencing link would eliminate much of the procedural inconvenience for both the applicant and staff personnel. In its first phase, the joint interview--the two-point link between WIN and the Department of Employment Services--could be accomplished via two-way video, initiated at either office. Some of the subsequent travel could also be eliminated. If the number of referrals warranted, a second phase would be instituted--the addition of the vocational rehabilitation office to the video circuit.

d. Point-to-Point Video for Inter-Institutional Communications: Psychiatric Testimony

The same technology would be utilized for the fourth application. Here, a two-point two-way video link would be established between the Spartanburg Area Mental Health Center (SAMHC) and the Probate Court. This would permit psychiatrists to testify at commitment hearings from the center rather than travel to the court. This application was a response to a new law that does not permit depositions for commitment hearings. It is anticipated that the new law will put considerable demands on the time of the SAMHC psychiatrist (one of only four psychiatrists in the county) due to time lost traveling and waiting in court. Two-way video testimony would eliminate the time waste. According to Rand's William Lucas, the Probate Judge has agreed that such testimony would satisfy the requirements of the new law.

Discussion:

The primary interest of The Rand Corporation was "experimental research" in the pure sense of the term. That is, Rand looked for applications that

were sufficiently well-defined to permit the construction of an evaluation design that would measure, in a reasonably precise manner, how well the program achieved its goals--both in an absolute sense and in relation to alternative methods. According to Rand's William Lucas, that criterion was predominant in selecting which community-suggested applications would be included in the design study and which would be postponed for later implementation by the interested agencies.

If the emphasis on the experimental research criterion led to the design of applications that were less than heroic in scope (unlike Los Angeles' objective of patterning a large urban telecommunications system), it also led to the design of applications that would furnish information of value even if the primary goals were not achieved. In other words, if it turns out that two-way video is not an effective way to deliver adult education, the experiment might indicate effective alternatives.

Status:

Three of the proposed applications were funded by the National Science Foundation.

High school equivalency education is scheduled to be offered on the cable beginning February 1976. Because a sufficient number of students was not available for random assignment to cable and classroom groups, it was necessary to recruit students from the cabled area of Spartanburg. At this writing, the recruitment and the curriculum development were proceeding concurrently.

The day care application is also scheduled to become operational in February 1976. The design has been modified to reflect the difference in curriculum needs between day care centers and day care homes. The first run will include only centers -- 16 had agreed to participate as of this writing. The second run will include only homes. Whether the third run will

contain a "mix" or will continue with a single type of day care facility will be determined by an analysis of the first two runs.

The WIN/Department of Employment Services application is scheduled to become operational in June or July when the new county regulations concerning the AFDC-WIN process are issued.

The SAMHC-Probate Court application did not receive a second-phase grant and the consortium has no plans for its implementation.

4. CONSORTIUM:

Lehigh University
City of Bethlehem, Pennsylvania
City of Allentown, Pennsylvania
Bethlehem Area School District
WLVT-TV (Allentown-Bethlehem public broadcasting station)
Twin County Trans-Video

For additional information contact: Arthur Larky, Department of Engineering, Lehigh University, Bethlehem, Pennsylvania 18015

Description:

Like The Rand Corporation, Lehigh University placed a high priority on the rigor of research design. Unlike Rand, however, Lehigh had come to a prior conclusion that while either video, audio, or data* transmission downstream is an economic use of cable, only data transmission is practical in the upstream direction. The consortium has termed the combination of downstream video and upstream data transmission "participatory video." The consortium's experiments are intended to demonstrate and evaluate a range of applications for participatory video.

a. Interactive Community Information System

The first application was intended to increase the level of public understanding on specific local issues and, in particular, to increase citizens' awareness of how public policy decisions affect them as individuals. Three channels would be devoted to this application. One downstream channel would carry information to the viewers. The major source of information would be Problem Identification Messages (PIM's). The PIM's would specify a problem (e.g., downtown development); identify the groups most likely to be affected by it (e.g., neighborhood store owners, potentially displaced residents);

* We have used the term "data" throughout to refer to digital or discrete data, such as letters or numbers, as distinct from analog or continuous data, such as pictures or voice.

and describe the alternate solutions to the problems identifying the groups associated with the rival solutions. Other programming, such as policy differences among the supporters of the rival solutions, might accompany the PIM's or be shown separately. A second downstream channel would continuously display a directory of viewing times for the PIM's.

Eight hundred converters would be distributed to households within the cabled area. Those households would be able to receive the two downstream channels. A proportion of that group would also receive the subscriber response terminals necessary for participatory video. At the end of each downstream message or cluster of messages, the participating viewers would turn to another channel. On that channel they would be polled for their opinions about various aspects of the programs they had just seen. Aggregated responses would be displayed immediately--broken down into relevant demographic groupings when appropriate. The upstream channel would also be used to list possible subjects for future PIM's. Viewers would be able to express their interest in particular subjects and thus influence the choice of downstream programming.

b. Social Service Delivery

A second application would provide educational services to the parents of mentally and/or physically handicapped children and to mentally and/or physically handicapped adults. Three sub-experiments were planned and, taken together, were intended to determine a) Whether participatory and/or one-way video could be used effectively to supplement standard social service treatment, b) Whether participatory video could be used effectively to maintain a given developmental level after standard social service treatment has been terminated, c) Whether participatory video could effectively substitute for standard social service treatment and thus extend the reach of social service agencies, and d) What groups could be most effectively treated through the

medium of participatory or one-way video.

The institutional participant in all of the sub-experiments would be the Lehigh Valley Association for Retarded Children (LARC), a bi-county service program for mentally and physically handicapped children and adults.

The individual participants in the first sub-experiment would be handicapped adults and the parents of handicapped children currently receiving services from LARC. The individuals would be randomly assigned to one of three groups. Group One would receive participatory video services; Group Two would receive one-way video service; Group Three would receive no televised services. Standard service from LARC would, in all cases, be continued.

The individual participants in the second sub-experiment would be people whose treatment at LARC had ended (except for evaluative follow-ups) when they were placed in community employment or in public schools. In this experiment, participatory video from the home would be compared with participatory video from client-run residences.

The individual participants in the third sub-experiment would be people who were eligible for LARC service but who, for a variety of reasons, had been unable to receive it. The treatment and setting would be the same as in the second sub-experiment.

The programming would be a combination of existing audio-visual materials* and a live instructor who would ask questions of the participatory video group at the end of each instructional segment.

Lehigh, in conjunction with LARC, has done a pilot study in which it was established that mentally retarded adults are able to use the five-button terminals.

* See for example, the description of Project FEATT under Specialized Audiences p. II-31.

c. Urban Administration

The third application concerned administration in the Bethlehem Area School District. Two experiments were proposed. In the first, the superintendent and other central staff members would provide systematic information to the professional staff on the following subjects: 1) Relevant policy information arising from the semi-monthly meetings of the school board and superintendent, 2) Issues pertaining to internally initiated system-wide programs, 3) Issues arising from state mandated programs, and 4) Demonstrations of innovative programs from individual schools.

The information would be presented to the staff at selected schools and homes at randomly assigned staff homes. At pre-designated points during the presentation, those members of the staff with access to response terminals would be polled for their opinions in multiple choice format.

The professional staff of the schools would be randomly assigned to one of two at-home treatment groups--those able to interact by participatory video and those receiving only one-way video. Those not living in the cabled area would be unable to receive the programs at home. In addition, the schools themselves would be assigned to one of three groups--those with participatory equipment, those with receivers only, and those unable to receive the programs. Staff at schools with access to the programs would be able to choose whether to participate (or watch) either at school or at home. That portion of the staff without access to the programs would form the no-treatment control group.

The evaluation would attempt to determine not only the differences between participatory, one-way, and no television groups, but also the differences between reception in home or school settings and the influence of the type of school (i.e., open or traditional) on the individual's response.

The second application used both participatory video and video-conferencing between schools in the area of curriculum development. Here, interactive cable would be evaluated as an alternative to the traditional communications patterns in an ongoing program of curriculum development. The first segment of the application would be a videoconference transmitted on an existing link between two high schools. In the conference, curriculum staff would present the issues involved in the new curriculum approaches to all teachers in the sample. Questions could be directed to the curriculum staff either from the originating school or, via two-way video, from the other school. The conference could be videotaped and replayed on one-way cable television, for school distribution.

The second segment of the application was a series of in-depth discussions of the issues raised in the videoconference. The discussions among the curriculum coordinators and selected teachers would be televised. As in the previous application, teachers with access to the participatory video equipment would be polled for their opinions and their cumulated answers immediately displayed on the television screens.

Discussion:

The experiments proposed in the Lehigh study grew out of on-going activities at the University. According to Roy Herrenkohl, director of Lehigh's Center for Social Research, the center itself provides an interface between the information and social sciences. One result of the merger of the disciplines was the construction of a precise methodology to evaluate the progress of the handicapped. Herrenkohl approached the design of the LARC experiment as an opportunity to investigate how the injection of innovative techniques might bear on evaluation points.

Similarly, the school administration project grew out of a joint project of Lehigh and the University of Michigan in which interactive cable for dissemination purposes in the Bethlehem Area School District was evaluated. The Community Information System grew naturally from a consulting relationship between Lehigh researchers and the cities of Allentown and Bethlehem on public policy matters.

Much of Lehigh's research relies on interdisciplinary teams. Herrenkohl pointed out that the school has been particularly interested in the interface between engineers and the social and humanistic disciplines--particularly insofar as the interdisciplines affect society. This orientation seems to be reflected in Lehigh's design study in which the engineering theory was interwoven with the social objectives.

It should be noted that despite the consortium's conviction that upstream data-return is the only economic use of upstream channel capacity, the school experiment did use interactive video, transmitting on a two-way link between schools, that was already in existence. The videoconference was a relatively minor component of the application and its function could have been assumed by using data-return. Thus, even within the framework of Lehigh's position that only data transmission upstream can be widely replicated, the inclusion of the videoconference by itself would not seem to affect the external validity of the experiment.

Status:

This study did not receive a second-phase grant and the consortium has no immediate plans to implement any of the applications.

5. CONSORTIUM:

Michigan State University
City of Rockford, Illinois
Rockford Cablevision

For additional information contact: Thomas Baldwin, Television-Radio, 322 Union Building, Michigan State University, Lansing, Michigan 48824

Description:

In common with Rand/Spartanburg and CTIC/Pecria, MSU/Rockford designed self-contained applications that displayed the versatility of cable as a delivery mechanism. The applications involved an intra-institutional use; an educational use; citizen information and referral; direct service to the handicapped; and an interface between governmental functions and private, professional needs. A variety of cable technologies was employed.

a. Firefighter Training

The intra-institutional use was to train firefighters in the methods and techniques of tactical, pre-fire planning. The curriculum to be developed would cover both the general aspects of pre-fire planning such as inspection procedures, use of equipment, and identification of hazards, and specific aspects such as tactical plans to extinguish a potential fire in a given high-risk building in Rockford. Ten fire houses would participate in the project. Two forms of instruction were to be employed. Basic skills would be taught by programmed instruction; skill application would be taught through the use of simulation games.

The instruction would be delivered to the station houses using three technologies: 1) One-way video with digital response, 2) One-way video with mail response, and 3) Video-cassettes with mail response. The group receiving instruction via the first technology mode would be broken into two subgroups--

those that responded individually and those whose responses represented a group consensus. Thus, four treatment groups would be compared. The comparisons would be made in terms of amount of material mastered, number of hours to mastery, amount of material retained over time, attitude toward the instructional mode, and relative cost.

The simulation games would be delivered in two technology modes: 1) Two-way cable with digital response and 2) One-way cable with self-scoring. In both cases, responses represented group consensus. Both groups would receive a presentation illustrating fire problems likely to occur in actual Rockford buildings. The firefighters would be able to "inspect" the building and develop pre-fire plans. After the presentation, multiple choice questions would be asked. The two-way group would send digital responses which would immediately be scored and displayed. The one-way group would score themselves. In other words, the two-way group would compete against each other; individuals in the one-way group would compete against a perfect score. After the game, the alternative pre-fire plans would be discussed on one-way video sent to both groups. Comparisons of the two groups would be made in terms of amount of material learned, attitude toward the instructional mode, and relative cost.

b. Interactive Television and Educational Opportunity

The educational application involved the science-mathematics Special Interest Center of the Rockford Public Schools. In 1974, the Rockford school system established two Special Interest Centers--one for science and mathematics, the other for language arts. The centers are staffed with content specialists in contrast to the generalist classroom teachers of the elementary schools. Each week, entire classes (including the teacher) from four of the elementary schools are bused to a center where they participate, for the entire week, in the educational activities there. The program does three

things: 1) It exposes the youngsters to an intensive learning experience in a well-equipped facility staffed with experienced content specialists; 2) It provides a socio-economic and racial classroom mix not usually found in Rockford's elementary schools, and 3) It gives the elementary classroom teachers a week of apprenticeship in specific content instruction.

The purpose of the cable television application was to reinforce the pupils' and teachers' experiences at the science-math center. In addition, cable would be used to acquaint parents with the center for the purpose of encouraging home support of classroom activities.

One-half of the classes attending the science-math center would receive cable reinforcement. Prior to the week at the center, an orientation program, via one-way cable, would be sent to the participating schools. Pupils, teachers, and parents would be able to see the programs. Also during that week, two-way video would be used so that the students and teachers in the participating classes could be introduced to one another and begin work prior to their center week.*

During the week at the center, one-way video would be employed to demonstrate center activities. These programs would be sent out on the entire cable system. Thus, all subscribers could receive them including parents of children in both the experimental and control groups.

After the week at the center, two-way video activity among the experimental schools and the center would be resumed on a twice-weekly basis so that classes could continue joint projects, and acquaintances made during the center week could be maintained. The post-center activities would also include continuation of in-service teacher training.

* The two-way mode might also be used to allow parents to become acquainted.

Of each group of four schools, two would receive the cable reinforcement. Each of the two schools and the Special Interest Center would be assigned their own non-standard broadcast channel and would be equipped with cameras, transmitters, and three monitors. Each monitor would be tuned to one of the three assigned channels so that participants could see their own site and the two others--each displayed on a separate screen. There would also be earpieces for the participants at each site in order to avoid audio feedback.

c. Early Screening/Intervention of Childhood Learning Problems

The direct service to the handicapped involved early screening and intervention in childhood learning problems. This application was intended to help parents of very young children (2-4 years) identify potential learning problems and, when necessary, deliver appropriate intervention services.

One-way video with digital response, one-way video with mailed response, and face-to-face professional examination would be compared. It was expected that 500 households with children two through four years of age would participate in the experiment. Each participating household would receive a limited-button terminal. During the screening phase of the project, the households would be divided into three groups: 1) Those initially using the interactive mode, 2) Those initially using the one-way mode, and 3) Those initially having the children examined at a testing center.

The response terminal would be activated for those using the two-way mode. A child development professional would conduct the live television program. The professional would establish that the parents had all the necessary materials at hand, saying, for example, "Would you push the 'yes' button when you have the blocks?" When everyone was ready, the professional would then lead the parents through the tests, pacing the procedure to take into consideration responses indicating that the program was going too fast or too slowly.

At intervals the professional would ask for responses to show whether the children were performing the tasks in question.

Using one-way television, no immediate response, and therefore no pacing, would be possible. These television programs could be given live or on tape. Parents would fill out a form indicating which tasks their child was able to perform. The parents would mail the forms to the project office.

The face-to-face examination would be done, by appointment, at a local school.

After each group finished its initial testing, the service mode would be rotated so that parents who used two-way would then use either the one-way or face-to-face mode. The modes would again be rotated so that each child would ultimately be evaluated in all three modes.

The comparisons among the modes would be made on the basis of the number of problems detected, the agreement between the examiners' evaluations and the parents', the cooperation rate of the parents, the relative costs, and the parents' attitudes toward the delivery methods.

The second phase of this application would involve only those children who displayed learning problems. It was expected that about 120 children would participate.

