# THE DEVELOPMENT OF TELECOMMUNICATIONS SERVICES : A REVIEW OF PROJECTS

## Volume 11

## Trip Reports

October 1979

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Bell Canada

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# INTRODUCTION

The Review of Projects on Future Communications Services was a joint study by Bell Canada and the Canadian Federal Government Department of Communications (DOC) initiated in late 1977. The intention was to gather information on the trials of telecommunication-based services undertaken in various countries. This material would then be available to both Bell Canada and DOC respectively in formulating plans for field trials and pilot tests of new communication services for the home and business.

The present volume (Part II of the study) contains detailed reports of projects visited. Volume III contains individual summaries of each project reviewed, plus an extensive bibliography. Volume I contains a brief description of the purpose and nature of the review of projects. The basis for a choice of projects was that the service trialed extend the current uses of telecommunications and not yet be generally available to the public. Of those included, one or two significant projects in each category were chosen for site visits and in-depth analysis. Most of the projects reviewed used interactive communication systems. Clearly, all trial projects could not be covered but it is believed that sufficient were reviewed to warrant compilation of the material.

The projects are classified under the following categories and headings and within each heading they are grouped by country, state or province.

## Teleconferencing

1. Video
2. Audio with Visual Aids
3. Graphic Conferencing Mechanisms

## Computer Mediated Communications

1. Computer Conferencing
2. Computer Augmentation
3. Computer Messaging

Tele-Education

1. Universities
2. Schools
3. Specialized Training
4. Handicapped (Universities, schools, specialized training)

Telemedicine

1. Urban
2. Rural
3. Remote
4. Distributed

Services to the Public

1. Broadcast Information Retrieval
2. Metering/Security
3. Community Services
4. Shopping
5. Multipurpose Systems for the Home

The visit reports are prefaced by an index of the projects visited in the course of the review. It identifies each entry by a project title (if such a distinct title exists), the name and location of the responsible organization, and gives a brief description of the project. There is also a complete index listing all the projects at the end of the present volume.

Some of the projects visited are no longer in operation. Others have undoubtedly progressed, developed or been terminated since this study was undertaken.

# LIST OF PROJECTS VISITED

## TELECONFERENCING

## COMPUTER MEDIATED COMMUNICATIONS

## TELE-EDUCATION

## TELEMEDICINE

## SERVICES TO THE PUBLIC

# VIDEO CONFERENCING

Bell Canada, Ottawa, Ontario

October 6, 1977

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A commercial video conferencing service network serving Ottawa, Montreal, Calgary, Toronto, Quebec City, and Edmonton.

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Contact: Rejean Myre
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In the early 1970's, Bell Canada, together with other Canadian telephone companies, decided to investigate the marketing opportunities for video conferencing services. Bell built two studios, in Montreal and Ottawa, for experimental black and white video conferencing. Other studios were subsequently added, first in Toronto and Quebec City, and later in Edmonton and Calgary which were linked via satellite. In 1978 the service was made available commercially.

The studio meeting room in the system can accommodate up to six people. Each of two color TV cameras focuses on three of the conference participants. A third color camera, intended for the pad board at the rear of the room, has remote controls for panning, tilting and zooming, and can also be used to provide a full-screen close-up of a speaker. An additional overhead camera in a booth at the side of the room is used for graphics and slide presentations.

Each studio has three color TV monitors. One, in the centre facing the participants, is used to monitor the outgoing video signal. Two others, slightly separated, each display three of the six people in the distant studio. The idea is to maintain the best possible approximation to normal face-to-face eye contact behaviour.

If split screen capabilities are used, more people can be seen on each monitor, or a third location can be added to the system.

Each studio provides facsimile communications. Both audio and video recording and playback facilities are available, and the video playback feature has proved to be particularly valuable in sales presentations.

Each participant has a microphone with a "mute" button to permit private conversations, and a scrambler device is attached to a telephone to permit confidential conversations, if required.

The studios have been carefully designed and are acoustically treated for maximum voice clarity. The light intensity in the room is high -- it requires four times as much light as is used in a conventional TV studio. The hardware is all off-the-shelf. Temporary studios can be established in other locations using portable black and white equipment.