All 120 children would receive center-based help. Sixty of the children would, in addition, be given supplemental treatment via one-way video/digital response television. The incremental benefits of interactive cable would be measured in terms of parent attitudes toward themselves and their children, parent social relationship skills, and the child's progress toward the norms.

d. Cable Information and Referral Service

The citizen information and referral application would provide access to a centralized computer-assisted data base.* Three access modes were to be

*The county's manual information and referral system would have been adapted for use in this application.

compared. They were:

1) Cable Information and Referral System (CIRS)

Five hundred limited-button terminals would be distributed to homes selected through a combination of randomization and socioeconomic criteria. Those homes would be able to receive a dedicated Human Services channel. Programming on the channel would consist of descriptions of city services shown on a rotating schedule. At intervals during the programs, viewers would be able to push appropriate buttons on their terminals indicating such things as a need for more information, a desire to enroll in a program or convenient hours for an appointment. Two to four service areas would be discussed each week. Multiple choice questions would permit viewers to designate the specific agency suitable to their needs. The agency chosen would automatically contact the interested viewer.

2) Telephone Information and Referral System (TIRS)

Clients would call a central office where a referral worker would process the client's inquiry. The referral worker would have access to the same data base that was available directly to the viewer in the CIRS mode. In this instance the selection of the appropriate agency would be mediated by the referral worker.

3) Neighborhood Information and Referral System (NIRS)

Clients would come into neighborhood centers. Face-to-face contact between client and referral worker would be the only operational difference between the NIRS and TIRS mode.

Comparisons among the three modes would be made for per capita use--particularly in relation to "social stigma" areas such as venereal disease--demographic differences, contact duration, information gained, attitude toward the system, referral rates, and costs.

e. Legal-Judicial Uses

The final application involved the interface between the legal-judicial system and the needs of legal professionals. This application was divided into two separate experiments: 1) The collection of pre-trial depositions from witnesses and 2) The delivery of legal information.

1) Pre-Trial Depositions

For the first experiment, court studios would be set up at the Rockford Police Headquarters, at the courthouse, and at several decentralized sites near attorneys' offices. Twenty-one pairs of attorneys would be randomly selected from the members of the Northern Illinois Bar. Each pair would be assigned the role of opposing attorneys taking depositions. Twenty-one police officers would be randomly selected from local law enforcement agencies. Each police officer would be assigned the role of witness. Thus, a pair of attorneys and a witness would form a set to simulate the conditions of deposition taking.

Three communications modes would be compared. The first mode was full two-way video. The attorneys were to be located in their respective court studios; the witness, at the Police Headquarters studio; and the court reporter, at the central studio. Unlike the Special Interest Center application, which used a separate channel for each origination point, the deposition participants would share a single channel. The court reporter would control the switching equipment.* Participants would signal the court reporter when they wanted to speak.

The second mode was mixed telephone and cable. Here, only the witness would be seen on television. A telephone link would connect all participants so that they would be in voice contact. As in the full cable mode, the witness would be at the studio at Police Headquarters. However, the attorneys and the

* See technical section p. III-64, for a discussion of switching.

court reporter would participate via telephone from their own offices.

The third mode, the control, utilized the conventional face-to-face deposition procedure.

The attorney-witness sets would be rotated through the three treatments, so that each set would be able to compare the modes.

In the two treatment modes (i.e., cable and cable-telephone) the testimony of the witness would be recorded on videotape. The attorneys would not be seen but their voices would be heard. These videotapes would be shown to a panel of judges (selected from the state court bench) and jurors (selected from the jury rolls). The panel would be asked to compare the tapes and the stenographic record taken from the live deposition treatment. The purpose of the judging would be to determine whether there was a perceptible variation in the demeanor of the witness depending on the mode of deposition taking and whether the panel believed that either or both methods of video testimony would be acceptable as a means of taking depositions.

2) Delivery of Legal Information

The second experiment in the legal application was the delivery of information. The three parts of this experiment involved: 1) Legal research, 2) Court and legal news, and 3) Court calendars. The parts were to be phased so that the second and third parts would be incremental to the basic system.

In the first phase, broadband coaxial cable and conventional cable bandwidth would be compared as conduits for carrying computer-assisted communication for legal research. There are several systems that currently provide access to remote computerized legal data bases via an interactive telecommunications system. One system, LEXIS, uses an electronic keyboard terminal to communicate, over telephone lines, with a data base of case and statutory law. In return information is displayed on a cathode ray tube (CRT). Facsimile hard copy is also delivered electronically.

In this experiment, 30 Rockford area attorneys would receive LEXIS terminals to access the legal data base in Dayton, Ohio. Each of the attorneys would operate the terminals at two different speeds.* The two speeds would be compared in terms of user attitude (expected to be more positive toward the higher speed).

In the second phase, legal and court news would be sent over the cable system to public officials and attorneys. Legal and court news is typically delivered in a format characteristic of both mass newspapers and individually addressed letters. Many items in the legal newspapers are general announcements requiring no response. Other items require answers. For example, a "drop" list states the intention of the court to drop certain cases unless the attorneys request that they remain on the calendar.

In this experiment, a court clerk would enter items (from pre-selected categories) on a character generator. The generator would continuously transmit the stored information.

Four groups--each with five members--would be compared. Group One would receive the information via two-way cable on addressed keyboard terminals. A terminal would be signalled when an item of interest to its particular address appeared. A hard copy facsimile would automatically be delivered. The office operator would send an upstream digital response if required (e.g., transmission of the attorneys schedule to the court).

Group Two would receive the information via two-way cable on non-addressed limited-button terminals. The office operators would monitor the terminal in the same way that they would read the legal newspapers. As explained by MSU's Tom Muth, when an item requiring response appeared (e.g., "Do not drop case.")

*A discussion of the technical details can be found in the technical section, p. III-53.

the operator would push the appropriate combination of buttons to send the upstream response. The kinds of response possible electronically would be limited by the number of buttons on the terminal. Complex replies would have to be transmitted in conventional manners.

Group Three would receive the information via one-way cable. As in treatment two, the terminal would have to be monitored. In this case, however, all response would be by conventional mail or telephone.

Group Four would both receive and transmit information in the conventional manner.

The groups would be compared as to utilization of the system, time savings, user attitude, and message accuracy.

The third phase would introduce remote court scheduling. Treatment groups and measures of comparison would be identical with those in phase two.

Discussion:

The MSU/Rockford relationship was unique among the seven consortia in that it was initiated by the city rather than the research organization. The city of Rockford, on learning of the NSF program, held what amounted to a mini-competition. A committee of aldermen contacted and interviewed representatives from several universities in order to find the most comfortable "fit." According to one of the committee members, "MSU seemed to be the only school that wanted to do the same things we wanted to do and was ready to do it right away."

The MSU/Rockford design study reflects both the particularism of the initiating city and the scope of a broad-gauged university. Two of the applications are especially illustrative.

The firefighter training application is, in content, virtually unique to Rockford. The city's fire chief, James Cragan, is a doctoral candiate in administration. He has written and lectured on pre-fire planning and has weighted that subject equally with extinguishment in his own department.

While pre-fire planning may not be a priority item in the training programs of most fire departments, the general framework of the application (mastery-based curriculum, alternate delivery systems) as developed by MSU is widely applicable.

The educational application, based on the Special Interest Center, is also specific to Rockford. Again, the general framework--especially the remote delivery of apprenticeship training for teachers--is generalizable and of great interest.

The MSU/Rockford study as a whole generalized from the particular. This is in contrast to most of the other service-delivery oriented applications which particularized from the general (e.g., Rand's adult education, Lehigh's Social Services for the Handicapped, CTIC's In-Service Training for Nursing Home Personnel).

Status:

The firefighter training application was funded by NSF. As of this writing the curriculum was being developed and the computer was being tested. System testing is scheduled to begin in spring 1976. The program is scheduled to become operational in the fall.

All of the other applications are being redesigned by the consortium and funding is being sought.

6. CONSORTIUM:

New York University
City of Reading, Pennsylvania
Berks TV Cable Company
Berks County Senior Citizens Council
Reading Housing Authority

For additional information contact: Mitchell Moss, Alternate Media Center N.Y.U. School of the Arts, 144 Bleeker Street, New York, New York 10012

Description:

The NYU/Reading design was unique in that it selected a single target population, i.e., the elderly, with which to work. Using that population as a prototype, the consortium proposed to explore the process of communications as it developed through teleconferencing.

Three Neighborhood Communication Centers (NCC's) would be linked with two-way video capability. The NCC's were to be located at a multi-purpose senior citizens center, a public high-rise apartment building for 165 elderly people (also used as a congregate eating center), and a public garden development for 118 elderly people within a larger public housing complex. Other two-way locations, such as the mayor's office, would be added to the network on an ad hoc basis. The added locations would receive semi-fixed equipment, to be moved as needed.

The participants in the interactive programs would be the elderly themselves, service providers, and members of public and quasi-public agencies. The programming would be planned and produced by the elderly and would be molded by their interests. However, three broad subject areas would be emphasized. They were: 1) Outreach programs, which would attempt to increase the number of senior citizens who take advantage of benefits (such as food stamps); 2) Informational programs, which would help people already enrolled in a program to take full advantage of its benefits; and 3) Actual service delivery, which

present some of the services provided by Berks County Senior Citizens Council, e.g., recreational activities, crafts classes.

Most of the communication among the participating locations would be through two-way video, in which the participants would be able to see and hear one another, with the switching managed by a program director located at the headend.* Occasionally, programs would be produced utilizing a one-way video open-audio mode.

One-way "broadcast" type television would carry the programming to 200 homes equipped with converters. These homes were divided into two groups. The first would contain elderly people who did not have easy access to any of the NCC's. For them, the programs would act as a substitute for center activity. The second group would be composed of elderly people with easy access to the NCC's. For them, the programs would be a supplement to center activities. Both groups would be able to interact via telephone. None of the programs would be cablecast on open circuit. Only locations with converters (including the participating sites) would be able to receive the programming.

The project was to be evaluated both in terms of the impact of the NCC's on senior citizens' behavior (e.g., Do they make greater use of services? Is their competence as consumers improved? Do they participate more in community affairs?) and the process and operation of the NCC's (e.g., Can non-professionals learn to use the technology? What are the optimum mixes of subjects, participants, and communications modes?). Matched groups would provide the controls. An analysis of NCC costs would be undertaken.

It was the intention of the consortium to train the participating senior

*See the discussion of multipoint two-way video, p. III-62.

citizens in the use of the equipment and to prepare them, in conjunction with several community agencies, to assume direction of the operations at the end of the experimental period.

Discussion:

The Alternate Media Center of N.Y.U. has been working with Berks TV Cable Company and the City of Reading since 1971. The purpose of the affiliation was to train citizens to use the cable system as a tool to communicate among themselves and with the city government. The cable system itself has intermittently set up multipoint two-way video demonstrations and is, to our knowledge, the only cable system in the United States with extensive experience in teleconferencing.

Thus, the NSF design study was more in the nature of an extension of an ongoing association than a new project. The attitude of NYU/Reading toward cable as a communications tool is in sharp contrast to that of Lehigh/Allentown. Where the latter regards digital upstream communication as the only efficient use of the resource, the NYU consortium believes that this "voting" aspect of citizen-government communications is unnecessarily limiting. According to Co-principal Investigator Mitchell Moss,voting is an important but relatively small portion of the political activity of a community. Dialogue, he says, in the form of bargaining, negotiating and just plain conversation is a more wide-spread form of interaction. Moss feels that, "Technology should not be used just because it is available. It should not determine social processes but should be a tool of them." The NYU/Reading design study, therefore, was a product both of the available communications network and of the philosophy that brought the network into existence.

Status:

The NYU/Reading design was funded by NSF for implementation. In December 1975, the multipoint network was activated and began test operations. Throughout December, the Neighborhood Communications Centers were cablecasting. One series, "Adventures in Maturity," had been produced by a local retired nurse with the help of the Red Cross. That was the first production done without the help of the project staff.

The degree of participation of the senior citizens in the various programs seems to depend on the subject matter. According to project coordinator, Eileen Connell, the greatest participation was in one of the crafts demonstrations when about 80 elderly people participated. The most popular series has been a morning sing-a-long with a pianist and leader at one of the centers and participants joining in at remote locations. About 40 people regularly participate in the sing-a-long.

The purpose of the December test run was to determine what formats would be most suitable (series, rather than single programs, are preferred), to select production times most conducive to participation (late morning rather than early--at least until the weather gets warmer), to train equipment operators, and to adjust the audio levels. The tests are nearly complete and the experimental cycle began in January 1976.

Members of the community who will act as the post-experimental staff are currently being selected and trained.

7. CONSORTIUM:

Cable Television Information Center/The Urban Institute
City of Peoria, Illinois
General Electric Cablevision

For additional information contact: Stanley Gerendasy, Cable Television Information Center, 2100 M Street, N.W., Washington, D.C. 20037

Description:

Like Rand/Spartanburg and MSU/Rockford, CTIC/Peoria designed discrete applications using several interactive communications modes. CTIC recommended a basic "package" of three applications. They were 1) A citizen participation-polling application using limited-button response terminals, 2) A practitioner consultation demonstration using a switched network for on-demand two-way video communication, and 3) In-service training for nursing home personnel using a multipoint two-way network for scheduled communications. The consortium also proposed two add-on applications: interactive programming by senior citizens and vocational rehabilitation for the severely disabled homebound.

a. Citizen Participation/Polling

The citizen participation-polling application would have presented informational programs about city services, problems, and priorities. Each program would be followed by an electronic poll. The application had three phases. In the first phase, 150 limited-button terminals would be distributed to randomly selected households throughout Peoria. Programs would deal with topics of city-wide concern (e.g., the public transportation system). After a brief introduction to the topic, multiple choice questions would be asked (e.g., Are the buses you ride too crowded?) Respondents with terminals would push the appropriate button (Never. Once in a while. Often.) and the aggregated answers would be shown immediately on the television screen. All cabled households tuned to the channel would be able to see the programs.*

*As in the DRI polling application, viewers who did not have terminals could respond by mail or phone, for subsequent tabulation.

In the second phase, the terminals would be redistributed within a homogeneous neighborhood. The programs would reflect the interests of the selected neighborhood. The third phase would be similar to the second but directed to a neighborhood with different socio-economic characteristics. The application would be evaluated in terms of impact on both citizens and government and the consistency of cable poll results would be checked against telephone and face-to-face standards. Costs would be compared with conventional mail, in-person, and telephone surveys.

b. Practitioner Consultation

The second application, the practitioner consultation demonstration, was planned in two phases. During the first phase, five nursing homes and eleven "backup" agencies (e.g., mental health centers, hospitals, physical rehabilitation center) would be assigned fixed, two-way video equipment. The video-network established would allow any participating unit to communicate with any other participating unit on an on-demand basis.* This would permit remote examination and diagnosis of nursing home patients. The service was expected to be particularly useful in cases of acute illness during "off hours" when only paraprofessionals were on duty at the nursing homes. This phase of the application was to be evaluated in terms of user satisfaction, cost savings due to decreased ambulance use and the effect (e.g., stress symptoms) on those patients who were examined by video, relative to those who were transported by ambulance.

Portable equipment was to be added during the second phase of the demonstration. Here, field workers would be equipped with lightweight video equipment that could be set up as two-way video origination points from any cabled location. For instance, a children and family service caseworker, encountering

*See the description of external switching below.

a multi-problem situation, could arrange sequential video interviews with appropriate agencies (e.g., Council on Alcoholism, Family Health Center) without having either to accompany the patients to the interviews or to rely on their arriving by themselves. This phase of the experiment would be evaluated in terms of overall utilization. Sub-evaluations would be in terms of each of the agency's own goals.

c. In-Service Training for Long-Term Care Personnel

The third application in the basic package was in-service training of nursing home personnel. Eight long-term care facilities were to participate in the project. Four of the facilities would receive the training programs via two-way video. The other four would receive them one-way, with no interactive capability.

The two-way mode would utilize dedicated channels--one per nursing home upstream and a single shared channel downstream.* The instructor, from a studio located at the headend, could selectively bring a given facility "on line". Thus, at any one time, the instructor or one facility--or the instructor and one facility on split screen--could be seen on the television screens of all facilities. Audio interaction would be open.

The programs would include a series on working with the aged (directed toward all levels of staff), nutrition (for food service personnel), "basic training" (for nurses' aides), and special topics for nurses.

Comparisons between two-way video and one-way video would be made with regard to impact as indicated by employees' attendance at lectures, their attitudes toward their jobs and training, and by reference to relative performance vis-a-vis selected aspects of the quality of service provided. Further comparisons would be made between the before and after states of the facilities.