The video conferencing network features simultaneous, two-way transmission with voice-switched audio channels between two sites. The Montreal-Toronto link uses the 700 km long LD4, Northern Telecom's long-haul coaxial cable facility. The other links use conventional analog microwave channels, but as digital networks expand, it is expected the conferencing network will include digital circuits. The Toronto-Calgary-Edmonton link is via satellite.

At the present time, only two locations may participate in a conference, but three-way experimental conferencing is imminent.

The conferencing project is funded by Bell Canada. The cost per studio is about $250,000, of which $190,000 is for electronic hardware, and $40,000 is for the room. The TV cameras are the most expensive component of the system. When the studios in Ottawa, Toronto and Montreal were converted to colour, the incremental cost per studio was $200,000. The investment in the earth station for transmission to Calgary and Edmonton was about $250,000. User costs range from one to several hundred dollars per hour.

Video conferencing is intended as a complement to face-to-face meetings rather than as a substitute. At present, the system is used mainly for high level executive meetings and sales presentations. Some oil companies have used the Toronto-Edmonton - Calgary link on a trial basis, and Inuit people living 400 miles north of Edmonton have tried it. Their response was very favourable.

## Future Plans

Trials are under way on techniques for compressing bandwidth to reduce system costs. It has been found that there is some degradation in image quality, but that it is still suitable for teleconferencing purposes. One of the goals of the trial is to determine the trade-off point between image degradation and cost.

# PHOENIX CRIMINAL JUSTICE ADMINISTRATION PROJECT

## (VIDEO TELEPHONE)

Phoenix, Arizona

November 5, 1977

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The emphasis in this report is in the post-experiment period of the Phoenix Project. The experiment up to August, 1976 is well covered in reports from the MITRE Corporation.

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In 1974, an experiment known as the Phoenix Criminal Justice Administration Project was initiated to determine the potential demand for video communications by criminal justice agencies, and the effect of their use on the administration of the judicial system.

The experiment ran for 16 months under the auspices of the National Institute of Law Enforcement and Criminal Justice, the Law Enforcement Assistance Administration (LEAA), and the U.S. Department of Justice, with the co-operation of the American Telephone and Telegraph Company. It involved the planning and installation of a video telephone network connecting criminal justice offices and facilities in Phoenix and Maricopa County, and the development of procedures for its use in many of the routine functions of the judicial system. The equipment was provided by AT&T and maintained by the Mountain Bell Telephone Company.

The results of the Phoenix Project have been fully documented in MITRE reports (1) - (4). This report examines the post-experimental period.

When the Phoenix project ended, the video telephone network was left operational with eight of its original 17 terminals activated. They were in five locations -- all relatively close:

- one in a Superior Court room (main building).
  (This location is also equipped with an overhead camera for transmission of documents; a videotape recorder, a 23-inch television monitor and an extra camera behind the witness stand.)

- two in the Public Defender's office (two blocks away)
- two in the jail
- one in the Adult Probation Office
- one in the Prosecutor's Office (main building)
- one in the Lower Court House (across from the main building)

The system provides black and white, face-to-face communications with head and shoulder display. All stations use a standard push button telephone coupled with Western Electric display unit comprised of solid state, black and white video monitor and camera on a lazy-susan base. In addition to one-to-one communications among the network users, three-party conference calls can be set up using a bridge with voice-activated switch for both audio and video. Wide-angle lenses and large-screen displays can be used in courtrooms. Some stations use a zoom lens to show documents and other objects important to the proceedings.

Because the video telephones are compatible with 525-line commercial television standards, the signals can be recorded on commercial videotape equipment for later replay, and videotape reproductions can be transmitted over the telephone lines for display.

The video telephone network consists of two-way coaxial cable and microwave radio connected through the central exchange of the local telephone company. It is centrally switched on a dial-up, first-come, first-served basis.