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*See the discussion of multi-point two-way video, p. III-63.

d. Interactive Programming by Senior Citizens

The fourth application, interactive programming by senior citizens, was suggested for implementation only if "budget considerations warrant." *

Peoria has between thirty and fifty centers of activity for elderly citizens. Those centers include golden age clubs, the community rooms of senior citizen housing complexes, and congregate eating centers. In this application, 20 of those centers would be linked in a cable network. Each week, five of the centers would be involved in interactive programming. Four of those centers would be given portable two-way video equipment. The fifth would be designated as the primary origination point and would use a two- or three-camera mobile unit. The interactive capability (including "prime origination") would be rotated among the twenty participating centers. In other words, for any given program, five centers could interact while the other fifteen centers would have conventional one-way reception. Transmission would be on a standard channel so that all cabled locations in Peoria would be able to watch the programs.

Programming, to be determined by the participants, would be in a magazine format, combining entertainment, information, and service segments. One hour-a-week would be cablecast.

Evaluation questions concerned the degree of participation by the elderly in center activities, the extent that the programs were watched by the elderly in the home audience, and any increased use by the elderly of services or benefits described in the programs.

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* The NSF grant specified that the cost of implementation should be within a range of $750,000-$1,000,000. The addition of the senior citizens application would have caused the CTIC/Peoria design to exceed that limit.

e. Vocational Rehabilitation

The fifth application was to provide to-the-home vocational rehabilitation training for the severely disabled homebound. At the time the design study was done, Peoria had no program for the severely disabled homebound. Therefore, in order to implement the delivery of training via telecommunications, it would have been necessary to assemble the basic components of a homebound program --e.g., the homebound population would have to be identified and evaluated and potential employers would have to be found. Implementation money from NSF could be expected to cover the telecommunications delivery. However, the bulk of the necessary funds would be for start-up costs and would have to come from other sources. Thus, the consortium did not include the vocational rehabilitation application in its basic package but requested later consideration contigent on its ability to attract first-phase funds.

The project would concentrate on training the severely disabled homebound for employment in high skill and judgmental jobs (e.g., computer programming). Extrapolations from national statistics indicated that about 150 severely disabled homebound Peorians would be both able and willing to be trained for high-skill employment.

Between 5 and 10 students would comprise each class and between 5 and 7 courses would be given during the pilot period. It was expected that about 50 of the 150 eligible recipients would be trained during that time.

The curriculum to be offered would depend on the match of students and available employment. Once the match was made, two tasks would be carried out simultaneously. The students would receive pre-training preparation. This would involve counseling for both the students and their families and job-tool adaptation.*

*For instance, a student with limited hand coordination might require levers on a machine normally operated with buttons.

At the same time, a suitable instructor would be selected from an available pool at Bradley University, Chicago City Colleges, Illinois Central College and the Peoria industrial community. The course would be adapted to the needs of the homebound and delivered, live, via two-way video.

Fixed cameras would be located in the students' homes. The interactive package would include 1) A lecture or demonstration by the instructor, 2) Interactive questions and answers between instructor and students, and 3) Interactive video monitoring of the students' progress. The video switching would operate as in the in-service training application described above.

This application was to be evaluated in terms of student performance (both in class and on the job), impact of the training on the social adaptation of the students (e.g., Will they, over time, increase out-of-home contacts?), and absolute costs of all phases of the demonstration. Comparative evaluations were not planned.

Discussion:

CTIC's orientation was in sharp contrast to Rand's. Where Rand was primarily interested in experimental research, CTIC was, according to its then Executive Director W. Bowman Cutter, primarily interested in the efficient delivery of services. Thus, while the Rand/Spartanburg design selected applications most amenable to rigorous evaluation, CTIC's selections were driven by the users. In practical terms, this meant that two of the applications--practitioner consultation and vocational rehabilitation--were in the nature of feasibility demonstrations rather than research experiments. An extensive discussion of the differences between true experiments and pilot demonstrations is beyond the scope of this report, although we will, for definitional purposes, touch the subject in the comparisons of research designs, below.* It is sufficient to say here that there is a difference in points of view, that both points

*See p. III-71.

of view are legitimate, and that they are well illustrated by the contrast between Rand's day care experiment and CTIC's vocational rehabilitation demonstration.

Status:

The vocational rehabilitation application received first phase funding from the Rehabilitation Services Administration of the U.S. Department of Health, Education and Welfare. The primary grantee is the Illinois Division of Vocational Rehabilitation. CTIC is responsible for the preparation leading to the delivery of the service.

The target audience has been expanded to include those severely disabled homebound for whom a vocational outcome is not feasible. That is, training in the skills of daily living (e.g., how to get from bed to a wheelchair) will be taught in addition to the job-related courses. The project is currently identifying and evaluating potential service recipients and exploring the employment opportunities in Peoria. The technical design for the application has been completed. If second phase money is forthcoming, actual service delivery is expected to begin in June 1976.

The consortium is seeking funding for in-service training of nursing home personnel. There are no plans to implement the other applications.

TABLE 3. CHARACTERISTICS OF THE APPLICATIONS

CHARACTERISTIC	APPLICATION	Home Subscribers	Public Forum	Public Places	Electronic Public Counter	Community Video-conference	Adult Education	Day Care	Coordinated Services	Psychiatric Testimony	Public Information Messages	LARC	Urban Administration	Firefighter Training	Educational Opportunity	Childhood Learning Problems	CIRS	Depositions	Legal Information	Neighborhood Communications Centers	Citizen Participation	Practitioner Consultation	In-service Training	Senior Citizens	Vocational Rehabilitation
Content	Service		*		*		*	*	*	*		*		*	*	*		*	*	*		*	*	*	*
	Education		*				*	*				*		*	*	*				*			*	*	*
	Post-secondary		*																						
	In-service							*						*	*								*		
	GED						*																		
	Developmental											*				*									
	Leisure time																			*				*	
	Public school														*										
	Bureaucratic mediation				*				*								*			*		*			
	Socialization																			*				*	
	Problem identification															*									
	Vocational																								*
	Government--citizen	*		*	*												*								
	Citizen--government		*			*					*									*	*				
	Administration				*				*	*			*				*	*	*						
Audience	General public	*	*	*	*	*					*						*				*				
	Undereducated						*																		
	Paraprofessionals							*						*									*		
	Professionals									*			*		*			*	*			*	*		
	Parents											*			*	*						*	*		
	Handicapped											*				*									*
	Poor								*								*								
	Elderly																			*				*	
Participating Agency	Service agency											*				*				*		*	*	*	*
	State							*	*	*						*						*	*	*	*
	County				*			*									*		*			*			
	Local	*	*	*	*	*					*			*			*	*		*	*	*			
	Schools		*				*						*		*	*									
	Professional organizations																	*	*						
Times of Service	Specified hours		*			*	*	*	*	*	*	*	*	*	*	*	*	*		*	*		*	*	*
	Business hours	*	*	*	*														*						
	24 hour																					*			
Limitation	Queuing		*		*				*									*		*	*	*			
Level of Innovation	New project	*	*	*				*			*									*	*	*		*	*
	Project extension				*	*	*		*	*		*	*	*	*	*	*	*	*				*		
		DRI			USC		Rand				Lehigh			NSU						NYU	CTIC				

B. TECHNOLOGY

Cable technology to support social service applications is at an early stage. There has not yet been enough use of equipment to result in standardized "off-the-shelf" equipment or procedures. As a result, each consortium was forced to evolve specific approaches to meet its needs. Given the wide divergence in functional needs, cable systems, engineering resources available, and some NSF limitations on hardware expenditures, there is no useful purpose to be served by a detailed review of the technology in each separate application. The choice of technology in each of the proposed applications was driven by a combination of factors that is unlikely to occur again. Consequently, this section concentrates on the general trends displayed across the seven proposals. The section is organized around the following categories:

1. Terminal types *
   This referred to relative permanence of the equipment location.
   a. Fixed
   b. Semi-fixed
   c. Portable

2. Data services
   These were services involved in the transmission of digital data, i.e., text, yes-no responses, etc.
   a. Limited button
   a. Keyboard
   c. Medium and high speed

3. Video services
   These were services involved in the transmission of video and audio.
   a. Two-point, 2-way video
   b. Multi-point, 2-way
   c. Switched
   d. On demand, one-way

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* Information on the number of terminal locations involved in an application as well as the number interacting simultaneously is given in Table 4 Technology Employed, p. III-70a.

4. Other technologies
   Some of the applications made significant use of communications technology other than cable.

One further area, confidentiality (access to information transmitted or gathered), was examined. Because of the widely varying approaches to the problem and the divergence of technical requirements, no attempt was made to categorize the approaches. Rather, some of the innovative techniques of achieving confidentiality are highlighted.

As in the rest of the paper, the technical section is written from the perspective of the social service users. It is not a "how to" guide to cable technology. Despite the fact that this is a user's description, however, engineers may find it a useful guide to the proposals.

1. Terminal type (permanence)

The permanence of a terminal installation affects not only the terminal itself, but also the cable communications system. The effect on equipment design is obvious. If it is necessary to move a terminal quickly and often, with little advance notice, the terminal must be very portable--lightweight and durable.

The effect on the cable system itself is less obvious. If the terminals are moved often, it becomes virtually impossible to predict the transmission paths of messages, what links will be used, even which input locations will be needed at any given time. As a consequence, a multitude of eventualities must be anticipated. Thus, the degree of permanence of the terminal installation has serious implications.

In examining the proposed applications, the terminals seemed to fall within three general groups--fixed, semi-fixed and portable. The fixed installations were intended to remain in place for many months (usually for the

entire experiment). In those cases, the cable system's transmission paths could be prepared well in advance to serve the fixed locations. If the experiments were to become permanent, these locations would be the logical candidates for service with dedicated communications links (e.g., as paths in an institutional cable network such as the Philadelphia Police network described in Chapter II.) Several of the applications, in fact, used such dedicated cable.*

NYU/Reading used dedicated upstream cable to service a fixed location outside the area served by the system's two-way plant. Lehigh University used a pre-existing two-way link between two high schools. The USC/Los Angeles study adopted the principle--if not the same transmission line--by using dedicated microwave links to reach several fixed sites in areas not serviced by cable. Particularly in the case of upstream video transmissions where the capacity of a normal cable system is usually quite limited (i.e., a maximum of 4 upstream video channels per trunk),**it makes particular sense to serve at least the upstream requirements of fixed terminal locations with dedicated communications. As The Rand Corporation pointed out in its discussion of point-to-point video and inter-institutional communications:

> Point-to-point communications can be introduced into the service delivery system of local agencies on a trial basis at a comparatively modest cost, without the costs or capital commitments of microwave or dedicated cable. After the system has been proven valuable to users, then a subsequent

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* A dedicated cable is an additional cable installed to serve specific uses. A dedicated channel is the use of one of the channels of the system for a specific purpose.

** When a cable system that is used to provide to-the-home service is also used to transmit upstream messages, the upstream messages are carried on that part of the available spectrum that is below channel two--usually no more than four channels. This is called a "subsplit" system. In those cases where the entire trunk cable is used to provide institutional services, the "split" is usually made between channels six and seven, permitting almost equal channel capacity in either direction. This is called a "mid-split" system.

> decision can be made as to what form of telecommunications would provide the same capacity at the least cost. An important role of interactive cable systems is as an interim communications system that will enable innovations that would otherwise not be likely to occur. [P. I-5]

CTIC, in its Practitioner Consultation application, proposed to install a short section of dedicated cable to provide service to several fixed locations in order to retain use of the upstream capacity in the regular cable trunk for non-fixed locations.

A second group of terminals was labeled semi-fixed, i.e., terminals installed with a lead time measured in days, and a use at any one site measured in weeks. These terminals occupy a middle ground between portable and fixed. While the components do not arrive assembled in a neat off-the-shelf package, the requirements for assembly are not nearly so rigid as they are for portables. There is time for adjustment each time they are moved. Nor need they meet the stringent requirements for durability demanded by portables. In addition, their mean time between moves and the predictability of their locations permits a degree of "fine tuning" of the cable system that is not possible when portable terminals are used. Using semi-fixed locations, there is time to test the equipment and the transmission paths whenever the terminals are relocated. However, the gain in packaging and engineering ease is traded-off against the convenience of use. The trade-off is illustrated by the day care application of Rand/Spartanburg. According to the proposal, [P.IV-12] the time between movement of the terminal must be "at least two weeks to avoid too much disruption in the facility and to minimize transportation of equipment." Lack of portability has its price.

The last category was portable terminals. There were two experiments that used portable terminals. The first was USC's Electronic Public Counter (EPC) in which teleconferencing was used to arrange job interviews between

applicants at the EPC and job counselors located at city hall. The application proposed the use of a "Video Cart" to bring the terminal to the job counselor. The other application using portable terminals was CTIC's Practitioner Consultation which used a video terminal carried in two suitcases weighing 18 pounds in toto. In neither case were these terminals standard "off-the-shelf" products.

USC's "Video Cart" would probably have been an adaptation of a prototype that has been developed by the University of Cincinnati for its hospital's use. CTIC found it necessary to custom design the terminal from available components.

The second problem associated with portable terminals is their effect on cable systems. Because a portable terminal may be attached to the system at any one of a large number of points on short notice, the entire cable plant must be constantly maintained at adequate performance levels. Portable terminals, unlike semi-fixed terminals, do not allow for "fine tuning" of the cable plant to ensure adequate performance.

The use of portable equipment, rather than fixed or semi-fixed, permits greater utilization of a cable system's ability to reach a substantial portion of the population. Cable operators, however, have had very little experience with two-way transmission. That inexperience fosters uneasiness in dealing with interactive video--particularly with the unpredictability of portable terminals.

It seems a reasonable inference that this lack of experience in cable's technical performance, together with the unavailability of low cost portable equipment were two major factors that inhibited the design of applications that relied on portability. Hopefully, the impetus given interactive social experiments by the NSF grants will stimulate further technical development.

2. Data services

The data services used by the experiments fell into three groupings--limited button, full alphanumeric (keyboard) terminals, and medium or high speed (downstream only).*

a. Limited button (low speed)

Overwhelmingly, digital terminals were used to allow a participant to respond to questions delivered over a downstream television channel with one of n responses ,where n was small (usually less than ten). In almost all uses the response was indicated by pushing one of n buttons (e.g., a bank teller using a Touch-tone phone).** With only a small number of buttons, there are severe limits to the number of responses possible. However, for general purpose use, a limited number of response options is desirable because of the difficulty in explaining the meaning of each response alternative.

Should the limited button response provide too small a set of responses for a given application, two alternatives are available. One, the electronic typewriter, was used by USC/Los Angeles and MSU/Rockford. It is discussed below.

A second alternative is a special purpose keyboard consisting of a relatively large number of buttons but with each button labeled with a specific

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* Digital transmission speeds are usually divided into three classes--low, medium, and high speed. Low speed transmissions require less than the bandwidth of a telephone line (voice grade), i.e., typically 30 or less bits per second (bps). Medium speed transmissions utilize a telephone line (roughly 1,200-9,600 bps). High speed transmission requires more capacity than a single telephone line (above 9,600 bps).

** An exception to the push button response is an n position rotary switch. This was a technical alternative suggested in CTIC's Citizen Participation application. The subscriber response terminal used by Denver Research/El Segundo permitted the user to respond by pushing one or more of three buttons, i.e., a three bit binary number.

message.* This type of keyboard is used on some electronic sales terminals in stores and restaurants. There are no siginificant technical differences between special purpose and limited button terminals. The important differences are cost and flexibility. The special purpose terminal requires more--as distinct from different--components and the special purpose keyboard itself is, by definition, useful for a small number of applications. None of the seven design studies used such terminals.

All of the limited button terminals were used in subscriber response applications where the receiving equipment was a television set without any addressing capability. In a subscriber response system each participant responds to messages sent to all participants. For instance, the instruction, "Press button A if you would like to see a presentation on home canning; press button B if you would like to see a demonstration of the martial arts" might occasion three A votes and thirty-two B votes. The result would be a martial arts demonstration sent to all receivers tuned to the channel. The individual responses sent upstream cannot be used to direct individual messages sent downstream.

The long-range importance of limited button terminals is that most forms of per-program (as opposed to per-channel) pay TV terminals will offer limited button capability at little or no additional cost. Thus if the pay cable industry evolves toward per-program charges, as many expect it to, then the incremental hardware cost of implementing the applications which use limited button terminals will be low. The economy of shared use was illustrated by the Lehigh design that utilized the limited button terminals of Twin-County Trans-Video's pay TV system and the NSU/Rockford design that used a minor

* For instance, pushing a key labeled with a picture of sun and clouds might indicate that the user wants a weather report.

modification of Coaxial Communications' pay TV terminals.

It was notable that no application proposed the use of limited button terminals in conjunction with upstream voice response although there were several applications (Rand's Multipoint Data Return and Adult Education project, Lehigh's Social Service Delivery, and MSU's Early Screening/Intervention of Childhood Learning Problems) where the addition of audio return would be particularly useful. These applications share a common characteristic--a relatively small group of participants engaged in simultaneously carrying out some new task (e.g., learning high school subjects, examining their child for learning problems, etc.) As the experiments are currently planned, the only way of indicating a lack of understanding is to push a button. A more flexible feedback mechanism seems appropriate. A microphone in each terminal whose operation was controlled by the leader would be a useful addition in this context. A participant experiencing difficulty could then signal by means of a response button, "I have a question to ask." If appropriate, the leader could then activate the participant's microphone allowing the question to be asked.* In these cases use of a dial telephone is less desirable because of the additional time delays and distraction caused by the dialing.** However, when either the number of participants increases significantly or when the immediacy of questions is not important, the dial-up telephone is an acceptable

* Obviously in some cases the ability to ask verbal questions may be counterproductive. The argument is not that all uses of limited button terminals by small simultaneous groups need voice but that many could benefit by its presence. Nor is the use wasteful of capacity since one audio channel can be shared among all users since the leader controls what is, in effect, a big party line.

** Nor is a full keyboard likely to be an adequate substitute for voice communications. For example, in Rand's use of limited button terminals it is unlikely that students in an adult basic education class would find a keyboard an adequate means to communicate their difficulties.

alternative. In either of those cases, a question period at a predetermined point in the presentation can be adequately handled using dial-up telephones. Or, as in the case of MSU/Rockford's Cable Information and Referral Service, the use of a telephone by a participant who found the possible response over the limited button terminal inadequate, would be acceptable. In such an application there would be no strong reason to add voice capability.

The most probable reason for the absence of voice capability is cost. Although limited button systems are not yet "off-the-shelf," the basic components are readily available. Low cost components for upstream audio on cable, however, are not yet available and the cost per unit for voice capability is high.* That cost will probably drop as demand increases.

b. Alphanumeric keyboard (low speed)

Only two applications used full alphanumeric keyboards. They were USC's Electronic Public Counter and MSU's Legal Information applications. The relatively high cost of keyboard terminals precluded their use in large numbers (neither application used more than ten terminals). When transmitting low speed data, cable has an advantage over telephone lines only when there is a large number of simultaneous users. Thus, the applications proposed offered no improvement over the communications capability available from the telephone system. In fact, the Electronic Public Counter would actually have used telephone lines, primarily because the same system was to have served both cabled and non-cabled areas.**

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* For example, the bids for the limited button terminals that included upstream audio component by one popular hardware supplier were about two-thirds higher than for limited button terminals without audio (from $300 to $500 per unit).

** Two of the applications that received implementation funds use limited button terminals (i.e., MSU's firefighter training and Rand's high school equivalency training). Since most of the components used in limited button terminals are identical to those used in alphanumeric keyboards, the experience gained from the use of limited buttons will be transferable to the use of keyboards on cable.

c. Medium and high speed data services

Both limited button and keyboard systems involve the transmission of information at relatively low speed, compared to the capacity of a single TV channel. Keyboard systems rarely exceed three hundred bits per second per terminal, in contrast to the million bits per second that can be transmitted over a TV channel. Thus, keyboard and limited button terminals are considered "low speed." Two applications proposed to use higher speed terminals. They were DRI's Interactive Information Services in Public Places and MSU's Use of Cable for Computerized Legal Research. Both of these applications proposed to transmit text downstream to a user at rates faster than those found in low speed services. The users would use a low speed keyboard to initiate their requests.*

The DRI application used a "frame grabber." A "frame grabber" system sends whole frames** from the headend downstream to specific terminals. Since a standard TV signal consists of 30 frames per second, a "frame grabber" system using one TV channel can transmit 30 separate messages per second. At the receiving terminals the address of each incoming picture frame is checked. When a match is found, (i.e., that picture frame was addressed to that terminal), the frame is simultaneously displayed on a TV set and stored in some form of recording device. The recorded signal is then used to "refresh" the TV screen until a new frame is sent to that terminal.

A "frame grabber" is a high speed system that uses video transmission. That is, an entire picture is sent from the headend to the TV set. Since the DRI application, in common with most "frame grabber" applications proposed

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* Note that there is no need for a higher bit rate upstream since the limiting factor is the user's ability to type, not the speed of the transmission.

** A "frame" is a still picture that fills the television screen.

in the literature, used the "frame grabber" to transmit discrete data--in this case, alphanumeric symbols, it was classified as a digital service. It should be noted, however, that the system could just as easily transmit analog data. In other words, if a user were to ask, "What time does the bus leave for Los Angeles?" the response could be either the alphanumeric symbols "7 o'clock" or a picture of a clock with the hands pointing at the relevant time. In a "frame grabber" system, the image shown on the TV screen is composed at the headend.

The medium-speed* system proposed by MSU involved digital, rather than video, transmission. Here, the picture is not composed at the headend, but by equipment connected to a video display terminal. Binary units for information (similar to the dot and dash of the Morse code) are transmitted from the headend and translated into alphanumeric symbols at the terminal. The symbols are displayed on the screen. Unlike the "frame grabber," analog data cannot be displayed.

The MSU application would have tested user reaction to two transmission speeds (1,200 and 9,600 bits per second). These speeds would have allowed the transmission of an average display page of text in seven and one-half and one second, respectively.

*The MSU report described the system as "broadband." "Medium speed," however, is a more accurate term since the transmission speeds proposed, i.e., 1,200 and 9,600 bits per second, can be handled on dedicated telephone lines and dial-up telephones lines, respectively.

The DRI and MSU applications which used medium and high speed data services shared two distinguishing characteristics. Only a small number of terminals (ten in the case of DRI, five in the case of MSU) were used and in both cases the terminals were to have been donated by the hardware vendor. The limitations on hardware dollars effectively precluded the use of medium- or high-speed terminals under any other conditions.

3. Video services*

Some of the experiments used the upstream capability of the cable system to carry on two-way video programming. Two aspects of these uses are of particular interest: 1) How locations talk to each other and 2) How much lead time is available in setting up the communications links.

The subject can be addressed either in a functional way (i.e., who is communicating with whom) or in a technical or actual way (i.e., what paths do the signals follow.) This section will discuss both approaches. It should be borne in mind, however, that from the point of view of the user, the functional (or virtual) link is what matters. If A wants to talk with B, the participants are not and should not be concerned that their images detour through the headend. While this section is not intended to provide a complete engineering guide, its purpose is to describe the ambiance of implementation so that engineers and users can, at the very least, speak the same language.

The simplest teleconferencing situation is two locations talking to and seeing each other, i.e., a two-point, two-way video service. The overall

*The contributions of the participants in a seminar on teleconferencing held under the auspices of George Washington University's Continuing Engineering Education Program (October 15-17, 1975) were particularly helpful in writing in this area.

technical design for the video is straightforward.* Each location receives the picture from a camera at the other location. Even this simple sounding circuit can consume a substantial amount of cable system capacity. If, for example, both locations are served by the same trunk of the cable system, as was proposed in Rand's Psychiatric Testimony application, then a total of four cable channels are used--two upstream out of a possible four** and two downstream channels out of twenty to thirty available. This is because the actual communications links must go through the headend. Therefore, each link from one location to the other involves one upstream channel to the headend and one downstream channel from the headend to the other location. See Figure 1.***

The upstream channel consumption is not as serious if the two locations are on different trunks, since <u>each</u> trunk has the maximum four upstream channels.

The technology and the user dynamics are more complicated when there are more than two locations. Technically, the problem is that the number of direct links quickly rises beyond reason. For instance, for three locations, six links are required; for four locations, twelve links. The general formula for locations is n(n-1) links. The MSU/Rockford Special Interest Center application used this configuration for three locations.

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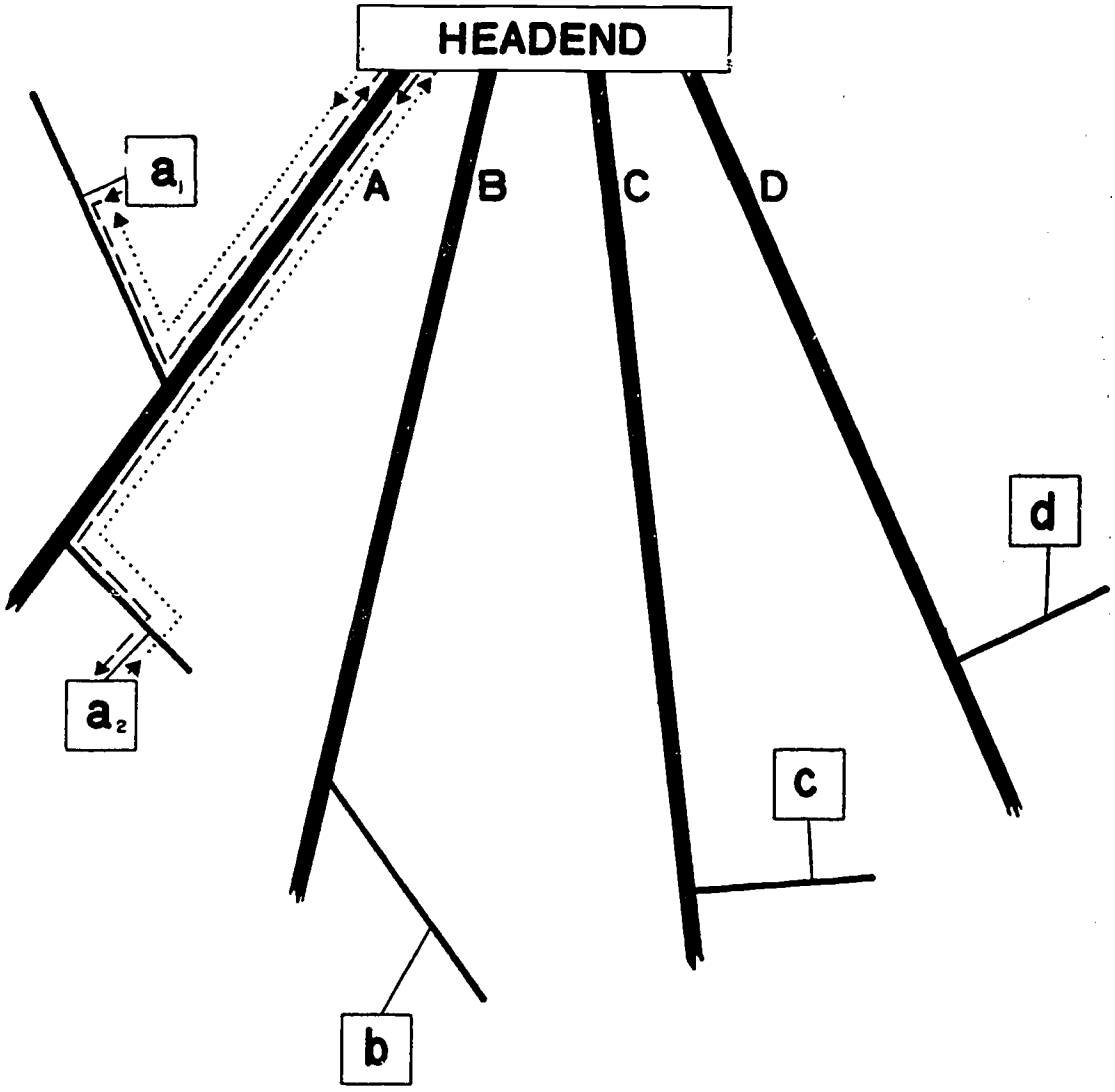
*See p. III-63 for a description of the audio.

** Most two-way cable systems intend to use one of their four upstream channels for digital transmission. (In any event the channel is usually unusable for video because of interference from Citizen Band radio.) An additional channel may be unusable during evening hours because of high frequency (HF) radio interference.

***In a situation like the one shown here, where one location, a_1, is near the path between the second location, a_2, and the headend, it is theoretically possible to tap directly into the trunk, A. In practice this is almost never done because of the cost of the extra cable to connect a_1 to A.

Figure 1

TWO-POINT TWO-WAY VIDEO SERVICE
Actual Links



a_1 Signal --------

a_2 Signal ....

Figure 2a shows the functional (as opposed to actual) links involved with three locations. Each location transmits one output to the two remaining locations, and receives two incoming links, again one from each remaining location. Note that this organization precludes the possibility of transmitting different information to different locations, but it is unlikely that this will be desired because of the difficulty of controlling two separate cameras and microphones. The implementation of this functional diagram on an actual cable system is shown in Figure 2b. Here each location transmits one upstream channel to the headend where it is distributed downstream to each location.

If more than three locations are involved, it becomes a practical necessity to use some form of switching, usually in a star configuration. Here, the signals from each location are sent to a central control where an electronic selection or combination process takes place. Only one signal is sent out to each location--either a selection of one or a combination of two or more images sent as a split-screen (or equivalent) signal.*

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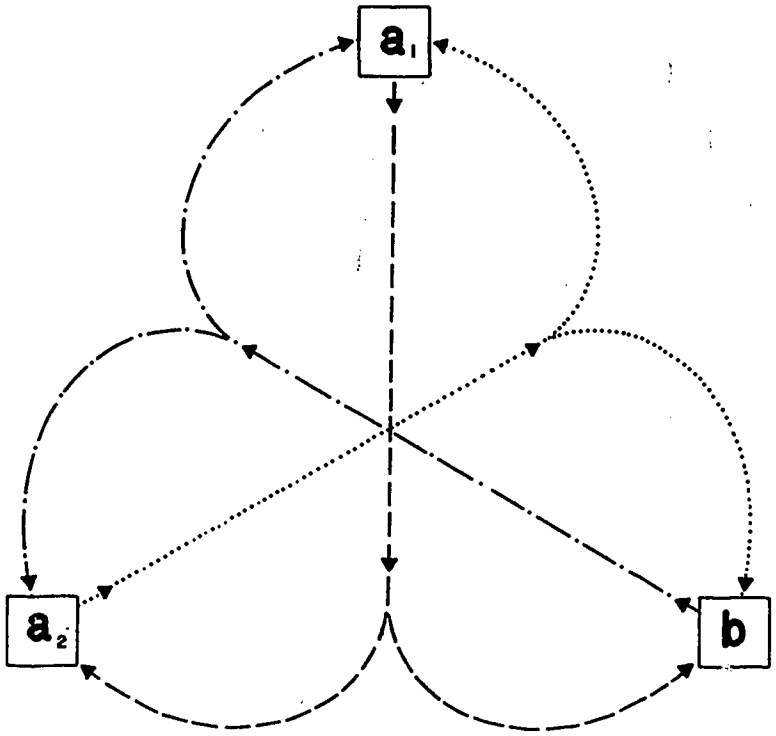
* Some of the technical problems inherent in achieving this are worth noting. Unless special efforts are undertaken, the frame rates (the rate at which the total area of the picture is scanned) of cameras at different locations will not be synchronized. Switching from one location to another when the two locations are not synchronized will cause a short breakup of the picture. Maintaining the two locations in "sync" will avoid this picture interruption. More important, unless the two locations are in "sync," it is impossible to do special effects such as split-screening or even simple fades. When only one distant location is involved, the procedure is relatively straightforward since the central location derives its synchronizing signal from the distant camera. The case of several distant locations is, however, more complicated. In this case the best procedure is to have each distant location derive its synchronizing information from a master location or a common external "sync." If this approach is too complicated, but screen effects are still desired, the master location can be successively synchronized with each distant location. In that case, the participants will have to live with a picture breakup (frame roll) at each change in synchronism. While these techniques are not unusual in broadcast television, they are rare in cable television.