The most significant benefit of the video telephone system is time saved, and therefore money. This is evident in two particular areas — it cuts down on the need to transport prisoners from jail to courtroom for appearance before a judge, and public defenders can interview prisoners without having to travel to the jail.

In Arizona, the arraignment is the third step of the judicial process, following both the initial appearance of a prisoner before a judge and a preliminary hearing. It is the simplest of all appearances, and is very brief.

The law required that a prisoner appear before a judge in person. This requirement has been considered met if the appearance is made by video telephone.

The video appearance is only used for in-custody, not guilty arraignment, and prisoners have the option of being physically present before the judge if they prefer. If not, they sign a waiver of physical presence.

Procedure is essentially unchanged. At an appointed time, the judge calls the jail where the prisoner waits accompanied by the public defender who is there to handle all assigned cases. The court clerk and the county attorney may be with the judge in chambers, or, when the three-way conference capability is used, the county attorney may participate from the Prosecutor's office.

Public Defender Conferences with Jailed Clients

In the case of interviews between the public defender and the prisoners there would appear to be a number of reasons why the video link is useful. It permits the public defender to contact his client more frequently and easily as transportation time to and from jail is eliminated. Prisoners would not normally be taken to a phone to talk to the public defender as readily as they are taken to the room containing the picturephone. Frequently there are documents or exhibits of one kind or another that the public defender must show to his client, and this cannot be done over a normal phone line.

Another reason, which is difficult to verify, is that the public defender can engage in better communication with his client when he can see the client, than when he cannot.

Whatever the reasons, there are some indications that the public defenders are making use of the system and like it. The main indicator is that there are about 20-25 client interviews per day by public defenders from the two video telephone stations.

There are a total of 60 public defenders of whom 32 are attorneys dealing with 6,500 - 7,000 felony clients per year. This is the section that uses the video telephone the most. It is also used a little in misdemeanor cases, but very little in appeal cases, juvenile, and mental health cases.

Since the system trial has been in progress, despite of an increase in the work load, there has not been an increase in the number of attorneys, which would indicate that the public defenders are, in fact, saving time by not having to physically go over to the jail to visit their clients. The prosecutor's office has increased its staff by 12.

In addition the number of contracts between a public defender and his clients has substantially increased. At one point it had increased by a factor of 3.

Another group of users in the public defender's office are the nine criminal investigators who occasionally make contacts with the defendants.

## Other Uses of the Video Telephone in Phoenix

Several other applications of the video telephone were tested during the trial period. A list of them and statistics of usage are available (1). There are also a number of other possibilities for the use of picturephones in the criminal justice system. Among those mentioned was a connection to the state penetentiary to permit family visits with prisoners, and to permit witnesses presently in jail at the state penetentiary to testify in trials taking place in Phoenix.

## EVALUATION

The switching among the three stations is such that whoever is making the loudest noise -- coughing or speaking -- will have his picture displayed on the other sets. This caused some rather serious problems in one arraignment. The picture of the defendant would disappear to be replaced by a picture of a public defender who was simply observing the proceedings, but who had rustled some paper and coughed. These activities caused the voice-actuated switch to switch to him. Once the picture had switched it took several seconds to change back.

One very interesting point is that the court does not benefit from the use of picturephone, although the court was responsible for the introduction and operation of the system. The primary benefits go to the sheriff and the public defenders office. The public defender's office would keep the video telephone even if they had to pay for it themselves from their own budget.

Of the approximately 35 judges operating out of the building housing the system only one makes use of the system, and this for the arraignment of prisoners.

One side effect of the use of the picturephone system by the public defenders office is that it may result in the depostion of earlier pleas. This helps to improve the scheduling of court room and judges' time. As it is now, most pleas tend to come just before a trial.

In general, it has been observed that attorneys are reluctant to use the videophone system, perhaps believing that their presence in person in a court room is much more effective than their appearance over television. But it would clearly be a way of saving substantial amount of an attorneys' time if brief appearances in a court room could be made via picturephone.

The present use of the system is entirely concerned with criminal offences. It would probably be much more adaptable to use with civil litigations, where there is not a question of encarseration of an individual.