Figure 2a

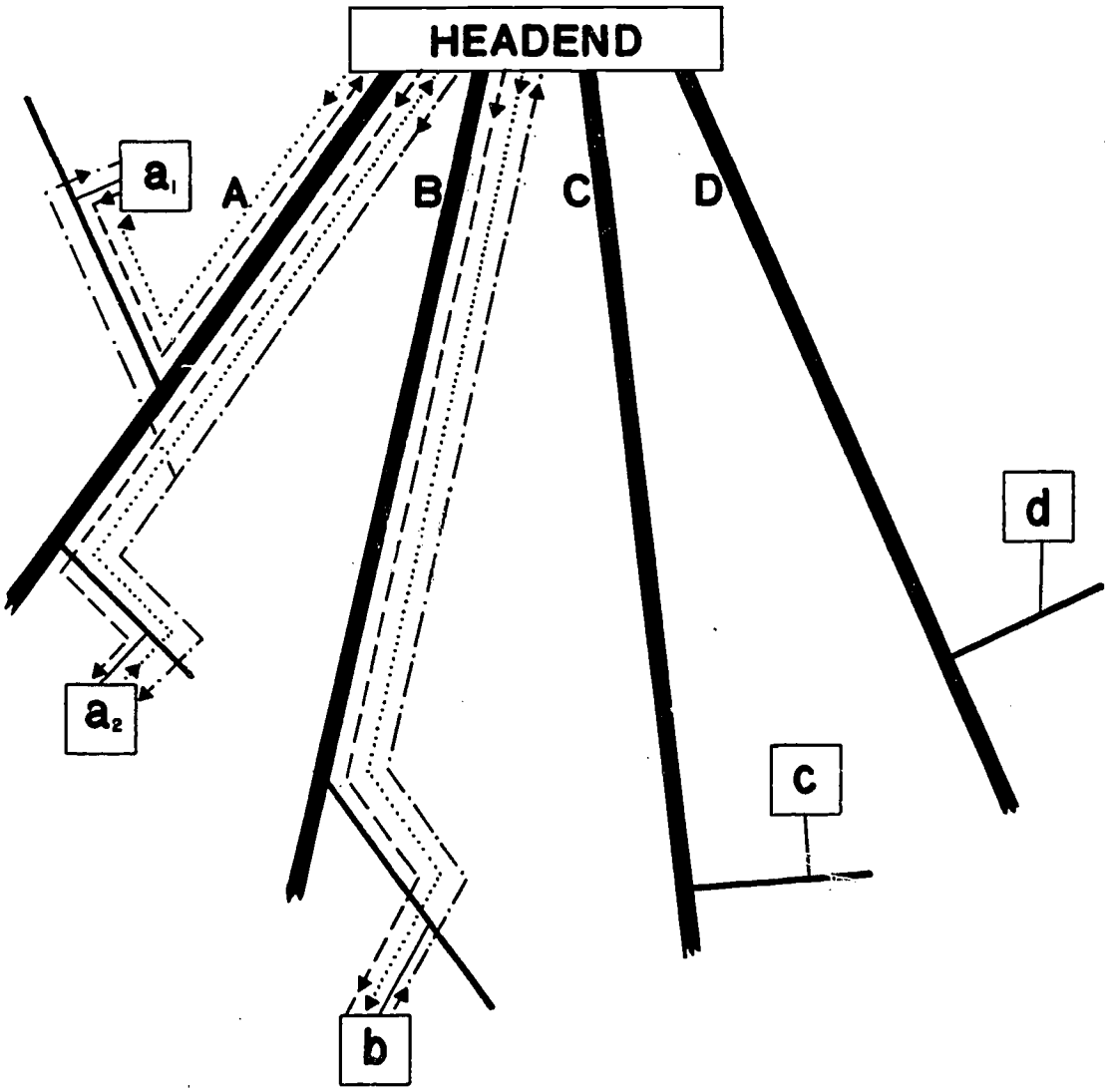
DIRECT CONNECTIONS
Functional Links



a_1 Signal ---------
a_2 Signal .....
b Signal -·-·-·-·-

Figure 2b

DIRECT CONNECTIONS
Actual Links



a_1 Signal ——————

a_2 Signal ……

b Signal —·—·—·—

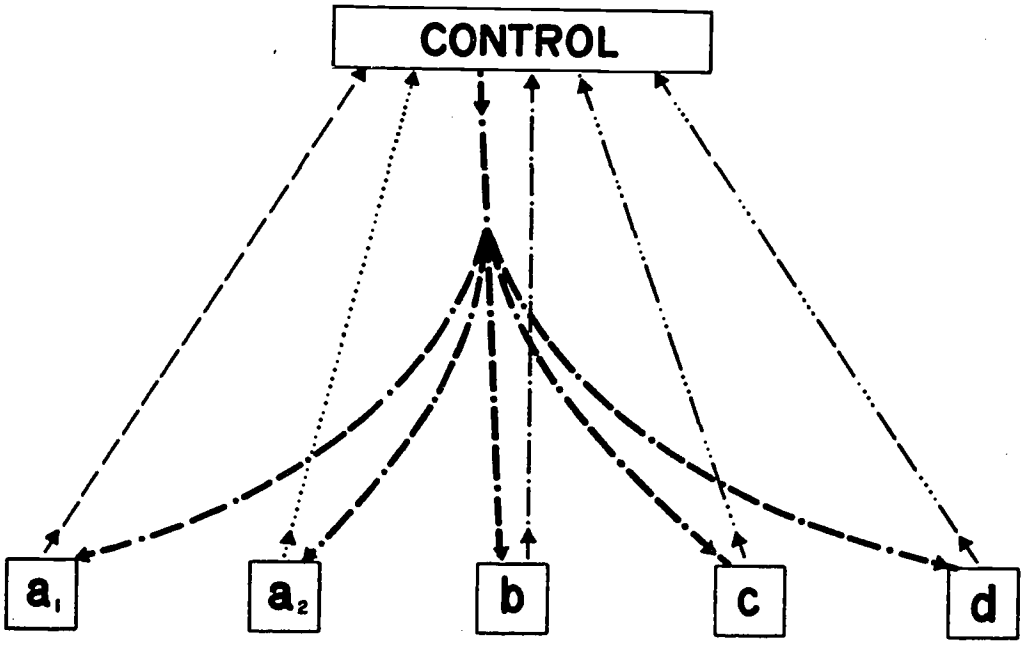
Figure 3a shows the functional links involved. Implementation of this network on a cable system is fairly simple if the central location is at the headend as shown in Figure 3b. This is the solution chosen for most of the applications (e.g., CTIC's Vocational Rehabilitation, Rand's Day Care).

Implementation of even this configuration becomes complicated if the central control is not at a headend. In that case, all of the upstream signals would be sent to the headend where they would be sent downstream, each on its own channel, to the control, selected and/or combined, (including the control location's own signal) and sent back upstream on a single channel to the headend. That channel would then be retransmitted downstream to all of the receiving locations. The demand for channels on the control's trunk would soon exceed the supply. See Figure 3c. If more than one originating location is on the control's trunk, the chaos is virtually immediate.

These technical complexities of multiple locations only reflect the more fundamental issues of multipoint communications, i.e., who talks to whom, when? Any multipoint teleconference with more than a few locations needs extremely strict protocol to control the communications flow. Multipoint communication is, on some respects, analagous to a classroom. In a traditional class, the instructor lectures and then calls on students for questions and answers. That is, the two-way communications flow is between the instructor and a single student at a given point in time. To transfer that classroom condition to a shared-channel, multipoint communications system, the instructor would "call on" the student by causing that student's image to appear on the screen.

Figure 3a

STAR CONFIGURATION
Functional Links



a_1 Signal ---------

a_2 Signal .....

b Signal -·-·-·-·-

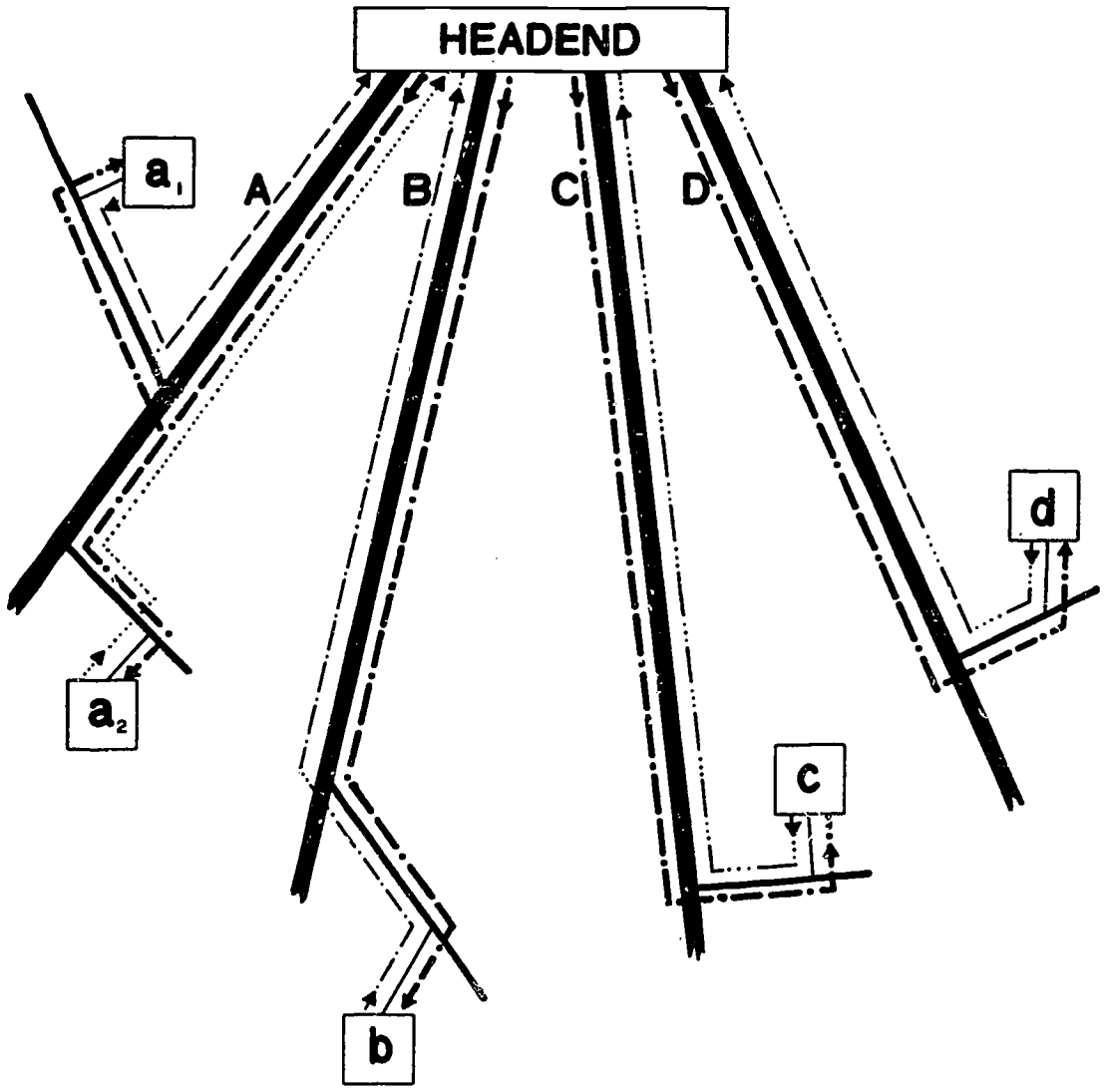
c Signal —··—··—··—

d Signal — — ··· — — ···

Common Output —·—·—·

Figure 3b

STAR CONFIGURATION
Actual Links (Control at Headend)



a_1 Signal ————————

a_2 Signal ·····

b Signal —·—·—·—·

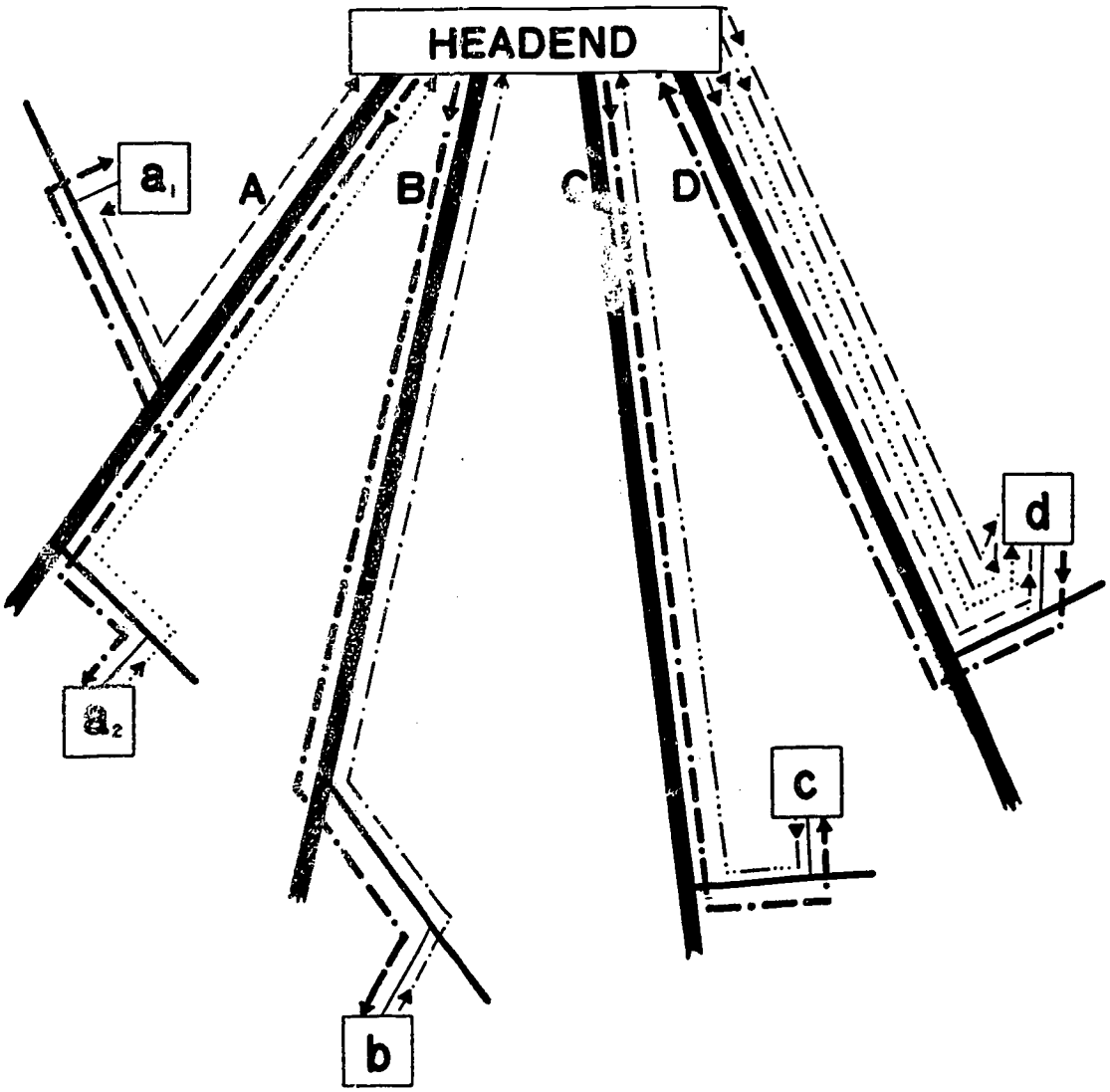
c Signal —··—··—··—

d Signal ——·····——·····

Common Output ——·——·——

Figure 3c

STAR CONFIGURATION
Actual Links (Control at d)



a_1 Signal ———————

a_2 Signal ·····

b Signal —·—·—·—

c Signal —··—··—

Common Output ——·——·

If the classroom is not traditional, however, but is a seminar, the problem is exacerbated. Here, the communications flow is not instructor to class, interspersed with instructor and student, but student to student to student, in unpredictable patterns. To transfer the seminar condition* to multipoint shared-channel video requires a "gatekeeper" of some sort and fairly complex rules of the road.

It is worth noting that of the roughly 15 meeting-oriented teleconferencing systems in the world only one that we know of--the British Post Office's Confravision--handles more than two locations. Confravision can handle three locations by having six communications links so that each location can see the other two.**

Even in cases where the video is simple, such as two-point two-way, the audio portion of the circuit can become very complex. The difficulty involves the necessity to prevent the audio from "feeding back" from the loudspeaker to the microphone. At low audio levels the "feedback" produces an unwelcome echo. At higher levels, the audio system will "howl." This has been a particular problem in general purpose teleconferencing systems where the intent has been to provide as natural an environment as possible, thus ruling out some techniques which reduce feedback such as push-to-talk microphones (e.g., CTIC's Vocational Rehabilitation application) or earphones (e.g., MUS's Educational application). Where the desire for a natural

*Most business conferences, for instance, resemble seminars.

**Personal communication from Roger Hough, Stanford Research Institute, on November 24, 1975. The NYU/Reading Consortium is teleconferencing among three locations. This application, however, has a technical director who is not a conference participant. The presence of an "outsider" would be unacceptable in many business conferences.

environment has been a prime consideration, the approaches have been careful placement of microphones and speakers combined with either substantial sound treatment of the room or a gain-switched audio, i.e., adding losses to the microphone outputs of those participants not currently speaking to reduce the feedback path. The audio aspect remains one of the more significant practical problem areas in teleconferencing.

a. Switching

There are two general forms of switching involved in video conferences. In one form, the communications links connect a previously determined group of participants or locations. The cable system has established connections between these locations and the switching is under the control--one way or another--of the participants. The transmission paths are known. The orginating locations are known. There are no surprises.

The other form of switching* involves virtually nothing but surprises. Here, the location of the participants (or even the fact that a teleconference will occur) is unknown until the initiation of the conversation. I this form, the participants do not control the switching. The cable system must handle it.

An example of this second format switching was CTIC's Practitioner Consultation application which had to meet the needs of the following type of scenario: After examining a patient in his home, the visiting nurse decides that the patient should be examined by a doctor at a hospital emergency room. Until this moment no one--particularly the cable operator--knew that the two locations wanted to communicate. At this point the cable system must provide a connection at the headend between the two locations. CTIC proposed to use the video equivalent of a manual telephone switchboard for this application. Rand, in its institutional application, proposed to

*Called "externally switched" in the table on p. III-70a.

use an automatic switcher controlled by operating a digital terminal. The automatic switcher would eliminate the need for a person at the headend to operate the switching equipment.*

Switching is needed to set up the connections for a teleconference when the locations of the participants are not known in advance. Connections are still needed, of course, when the locations of the participants are known in advance. But as in the case of fixed or semi-fixed terminals vs. portables, the longer the lead time, the more likely it is that simpler, less flexible equipment and procedures can be used.

b. Downstream Video

Most of the applications used traditional "broadcast type" downstream transmission, i.e., a signal delivered from one point to many. Since this is the traditional use of cable systems, no new technical issues are raised. Two of the applications, however, proposed on-demand one-way transmission. In both DRI's Interactive Programming for Home Subscribers and USC's Job Listings over cable a home viewer could, by telephone, request that a particular videotape be shown. While this can easily be done there is a severe problem--queuing. Since the number of downstream channels on a cable system is limited, only a small number of channels can be used for this service. The result is a large party line where only one selection at a time can be shown on any channel. If this service becomes popular, the line of requests can grow very long as viewers wait in turn to see their selections. Unless the request rate for showings is known to be low, users may become frustrated by long waits for their turn.

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* Because of a change in requirements, Rand now expects to use a patch panel.

4. Other Technologies

In several applications, technologies other than cable played a prominent role. USC, because of a desire to provide services to areas not served by cable, made extensive use of other technologies. For video transmission USC proposed to use either microwave circuits leased from the telephone company or private microwave.* As discussed earlier, the use of dedicated microwave links was consistent with USC's use of fixed terminal locations. The other technology widely used was dial-up telephone. This was used in applications that displayed information to cable subscribers with a telephone number to call for more information. As discussed earlier this is an appropriate use when there is no need for a rapid simultaneous interaction.

5. Confidentiality**

Confidentiality of personal information is not solely a technical problem. It does, however, have an important technical component and it is this aspect that will be discussed here. Because of the significant technical differences between digital and video transmissions, they will be discussed separately.

The use of digital transmission in the proposed applications raises two issues. The first is the confidentiality of the information during transmission and the second is the confidentiality of the information after receipt. The first problem--interception--is straightforward. While

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*Using either the CARS cable relay band (12.7-13.2 GHz), or the business microwave band (12.2-12.7 GHz), (p. 5 of Appendix I).

**The term "confidentiality", as used here, involves the issues concerning who is allowed access to personal information. These are different issues than those concerning privacy. "Privacy" issues involve the nature of the information collected. Source: Alan F. Westin, Michael A. Baker, Report of the Project on Computer Databanks of the Computer Science and Engineering Board, National Academy of Sciences, Databanks in a Free Society, (N.Y.: Quadrangle Books).

under certain circumstances interception of the digital messages on the cable system can be accomplished, translation of the intercepted signals to their English text meaning is a difficult and technically demanding operation. None of the applications proposed transmitting information whose value to a potential interceptor might justify extraordinary investment in time and effort to intercept and interpret the transmitted messages. If future applications propose the transmission of extremely sensitive information, there are readily available cryptographic devices which provide a wide spectrum of security.

The questions of data confidentiality after it is received, is more complicated primarily because it is less a technical problem and more a question of appropriate public policy. In general the applications used three techniques--informed consent of the participants, use of currently accepted procedures, and sensitivity to the problem combined with careful supervision of the personnel involved. Often the use of cable allowed a significant increase in privacy over current procedures. One example was CTIC's Citizen Participation/Polling application. The use of cable technology allowed a significant reduction in the number of people with potential access to the responses of a public opinion poll, thus reducing the possibility of abuse of confidentiality.*

Many of the limited button terminals are combined with a set converter and routinely report the channel being watched on the television set. The usual intention is to provide information by household on special channels such as a pay TV or social service channel and to aggregate "ratings" of

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*Note that this refers to the conduct of the polls only. Later dissemination of results is not affected by the technology used.

viewing habits in the community for all channels. There is concern that a system intended only to collect aggregate viewing data could be used to collect individual viewing data of regular TV programming.* Some consortia, such as Lehigh/Allentown-Bethleham, avoided the problem by modifying the terminals so that only the viewing of certain channels would be reported to the headend. Other consortia , such as CTIC/Peoria and Rand/Spartanburg, separated the converter from the terminal so that no information on viewing would be reported.

Video transmission raises the same two problems as digital but the difficulty of the problems is reversed. Unlike the case of digital transmission, unauthorized reception of video transmission over a cable system might be a serious problem. The lowest level of security used in the applications was the use of channels not receivable by a normal TV set. Only authorized recipients of the signal were to be given the converters which permit reception of these signals. As a rule, these converters were the conventional converters used by the cable industry to provide more than 12 channels. When such is the case, the use of converters to receive special channels to prevent unauthorized reception is usually less effective than when used on a cable system that does not normally use converters. Even on systems that do not use converters for normal operations, the use of a special channel by itself provides only limited confidentiality, since

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*Any attempt to collect and save the viewing patterns of an entire community on an individual basis would be readily detected because of the large memory requirements. Detection of the covert observation of a small number of individuals' viewing habits would be difficult to detect. Note, however, that other, albeit more difficult, techniques exist for determining the viewing habits of particular individuals including the detection of the tuning oscillator in the individual television set.

converters can be otherwise obtained.

Applications, such as NYU/Reading, that used only a converter and a special video channel did not carry sensitive information. The desire to restrict access was motivated primarily by the desire to maintain control groups, rather than to preserve confidentiality.

Applications that did involve the transmission of confidential information used some form of scrambling. Unfortunately, scramblers available off-the-shelf only scramble the video while leaving the audio unimpaired. Rand Corporation proposed to use a dedicated frequency assignment in a non-standard band in order to maintain audio confidentiality.* Because the CTIC applications which required video and audio transmission security used monochrome video, CTIC was able to provide scrambled video and audio by the simple addition of two interfering signals. This approach would not have been possible if the applications had used color.

Improvements in transmission security over the simple scramblers now available will be hard to achieve. At present there is relatively little in the way of alternatives between the simple scramblers used in pay TV systems and the extremely expensive systems used to meet national security requirements.** Considerable research is needed in this area.

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*Rand now expects to use standard telephone service for secure audio.

**The Baltimore Defense and Electronics Systems Center, Westinghouse Electric Corporation, has developed a security technique in conjunction with their own teleconferencing experiment using the CTS Satellite. The evaluation of the technique will begin near the end of 1976. Westinghouse expects to provide a much higher level of security than found in pay TV systems at costs lower than those incurred to meet national security requirements. If those expectations are met, this technique may be of significant use. (Personal communication from Herb Nunnally, the experiment's Principal Investigator, on January 6, 1976).

While the interception of video transmissions raises more privacy problems than does digital transmissions, once the signal has been properly received, the problem becomes insignificant. Video conferences are neither more nor less subject to unauthorized "leaks" than face-to-face conferences.

TABLE 4. TECHNOLOGY EMPLOYED †

TECHNOLOGY		APPLICATION	Home Subscribers	Public Forum	Public Places	Electronic Public Counter	Community Video-conference	Adult Education	Day Care	Coordinated Services	Psychiatric Testimony	Public Information Messages	LARC	Urban Administration	Firefighter Training	Educational Opportunity	Childhood Learning Problems	CIRS	Depositions	Legal Information	Neighborhood Communications Centers	Citizen Participation	Practitioner Consultation	In-service Training	Senior Citizens	Vocational Rehabilitation
			DRI			USC		Rand				Lehigh				MSU					NYU	CTIC				
Terminal Type	Fixed		*	*	*	*	*			*	*	*	*	*	*			*			*			*		
	Semi-fixed							*	*							*	*		*	*	*	*	*		*	*
	Portable					*																	*			
Data Services	Limited button		*	*				*				*	*	*	*		*	*				*				
	Keyboard (2-way)					*														*						
	Medium speed or frame grabber				*															*						
Video Services	--point 2-way video					*				*	*			*									*			
	Multipoint 2-way video						*		*							*			*		*			*	*	*
	Externally switched video									*													*			
	On-demand 1-way video		*																							
	Technology Mixture					*	*											*								
Number of Locations	2										*															
	3-10				*	*	*		*	*			*		*	*			*		*			*		
	11-109							*									*			*			*		*	*
	Over 100		*	*								*		*				*				*				
Number On-line Simultaneously	2					*				*	*															
	3-10				*		*		*				*		*	*			*	*	*			*		
	11-100							*				*		*			*							*	*	*
	Over 100		*	*										*				*				*				

† In categorizing each application the more sophisticated technology was used as the basis for classification when there was a choice between that and a simpler one.

C. RESEARCH DESIGN

A comparison of the research designs comprises this section. The research problems encountered in the NSF proposals are not specific to these studies but are common to most field experimentation. As this is an already well-researched and abundantly-articulated area,* this report will discuss research design solely to describe how the seven research teams actually proposed to measure social service effectiveness.

A matrix on page 74a cross references the 24 applications with the elements in research designs and shows the various components of the experimental designs proposed.

1. Design Classifications

Evaluation research distinguishes among three categories of designs:

a. True experiments. One major characteristic is their reliance on random samples. Field experiments using cable have a special problem in achieving random samples since cable systems may not reach all parts of their franchised areas, and within these areas, not all individuals are subscribers.

b. Quasi-experimental designs. This category refers to techniques that permit reasonable inferences to be made even without the assurance of random sampling.

c. Other designs. Called "non-experiments," "feasibility studies" or "demonstrations," these formats are used when it is impossible to establish

*See, for example, the following: Carol H. Weiss, Evaluation Research, (Englewood Cliffs, N.J.: Prentice-Hall, 1972). Edward A. Suchman, "Action for What? A Critique of Evaluative Research," The Organization, Management, and Tactics of Social Research, ed. Richard O'Toole (Cambridge, Mass.: Schenkman Publiching Co., Inc., 1970). Joseph S. Wholey, et al., Federal Evaluation Policy (Washington, D.C.: The Urban Institute, 1970). Donald T. Campbell and Julian Stanley, "Experimental and Quasi-Experimental Designs for Research on Teaching," Handbook of Research on Teaching, ed. N. L. Gage, (Chicago, Ill.: Rand McNally & Co.) pp. 171-246.

a control or comparison group (as with DRI's Information in Public Places application); or when the sample size is very small (CTIC's Vocational Rehabilitation use); or where several innovations are being tried at once (CTIC's Practitioner Consultation).

2. Data Collection

Among the various methods used by the NSF consortia to collect data are:

1. Researcher-generated data. These are data gathered through such means as observation or content analysis where, in one respect or another, the opinion of the researcher is part of the measuring instrument.

2. Subject-generated data. These are gathered through such means as questionnaires or interviews.

3. Objective measures. These are tests, logs, counts, or archival data. They are not wholly objective in that the researcher makes some assumptions (e.g., the test actually measures the relevant characteristics, the logs are accurately kept). However, if there is a bias, it will be an objective bias--i.e., not one generated by the experiment itself.

4. Unobtrusive measures. The best known example of an unobtrusive measure is the observation of degree of wear of the carpet under museum paintings in order to tell which paintings are most viewed. Unobtrusive measures are most often used when the researcher believes that more obtrusive data collection will itself influence the experiment. The assumption is made that proper inferences can be drawn from the data. That this assumption is not always justified can be seen if one considers that the most worn carpet may be under the painting hung near a popular meeting point.

When the danger of bias exists, most designs arrange to collect data in several ways in order to neutralize the effects of the bias.

3. Process Measures

These measures differ from outcome measures (discussed below) in that they concern how the operation is getting on, without regard to the more general effects it may have. The difference between process and outcome is sometimes ambiguous near the edges. For instance, while there is no question that "human interaction with the technology" is a process measure, "placement"

as a measure of a job training program could be either a process or an outcome measure depending on the final goal of the project and the interests of the research team. Thus, the assignment of measures to either the "process" or "outcome" categories represent interpretations of goals and interests.

Most of the process characteristics listed in the matrix are self-explanatory. Listed below are those terms which require definition.

a. Time saving: by professional, client, or start-to-finish transaction.
b. Placement: in employment or community life
c. Attitude toward the process: What are the users' opinions about transactions over the cable?
d. Cost: various characteristics including relative, per unit, per success-incremental, and absolute costs.
e. Interaction with the technology: the "human factor" characteristics. For example, can the displays be easily read? Are the buttons too close together?
f. Convenience: Is the cable easier to access and use than traditional communications modes?
g. Information dissemination in the community: Does the presence of the cable project increase the information level of people not involved as participants or audience?

4. Outcome Measures

The "outcomes" are the real goals or results of the experiment. While it is encouraging to know, for example, that day caregivers' "attitudes toward the process" are positive, the experiment cannot be counted a success unless something more significant happens, e.g., that they like their jobs better, that the children are better cared for, that the day care sites are cleaner than would be the case without the experimental treatment. Similarly, it is small comfort to know that terminal buttons are easy to manipulate if the citizen to government information flow does not have some positive impact on the political system.

As with the process measures, only the outcomes, which are not self-explanatory are listed below:

a. Attitude toward the environment: Do people feel less helpless? Are they more satisfied with their jobs?
b. Impact on the system: Has anything really changed?
c. Acceptance by the community or institution: Is cable being used as a genuine communications tool or is it regarded as a technological curiosity?
d. Demographic variations: Are the outcomes uniformly spread or do some groups behave differently than others?
e. Attenuation of effects: For instance, is course material learned via cable retained as long as face-to-face learning?
f. Credibility of the system: For instance, will information transmitted via cable be regarded as manipulative or will the system be regarded as a reasonably unbiased information source?

5. Comparisons

The matrix compares the delivery mechanism proposed in the experiments and quasi-experiments with the same service via some other communications technology to determine the comparisons.*

*Two of the "demonstrations," DRI's Information in Public Places and CTIC's Vocational Rehabilitation do not make same-service comparisons.

TABLE 5.