Controlled Tests of Image Reproduction

Controlled tests of image reproduction were conducted during the trial period prior to August, 1976 (3). On the average, the findings indicated that the equipment is marginally satisfactory for reproduction of graphics typically used by the Phoenix Police Department. Given the resolution capability of the equipment under test, the results indicated the magnification is essential to create usable images of fingerprints and documents, and is important in creating usable images of photographs.

Agreement as to usefulness was stronger, on the average, for photographs and fingerprints than for documents.

FUNDING

When AT&T withdrew from the project, it handed the responsibility of maintaining the system to Mountain Bell Telephone Company. Mountain Bell appeared to have little interest in maintaining the project and charged about $3,300 per month for lines and rental and maintenance of eight terminals after taking about six months to settle on a rate.

The annual operational budget for the system is over $46,000 of which $39,000 go to Mountain Bell.

The Mitre evaluation report (1) contains detailed cost-benefit analyses. It was found that the total monthly net savings of the Phoenix system during the trial period was in the order of $566. The highest labour savings were in the Public Defender's office.

An analysis of a hypothetical minimum-cost system in Phoenix gave a monthly net savings of roughly $27,000. The characteristics of such a system were determined by projecting usage to the maximum possible on the basis of the overall average interaction rates experienced during the project for each application; adding additional video telephones as necessary to accommodate the full scale usage, then removing video telephones where the usage experienced was zero or not significant (1).

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# CLOSED CIRCUIT TV SYSTEM

Philadelphia Police Department

Philadelphia, Pennsylvania, U.S.A.

19 October, 1977

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The Philadelphia Police Department has a cable TV network used for in-house training, newscasts, data transmission and the facsimile transmission of graphic material.

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Of the 18 million inhabitants of the state of Pennsylvania, 1.8 million (17 per cent) live in Philadelphia and five million live in the surrounding area. The total expenditure for communication functions by the Philadelphia Police Department (PPD) is about $5 million out of a total budget of $150 million per year. Of this amount $3.5 million is allocated for the Police Radio System, including the costs of dispatching and transmitter facilities.

In December, 1969, following a study conducted by the Franklin Institute Research Laboratories, an investigation was launched with the objective of:

- determining what police communication functions could be better and more economically performed on closed circuit television;
- establishing an appropriate systems configuration;
- if required, developing and installing a pilot system to demonstrate the capabilities of telecommunications to perform the tasks assigned.

The Franklin Institute study had determined that existing communications function could be done more economically over telecommunications links. It also identified a number of new procedures which could be implemented.

This feasibility study recommended the use of microwave links, and in December, 1970, a pilot microwave system was built from one division HQ to the main HQ center. But it did not provide enough channel capability for the planned activities. It was also very noisy.

Cable was therefore installed in place of the microwave system. This was less expensive than usual because of a bylaw requiring that free ducts be installed in all underground conduits for use by police,

fire departments and other organizations offering emergency services. As a result, the only installation cost for the cable network was that of pulling the cable through the ducts.

FUNDING AND OPERATING COSTS

The police Department estimated that $3.7 million would be required to build the cable system. Two million was allocated and spent to start the project, and another $1.7 million was still to be obtained to fully implement the present plan. The cost of the cable plant (cable, amplifiers, installation) is about 75 per cent of the cost of the system to date. The project is funded by the City of Philadelphia and by the Law Enforcement Assistance Administration (LEAA).

The cost of operating the system is $150,000 per year.

It is a dual cable system. Each cable has a capacity for 32 channels downstream and four channels upstream. The network connects the main police headquarters, city hall and nine division headquarters.

There are several locations where the cost of cable was prohibitive, so two microwave dishes were installed instead. Other locations are being connected to the network according to priorities and the funds available: All divisional headquarters are now serviced by the network, as are the district headquarters. All remaining police locations such as the airport, the police stations, the Harbour Patrol, and the Policy Academy are currently being connected to the network. Twenty locations out of thirty-three are now using the cable.