MATRIX CROSSREFERENCING APPLICATIONS WITH DESIGN CHARACTERISTICS

DESIGN CHARACTERISTICS		APPLICATIONS																										
		Home Subscribers	Public Forum	Public Places	Electronic Public Counter	Community Video-conference	Adult Education	Day Care	Coordinated Services	Psychiatric Testimony	Public information Messages	LARC	Urban Administration	Firefighter Training	Educational Opportunity	Childhood Learning Problems	CIRS	Depositions	Legal Information	Neighborhood Communications Centers	Citizen Participation	Practitioner Consultation	In-service Training	Senior Citizens	Vocational Rehabilitation
Design	Randomization	*	*				*	*			*	*		*	*	*		*	*		*				
	Not random; validity cont controls				*	*			*	*			*			*				*			*	*	
	Demonstration			*													*				*				*
Data Collection	Researcher-generated data	*				*		*	*		*				*	*			*	*				*	
	Subject-generated data				*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Objective measures			*		*	*		*	*	*	*		*	*	*	*		*	*	*	*	*	*	*	*
	Unobtrusive measures				*				*						*					*			*	*	
Process Measures	Number of transactions		*	*							*						*		*		*				
	Time saving				*	*			*	*		*	*	*		*	*	*		*	*	*			
	Communication/transportation trade-off				*	*	*	*	*					*	*	*	*	*		*		*			
	Placement				*							*													*
	Productivity				*	*							*	*		*	*		*						
	Attitude toward process	*	*	*	*		*	*	*	*	*			*	*	*	*	*	*	*	*	*	*	*		
	Cost	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*
	Message accuracy				*								*				*	*	*		*	*	*			
	Drop-out rate						*																			*
	Interaction with technology	*	*		*	*			*			*				*		*	*	*						
	Convenience			*	*	*	*									*	*	*	*							*
	Attendance					*	*	*								*				*			*			
	Information dissemination in the community			*											*		*		*	*						
	Socialization											*			*					*				*	*	
	Information gain other than from instruction	*	*			*					*				*	*	*		*	*	*			*		
	Unanticipated benefits																			*	*		*	*		
		DRI			USC			Rand			Lehigh			MSU						NYU	CTIC					

DESIGN CHARACTERISTICS		Home Subscribers	Public Forum	Public Places	Electronic Public Counter	Community Video-conference	Adult Education	Day Care	Coordinated Services	Psychiatric Testimony	Public Information Messages	LARC	Urban Administration	Firefighter Training	Educational Opportunity	Childhood Learning Problems	CIRS	Depositions	Legal Information	Neighborhood Communications Centers	Citizen Participation	Practitioner Consultation	In-service Training	Senior Citizens	Vocational Rehabilitation
Outcome Measures	Participation in community affairs	*	*			*					*									*	*			*	
	Attitude toward environment		*		*	*		*			*		*	*	*	*				*	*	*	*		*
	Impact on the system	*	*		*	*					*			*						*	*		*		
	Acceptance by the community or institution								*	*	*						*			*		*			
	Demographic variations				*	*						*	*			*	*			*					
	Attitude toward self							*						*		*				*			*		
	Performance						*	*				*				*									*
	Attenuation of effects							*				*													
	Credibility of the system										*							*							
	Extension or expansion of service				*	*	*					*								*		*	*		*
	Non-public subscriber response (individual)	*	*				*				*	*	*	*		*	*				*				
Comparisons	Non-public subscriber initiated																		*						
	Public subscriber response			*																					
	Public two-way video				*	*																			
	Digital telephone				*														*						
	Non-public two-way video							*	*	*			*		*			*		*		*	*	*	*
	Non-public subscriber response (group)													*											
	One-way video/two-way audio																	*		*					
	Addressed terminals																		*						
	Non-addressed terminals																		*						
	One-way video	*	*		*		*	*			*	*		*		*			*	*			*	*	
	Telephone		*		*												*			*	*				
	Traditional treatment/ no cable	*	*	*	*	*	*	*	*	*	*	*	*		*	*		*	*			*	*	*	*
	Cassette													*											
	Face to face																*				*				
	Mail		*																		*				
		DRI			USC		Rand				Lehigh			MSU						NYU	CTIC				

APPLICATIONS

III-74b

D. SUMMARY AND CONCLUSIONS

All of the studies proposed a set of applications that varied in content. In other words, no design suggested that only a single service or type of information be transmitted on the cable system. All but one of the teams proposed a set of applications intended to affect either the general public or several segments of the public. Only one grantee, NYU/Reading, elected to serve a single population--the elderly.

The applications can be divided into two major cateogries, i.e., those that delivered a service directly and those that delivered information about government or a service. All of the grantees proposed at least one application that would deliver a service. Of the services, every grantee except the University of Southern California/Los Angeles suggested at least one educational application. Those applications included post-secondary education, in-service training, adult basic education, education for the handicapped, leisure-time learning, and a supplement to public school education.

Five of the grantees* proposed some form of mediation service between citizens and the bureaucracy. That is, at some point where a citizen dealt with a government agency, a form of active intervention was delivered via the cable. The purpose of the intervention was to help the citizen cope with the government. This service was delivered variously. In the Michigan State University, Cable Information and Referral Service application, for instance, the intervention was impersonal. By pushing buttons, a citizen could select an appropriate agency and register for an appointment.

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*The exceptions were Denver Research Institute/El Segundo; and Lehigh/Allentown-Bethlehem.

In the Rand, Coordinated Services application, the intervention was personal. The citizen engaged in a teleconference with personnel from relevant agencies. Whatever technology was used, however, something beyond the transfer of information happened. The citizen was not simply told how to deal with government but could actually complete a transaction over the cable.

Two other general categories of service were proposed. They were problem identification, as suggested by MSU in the screening phase of its Screening/Intervention of Childhood Learning Problems, and the opportunity to socialize as proposed by NYU and CTIC in their applications for the elderly.

All of the studies, with the exception of Rand's, also proposed an application that provided an information transfer. These were sometimes combined with bureaucratic mediation, as was the case of the University of Southern California's Electronic Public Counter, but in all cases the information delivery itself was a sufficient raison d'être. The information transfer was sometimes uni-directional, where the function of the technology was to help the citizen select the most appropriate information. This was the case, for instance with the "Information" part of MSU's Cable Information and Referral Service and DRI's Information in Public Places application. Those three applications (DRI, MSC, USC) were the only instances in which the information flowed in one direction.

Five other applications were designed for a bi-directional information flow. They were DRI's Public Forum, USC's Community Video Conference, Lehigh's Public Information Messages, NYU's Neighborhood Communications Centers, and CTIC's Citizen Participation/Polling. Here, the information went not only from government to citizen but from citizen to government.

One other major category--administration--was, in the strictest sense of the word, proposed only by Lehigh, although most of the "bureaucratic

mediation" applicators had, as a side benefit, some administrative aid.

One of the intentions of this report had been to identify the component parts of each application, to classify them, and to compare the classifications. The end product was to have been the identification of a consensus on what services were most amenable to cable delivery, how best to deliver them, and what outcomes would be trustworthy measures of success.*

As it happened, no consensus emerged; there is no general agreement among the seven consortia as to how to deliver any given service or information and only minimal agreement on how to tell if delivery has been successful.** It became clear that after seven years of intensive discussion, speculation, and occasional trials no single theoretic prototype existed to guide the research consortia. Nor did the teams arrive at one during the course of their studies. To date, all that can be said with any assurance is that whatever cable technology a user may select in order to deliver a given service, at least one responsible research organization will probably agree that it is the right technology for the job.

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*Appendix B contains a discussion of the cluster analysis used for analysis.
**Lehigh's LARC application looks very much like MSU's Screening/Intervention; CTIC's Interactive Programming for Senior Citizens is similar to NYU's Neighborhood Communications Centers; Rand's Psychiatric Testimony and MSU's Pretrial Depositions have many points in common. However, since the sets involve only two applications apiece, "general agreement" would be an extremely misleading description.

Despite the continued state of indecision, however, the lack of consensus has one very positive implication. The money spent by NSF was clearly for exploratory purposes and the explorations charted an extremely large territory. There was almost no duplication of effort. As mentioned in the Introduction to Chapter I, these studies brought together for the first time teams of cable operators, local governments, and research institutions. The studies are not new additions to the "blue-sky" literature. Each application met tests of need and of technical feasibility. Most of them met tests of evaluability. There is a very high probability that each application suggested would "work." In that sense--and it may be the only "sense" that matters--these studies form the most significant body of material in the cable television literature. The implementation phase should produce some indications of what works best.

IV. CONCLUSIONS AND RECOMMENDATIONS

During the course of this investigation, it became abundantly clear that the available data would produce no firm, unambiguous guidelines either for policy makers or for users of cable television. There is no consensus on the best way to deliver social services or even on the most appropriate social services to deliver. Neither the literature nor the sporadic trial-and-error service delivery projects have produced much more than speculation.

Even the carefully researched NSF design studies failed to provide definitive conclusions or consensus. In an attempt to identify common perceptions or patterns about what specific technologies are best adapted to specific uses, the seven design studies were divided into 85 component parts and subjected to a cluster analysis, the Bond Energy Algorithm (BEA).* No perceivable patterns emerged. Hopefully as some of the applications designed for the NSF studies become operational, a body of knowledge will develop. This is not an unreasonable expectation. These experiments are the first series of cable television projects to test explicitly measurable hypotheses. From these tests information about what services are appropriate for delivery via cable and the appropriate technology will certainly be learned.**

The issues that were raised in the literature and illustrated in the service delivery projects were of two kinds. First were the pragmatic questions --those that involved the selection of technology and of subject

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*See Appendix B

**The Spartanburg cable system for instance, has had a signal ingress problem during two-way video transmission. One-way video and digital response has not been affected. TeleCable's analysis of and response to the problem should be instructive for future users of interactive cable.

matter. Second were the policy issues -- those that asked what ought we do rather than what can we do. The following sections will discuss the two sets of issues in the context of the data gathered for this report.

A. THE PRAGMATIC ISSUES

The pragmatic issues are reasonably straightforward and can, at least in principle, be answered through continued experimentation.

1. Technology

The most straightforward issues are those that concern the availability of technology to implement particular applications. The solutions to some of the technological problems (e.g., applications that require the use of low-cost movable terminals) will have to await the development or ready availability of suitable components. However, many questions relating to the actual use of interactive equipment may very well be answered during the implementation phase of the NSF-sponsored designs. These answers might include such things as the solutions to the problems associated with the audio level (Reading), the cathode ray tube display (Rockford), and the performance of a lightweight, movable keyboard (Spartanburg).

2. The Critical Mass

An issue that might remain open is whether a "critical mass" of services must be offered before valid judgments can be made about either the efficiency or the effectiveness of delivering a particular service.

The Denver Research Institute study highlighted this question, stating "analogous to 'cross-elasticities' in economics, the presence of a variety of services affects the utilization and impact of each service. One or two

services cannot be tested in isolation and those tests extrapolated to judge performance in the context of the entire system." [p.2]

The critical mass proposition is usually based on two considerations: one economic, the other psychological. The economic aspect pertains to the savings made possible by the sharing of facilities. The psychological aspect is based on the theory that people perceive television as a passive entertainment medium. According to critical mass proponents, isolated experiments using television for non-entertainment communication can be thwarted by this perception. They hold that only a comprehensive offering of both commercial and public services can provide the environment needed to change this perception and provide a fair test of new services.

The implementation phase of the NSF-sponsored designs will dispel the critical mass proposition only if the experiments are unqualified economic and psychological successes. If ambiguities remain, it could be reasonably argued that the degree of "failure" is due to the absence of a critical mass. In that case, a working demonstration of a comprehensive system would be needed to test the hypothesis that the critical mass would lead to success.*

3. Alternative Audiences

Almost all of the research designs compared cable with other means of delivering the same service in terms of costs, user attitudes, and the extent of information dissemination. However, anecdotal material accumulated during this investigation suggests that one specific area of investigation might prove particularly fruitful, i.e., the identification of alternative audiences for educational services and the subsequent testing of varied delivery systems.

*It is possible that the presently funded sites will serve as magnets for further experimentation, achieving the critical mass by evolution.

For instance, interviews with the recipients of Project FEATT* services indicate that, for FEATT's target population (multiply-handicapped preschoolers and their parents), television teaching may be better than face-to-face. The Project FEATT parents reported that their children made more progress when developmental services were delivered via television than when the child development specialist appeared in person. This was apparently due to the children's fear of strangers.

Similarly, CTIC's discussions with vocational rehabilitation specialists suggested that interactive cable television may be an optimal way to train the severely disabled homebound. The vocational rehabilitation specialists reported that "family interference" is a major problem in teaching that population.** It was suggested that because the camera would be focused on the client, it would be extremely difficult for the family to "get into the act." In addition, because the proposed application allowed the instructor to monitor the clients' progress in hours other than those allotted to instruction, the associated problem of the family "helping" the client with homework would be ameliorated.

Observers of the Spartanburg high school equivalency experiment have speculated that the anonymity afforded by television response may have beneficial results. Students in "remedial" classes of all kinds tend to be embarrassed by displaying their ignorance to their classmates. Consequently, they often fail to ask questions. The Spartanburg design permits the students to indicate when they do not understand the lecture without the resulting embarassment.

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*See p. II-31 for a description of the project.

**For a discussion of the problem see Herbert Rusalem, and Milton Cohen. The Administration of the Homebound Rehabilitation Programs, Programmatic Research Project on the Rehabilitation of Homebound Persons (New York: 1967) pp. 11-14.

Most research on the topic of television teaching concludes that there is "no significant difference" in effectiveness between classroom instruction and one-way.* However, the bulk of the research has investigated "normal" populations. The problems idiosyncratic to special groups might return different results.

If, as has been assumed, cable television is particularly suitable for "narrowcasting" (reaching audiences too small to make good economic use of scarce over-the-air bandwidth), then the identification of appropriate small populations should prove a useful area of research.

4. The Problem of Content

Most of the applications proposed in the seven design studies used cable television as a vehicle either to create a new service (e.g., CTIC's Vocational Rehabilitation) or to extend an existing service to a wider population than presently served (e.g., Rand's Adult Education). All of those applications presupposed either existing or easily created content suitable for television transmission. This presupposition has an inherent danger, i.e., that cable will be used as a substitute for content, as a technological gimmick to replace a real solution. The pragmatic question, "Can cable deliver this service?" is amenable to experimental answers only if there is a service to be delivered. A case in point is information and referral service.

Interviews with members of each consortium produced near unanimity as to the "most needed cable project." At least one member of almost every team said that an information and referral system should have top priority. (The purpose of an

*See, for example, Robert Dubin and R. Alan Hedley, The Medium May be Related to the Message: College Instruction by TV (Eugene, Oregon: University of Oregon Press, 1969); and Christopher J. Reid and Donald W. MacLernnon, Research in Instructional Television and Film: Summary of Studies (Washington, D.C.: Office of Education, U.S. HEW, 1967) (OE-34041).

information and referral system is to match the needs of individuals requiring assistance with available social services and resources in the community. In some cases the referred individual is "tracked" through the system to make sure the required services are obtained.) That more information and referral applications were not actually proposed* was a measure of the formidable problems encountered in implementing such a project.

Two of the major problems were the lack of comprehensive, easily accessible information and resistance to the structural changes needed to make such a system work. The proliferation of service agencies, each with its own set of eligibility requirements and procedures, has produced a jungle of uncodified and unshared information. It was not a coincidence that the only full-scale information and referral application--MSU's CIRS--was designed for an area with an available, computerized data base.

While cable television is an intriguing tool, it is not in itself a solution to substantive problems. It is no more than a conduit to carry messages. As such, it has certain advantages and disadvantages compared to other conduits. In no case is the cable medium the message.

Adequate content should be assured before cable is tested as a delivery vehicle. It is, of course, possible to test alternate methods of delivering an insufficiently developed service. However, the results of the test are unlikely to produce usable information. For instance, if an inadequate information and referral service were to be delivered via cable, on telephone lines, and through walk-in centers, the most likely result would be very low utilization of each of the delivery systems. Thus conclusions about the relative value of the delivery system would be meaningless.

*Information and referral applications were considered by almost every consortium. Most did not reach the design phase on grounds of infeasibility.

5. Community Adoption as a Measure of Success

One common way of judging the effectiveness of cable television as a social service delivery system would be to assume that if, after a demonstration, it is adopted as part of the community's delivery system, then it is a success. If it is abandoned, then it couldn't have been much use. Using that criterion, the overview of past and present services offered on cable in this NSF report tends to indicate that cable is not a promising social service delivery mechanism. However, caution must be used in interpreting community adoption as a measure of success. There are many factors that could affect the adoption of cable television as a social service delivery mechanism. Very few of those factors involve the intrinsic merit of the technology.

The Janesville, Wisconsin mental health project* pointed out that the discrepancies between federal and local budget cycles could be effective barriers to adoption. Another factor, if the proponents of the critical mass theory are correct, is the impossibility of making valid judgments on the basis of isolated experiments. A third factor that would lead to fallacious conclusions is the possiblility of attributing a community adoption failure to inadequacies of the technology when the true inadequacies were of content.

Robert Yin and his colleagues at the Rand Corporation,** in an examination of 140 case studies found that only three of ten factors related to the adoption of technological innovation depended on the merits of the innovation. These were prior need, the hardware itself, and the transitivity of the device (where the intended effect was to create new practices between client and provider). The other seven factors were all related to such things as the structure of the agencies using the technology, and the history of the community. The researchers concluded that

*See p. II-9

**R. K. Yin, et al., Tinkering with the System: Technological Innovations in State and Local Governments (The Rand Corp., Feb. 1976) R-1870-NSF.

"the attributes of the innovation--i.e., the device--are but one set of factors relevant to the innovative process. At least two other sets are also important in influencing the adoption of technological innovations by local service agencies: the attributes of the agency and the environment within which the agency operates."* In other words, even in cases where the need for service delivery exists and cable television satisfies that need, community adoption still may not result.

Certainly the adoption or non-adoption of cable television by the social service agencies is an important factor in measuring the success of the technology. It is, however, neither the only measure that can and should be used nor is it a measure that is likely to be entirely reliable.

B. THE POLICY ISSUES

The first set of issues, the pragmatic issues are reasonably straightforward and could ultimately be resolved by the results of continued experimentation Resolution of the second set of issues, the policy issues, will evolve either from conscious policy choices or as the incidental byproducts of technological advance.

If policy makers are to minimize the possibility of the latter occurrence, two classes of decisions should be considered. The first class concerns the decision to experiment at all. That is, will a given experiment, in and of itself, constitute a de facto policy decision? Will a limited, controlled experiment, if successful, encourage uncontrolled replication? Would such replication have the potential for undesirable social consequences? If so, what is the trade-off between that potential risk and the information that might be gained from the experimental results?

The second class of decisions concerns the social consequences themselves. From the invention of the wheel to the development of sophisticated computer

*Ibid., p. 81.

technology, history abounds with examples of technological innovations and their social consequences. The stance of policy makers vis-a-vis any particular innovation (e.g., to encourage its development, to regulate its use, to ban its existence) can have enormous impact and should be taken only after full, open and informed debate. The previously mentioned class of policy decisions--those regarding whether or not to experiment--have impact on this second class of decisions since fully informed debate may depend on experimental data.

The investigation of social service delivery on cable television touched on three areas of policy concern: 1) Privacy and confidentiality, 2) Electronic opinion polling, and 3) The potential widening of the information gap between rich and poor. The remainder of this paper will briefly discuss each area.

1. Privacy and Confidentiality*

As the terms are used here, privacy refers to social policy issues concerning the nature of the information collected. That is, should there be a prohibition against collecting certain kinds of information? For example, many pay TV and security systems have the technical capability of monitoring the individual viewing habits of subscribers. Whether or not the collection of these data should be permitted under any circumstances is a policy decision relating to the privacy of individuals. Confidentiality involves the dissemination of information. That is, who should be authorized to receive information and under what circumstances should they be authorized to do so. For example, if individual viewing habits can be legally monitored, the designation of authorized personnel and the use they can make of the data are policy decisions relating to the confidentiality of information.

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*See p. III-66

These issues are often raised with regard to subscriber services. A 1974 CTIC publication contained the following note:

> In some cases, the subscriber may choose a service such as pay cable or a security system that requires monitoring at the headend. In pay cable, for instance, monitoring the selection of pay channels by the cable company is necessary for billing. And monitoring is necessary in security systems for the detection of fires, break-ins or other emergencies. The subscriber may not, however, want his viewing of non-pay channels monitored and recorded by the cable system's computer. Most two-way testbeds as presently programmed do not allow part of the data to be retained and part ignored....
>
> Information about subscriber channel viewing is a salable commodity that rating services and advertising agencies would probably be willing to pay for. If handled properly, commercial use of aggregate viewer information may be harmless, but there is no way to obtain aggregate data without polling individual receivers. The question is whether individual viewing data should be retained after the information is collected.*

Virtually every writer on the subject of cable television has recognized that potential abuses of privacy and confidentiality exist. The suggested safeguards, however, range from the extraordinary technological measures proffered by Jerrold Oppenheim,

> Certainly, if a portion of the cable spectrum is reserved, by statute or ordinance, for private communications, then scrambling devices of relatively high sophistication should be installed on these channels. In addition, locks and armored cable should be installed to deter access to terminal boards and cable drops from pole to house and within the house.**

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*Cable Television Information Center, Survey of Two-way Cable Television Testbeds (Washington, D.C.: The Urban Institute, 1974) p. 10.

**Oppenheim, Jerrold, "The Coaxial Wiretap: Privacy and the Cable," Yale Review of Law and Social Action (v.2, n.3, Spring) p. 285.

through Walter Baer's "some balance must be sought among privacy, ease of use, and cost;"* to non-specific suggestions for legal and technical safeguards and informed consent.

It should be noted that while the argument proceeds, some pay TV and security systems (e.g., the Texas based TOCOM system described in II-26) are operating without benefit of any safeguards.

2. Electronic Opinion Polling

Two issues are involved in the use of cable television for the polling of citizens' opinions. One issue, privacy and confidentiality, has been discussed above. The other issue is fundamental to the democratic process itself. Local referenda, straw polls, and scientific samplings have long been part of the American political process. What is at issue in electronic opinion polling is the question of scale—whether the ease of sampling and collating opinions represents a quantum leap into a "digital democracy." A corollary concern involves the limited reach of the cable. That is, if electronic opinion polls become commonplace advisory tools for government policy makers, those people who choose not to subscribe to cable or who live in neighborhoods not served by the cable could be partially disenfranchised.

Another concern involves the speed with which electronic opinion polls can be conducted. Responses to such polls are instantaneous. Reflective choices would be difficult to make. There is some uneasiness over the possibility that public administrators might manipulate the timing and content of polls in order to create a consensus in favor of a given policy.

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*Walter S. Baer, Cable Television: A Handbook for Decision Making (Santa Monica, Ca.: The Rand Corporation, R-1133-NSF) p. 175.

Of the seven design studies, three (Denver Research Institute, Lehigh University, and Cable Television Information Center) proposed electronic opinion polls of various kinds.* All of them were confined to advisory polls on concrete issues. No poll results were to be binding. The policy questions to be considered here are of the first class, i.e., would a decision to experiment constitute a de facto policy choice?

Some of the issues raised in electronic opinion polling were drawn sharply by the contrasting views of Lehigh and New York Universities. Implicit in both of their positions is the judgment that citizens should know what their local governments are doing and should participate in the decisionmaking processes.

Lehigh maintained that since digital response would ultimately prove the only economically feasible use of cable's upstream capacity, electronic opinion polling was the way to exploit the technology's interactive capability in order to increase citizen participation in governmental decision making.

NYU, on the other hand, maintained that people do not now interact with their government by pushing buttons; as a general rule, they talk to people. According to Co-principal Investigator Mitchell Moss, the mere existence of a technological capability is not sufficient justification to use it. If its use requires drastic changes in normal behavior patterns, the most probable result will be that the technology is not utilized.** Moss stressed that human beings should not be required to adapt to the convenience

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*Two others, the University of Southern California and New York University used teleconferencing to provide citizen participation in governmental decision making.

**There is some support for this position. A demonstration "Televote" system, using mail, newspapers and telephone response was tested by the San Jose (California) Unified School District for seven months in 1973-1974. At most it engaged about four per cent of the eligible population.

of technological innovations. Rather, the technology should be molded to suit the convenience of the people it is intended to serve.*

Other arguments against electronic opinion polling rest on the belief that extensive citizen participation is undesirable. The reasons for this include the fears that the result of mass participation in decision making would be political instability and/or a series of uninformed decisions that would ultimately lead to a breakdown in effective government. Advocates of these positions oppose any encouragement of extensive citizen participation.**

3. The Information Gap

A number of theorists*** have speculated that as society moves into the "Information Age," the amount of information available to everyone will vastly increase. However, because the rich have already acquired the skills needed to find information in a complex society, they will accumulate a disproportionately greater share of the new information than will the poor. Thus, the "information gap" between rich and poor will grow.

There are trends in American society that both support and refute the theory. Certainly the broadening base of higher education and the near ubiquity of broadcast television have tended to narrow the gap. On the

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*The argument has been stated in another context by Orion White, Jr. "What must be feared most is that public policy will be set purely in terms of the capabilities which unfold mechanically as various technologies are elaborated." See White's essay, "Organization and Administration for New Technological and Social Imperatives," Public Administration in a Time of Turbulence. Dwight Waldo (ed.) (Scranton, Pa.: Chandler Publishing Co., 1971) p. 159.

**A clear statement of the opposing views can be found in Stuart A. Umpleby's article, "Is Greater Citizen Participation in Planning Possible and Desirable?" in Technological Forecasting and Social Change (v.4, 1972) pp. 61-76.

***See, for instance, Katzman, Nathan, "The Impact of Communication Technology: Promises and Prospects," Journal of Communication (Autumn 1974) pp. 47-58.

other hand, the complexities of extracting reliable information from an increasingly bureaucratic government have tended to favor those who have information acquisition skills. This latter trend accounts, at least in part, for the perceived need for comprehensive, accessible information and referral services.

The experience of the Adult Education project in Spartanburg is related to the information gap issue. The research design was, as originally proposed, a "true" experiment, with students randomly assigned to either classroom or cable. It soon became evident, however, that the trunk cable served very few of the areas from which high school equivalency courses draw students, i.e., the less affluent areas. Virtually all of the participants who lived in cabled areas had to be assigned to the cable class in order to amass a large enough sample in that group. Randomized assignment was not possible. Additional students are being recruited.

It is a reasonable assumption that if the course offered had been one with more appeal in the affluent sections of Spartanburg, the problem would not have arisen.

It is possible that if cable television proves to be an appropriate vehicle for adult extension courses (and early reports from Spartanburg suggest that the techniques developed are working well), the nature of the courses offered will be molded to the interests of those areas served by the cable. In many locations, that means the affluent areas. Such a development would widen the information gap.

Unlike broadcast television, cable is not a public good available to all who are willing to listen. It is a private good and, as such, its entrepreneurs attempt to maximize profit. While some of its entrepreneurs

have laid cable with a relatively even hand, others have chosen to "cream skim" in those areas where regulatory sanctions have not been applied.

As social service uses of cable television develop, policy makers concerned with cable television franchising and regulation should carefully consider the possible social consequences of selective cable penetration.

Thus, while the literature in this field has been voluminous and test projects numerous, neither has provided definitive solutions or even general agreement on delivering social services via cable TV. Financial, technical and human factors have prevented until very recently systematic experimentation in this area. However, both the theoretical literature and projects described in this report have helped to formulate the pragmatic and policy issues that need further investigation. As the NSF design studies become operational, perhaps the knowledge and skills amassed as a result will help to answer or redefine the questions concerning cable TV's role in the delivery of social services; and will provide the motivation to other experimenters to continue research into cable's potential in this area.

APPENDIX A

TELECOMMUNICATIONS IN SOCIAL/PUBLIC SERVICE DELIVERY

A Topical Bibliography

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APPENDIX B

CLUSTER ANALYSIS

In order to categorize the 85* identified component parts, a cluster-analysis method, the "bond energy algorithm." (BEA) was used**. The purpose of the technique is to identify and display natural variable groups and clusters that occur in complex data arrays. Additionally, the method displays the associations and interrelations of these groups with one another.

In common with most cluster techniques, the BEA has two problems associated with it. First, the identified variables--the inputs--are themselves the result of selective classification. The input categories selected for this analysis were culled and standardized from those most frequently mentioned in the cable literature. They dealt with the nature of the applications (e.g., purpose, audience, participants); the technology used (e.g., terminals, method of transmission); and research components (e.g., experimental design, process and outcome interests). There are, obviously, other categories that could have been selected, such as the personnel-to-hardware-cost ratios*** or the rate-of-useful-information transmitted. However, because of the reliance on the most-mentioned categories we were

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*See below.
**William T. McCormick, Jr., Paul J. Schweitzer, and Thomas W. White. "Problem Decomposition and Data Reorganization by a Clustering Technique." Operations Research (v. 20, no. 6, Sept.-Oct. 1972) pp. 993-1009.
***Probably not a valid category for this analysis since the NSF guidelines placed an arbitrary limit on the percent of money that could be used for hardware.

confident that if interrelations among purpose, technology and experimental design (particularly outcome measures) could be established pragmatically useful models would result. In other words, it would be possible to describe a method that seven consortia independently agreed was the best way to 1) Deliver a given service or information and 2) Tell whether it had been delivered successfully.

The second problem of clustering techniques is that of incidental or trivial association. Given a finite number of independent variables—in this case, the characteristics--it is not improbable that some of the dependent variables will randomly cling to each other. It is the function of the analyst to distinguish between random and significant associations. As it happened, this problem did not arise when the BEA was applied to the NSF projects. They did not cluster.

CATEGORIES SELECTED FOR CLUSTER ANALYSIS

A. APPLICATIONS:

Denver Research Institute/El Segundo
1. Information Services for Home Subscribers
2. Public Forum on Selected Issues
3. Information Services in Public Places

University of Southern California/Los Angeles
4. Electronic Public Counter
5. Community Video-Conference

Rand Corporation/Spartanburg
6. Adult Education
7. Day Care
8. Inter-institutional Communications: Coordinated Services
9. Inter-institutional Communications: Psychiatric Testimony

Lehigh University/Allentown-Bethlehem
10. Public Information Messages
11. Social Service Delivery: LARC
12. Urban Administration: Bethlehem School District

Michigan State University/Rockford
13. Firefighter Training
14. Special Interest Center: Educational Opportunity
15. Screening/Intervention of Childhood Learning Problems
16. Cable Information and Referral Service
17. Criminal Justice System: Depositions
18. Criminal Justice System: Legal Research and Information

New York University/Reading
19. Neighborhood Communications Centers: Elderly

Cable Television Information Center/Peoria
20. Citizen Participation/Polling
21. Practitioner Consultation
22. In-Service Training for Long-Term Care Personnel
23. Senior Citizens
24. Vocational Rehabilitation for the Homebound

B. SELECTED COMPONENTS

CONTENT
1. Service
2. Education
3. In-service training
4. Bureaucratic mediation
5. Government to citizen information
6. Citizen-government interaction
7. Administration

TECHNOLOGY
8. Fixed terminals
9. Semi-fixed terminals
10. Portable terminals
11. Limited button terminals
12. Full keyboard terminals
13. Medium speed (or frame-grabber) down/low speed up
14. Two-point two-way video
15. Multipoint two-way video
16. Switched video
17. On-demand one-way video
18. Technology mixture
19. Number of locations (subdivided)
20. Number of locations on-line simultaneously (subdivided)

AUDIENCE
21. Entire public
22. Segment of public
23. Institutions
24. Client or citizen user
25. Professional or paraprofessional user
26. Administrative user

PARTICIPATING AGENCIES
27. State
28. County
29. Local
30. Schools
31. Professional organizations

TIMES OF SERVICE
32. Specified hours
32. Business hours
33. 24-hour

LIMITATIONS
34. Queuing

LEVEL OF INNOVATION

35. New project (currently not offered at all in the community)
36. Project extension (current service extended by use of cable)

RESEARCH & EVALUATION

Design

37. Randomization
38. Not randomized; validity controls
39. Demonstration

Data

40. Researcher-generated data (e.g., observation)
41. Subject-generated data (e.g., questionnaires)
42. Objective measures (e.g., logs, tests)
43. Unobtrusive measures

Process measures

44. Number of transactions
45. Time saving
46. Communication/transportation trade-off
47. Placement
48. Productivity
49. Attitude toward process
50. Cost measure
51. Message accuracy
52. Drop-out rate
53. Interaction with the technology
54. Convenience
55. Attendance
56. Information dissemination through the community
57. Socialization
58. Information gain other than from instruction
59. Unanticipated benefits

Outcome measures

60. Participation in community affairs
61. Attitude toward the environment
62. Impact on the system
63. Acceptance by the community or institution
64. Demographic variations
65. Attitude toward self
66. Performance
67. Attenuation of effects
68. Credibility of the system
69. Extension or expansion of service

Comparisons

70. Non-public subscriber response (individual)
71. Non-public subscriber initiated
72. Public access subscriber response
73. Public access two-way video
74. Digital-telephone
75. Non-public two-way video
76. Non-public subscriber response (group)
77. One-way video/two-way audio
78. Addressed terminals
79. Non-addressed terminals
80. One way video
81. Telephone
82. Traditional treatment/no cable
83. Cassette
84. Face-to-face
85. Mail

*U.S. GOVERNMENT PRINTING OFFICE: 1976 626-155/507 1-3