The system is used interactively mainly in the arraignment of suspects and this use may be sufficient to justify the cost of the system in the long term, because transporting prisoners from a

temporary confinement location to a judge is expensive. The total expenditure on transport of prisoners is about $750,000 per year and the Police Department estimates that it is presently saving about a third of this sum by using the system. Transportation has not been eliminated completely however and some additional expenditures have been required to locate qualified people in every district to process finger-prints, pictures and documents.

The system is used for the following services:

Roll Call

At the beginning of every shift, at 8 a.m., 4 p.m. and 12 p.m., a pre-recorded 5-10 minute briefing is transmitted to all police locations, every day. This briefing consists of three parts:

- general information and up-dates on police procedure
- descriptions with photos of wanted people and/or missing persons
- training/teaching segment

The training is in the form of reminders and is not supposed to replace formal training. Showing mug shots of wanted people has frequently resulted in arrests.

Arraignments

There are about 125 arraignments per week performed over the system - for close to one-half of all prisoners. Suspects are interviewed in three remote districts by judges who are located at City Hall, which saves them being transported to City Hall by two policemen. This results in a substantial saving.

A state law in Pennsylvania requires that all prisoners must be seen by a judge within six hours of arrest. Because of this, saving an hour of transportation time (and sometimes two hours in peak traffic) out of the six hour limit is important. About 75 per cent of all prisoner escapes occur during transportation. Use of the system helps avoid escapes because there are no moves.

The public defenders like this system it permits a much faster turn-around time for each arraignment. Both lawyers and judges accept the system, although prisoners and their lawyers are sometimes concerned about privacy.

Telephones can't be used for arraignments because the visual identification of the prisoner is required for legal reasons.

Court documents, finger prints and mug shots can also be transmitted via the system.

Training

There are about 8,000 people in the Philadelphia Police Department and many of them receive some type of training on the job. The Department produced about 50 of the training tapes in their 135 tape library. The tapes must be replaced continuously because their contents quickly become obsolete. Other tapes are provided by the International Association of Chiefs of Police.

Each morning at 10 a.m. commercially prepared films dealing with management problems are shown to middle management personnel (500-700 people.) Inspectors watch weekly training films. Generally speaking these programs have been met with a responsive and enthusiastic attitude. Individuals seldom request tape viewings, but groups often do.

Facsimile Transmission

For the transmission of fingerprints, special documents and ring sheets, high resolution and high speed facsimile transmission is used between police locations. The facsimile sheet dimensions used are 8 x 16 inches.

Identification of Suspects

The network is used to transmit color slides belonging to the 500,000 slide collection of people who have been involved with criminal activities in Philadelphia. The selection of slides is made on the basis of a victim's description of the people who acted against him. The slides are transmitted to a Police Station that is conveniently located for the victim.

A proposal has been made to use the network to televise line-ups of people who have been arrested for one incident to people victimized in other incidents to see if there are further charges that should be laid. One possible advantage of television in this case is that the victims can get better close-up views of the suspects without being intimidated by them. However a legal problem exists: the suspect's lawyer must be present to supervise the identification, a procedure which could be accomplished by two-way television.

The upstream channels in the Police system are not used because one cable is dedicated to upstream communications, and its total channel capacity is much in excess of requirements. With this in mind, the Department would like to use its system for data transmission replacing leased Bell Telephone lines.

The Police Department has two studios for the production of programs and videotapes - one at the main police headquarters and the second at the Police Academy.

The system's two-way capacity is used for arraignments and training assignments, in black and white video. Mug shots and other specialized visual material are transmitted in color in a broadcast mode.

For video conferencing applications, such as arraignments and interviews, 25 VICON terminals, Model V3000, are used. These consist of a standard 9" television monitor and a camera, packaged in one assembly. They have a self-view feature and a TouchTone dial system that is used to establish communications. Several video conferences can be held simultaneously. The automatic switching equipment and the VICON terminal were custom built because no other suitable equipment was found "off the shelf." Cost of the terminal is $2,200 each.

Facsimile is also transmitted over the cable system. HARRIS LASER FAX terminals use a heat process without chemicals. Transmission of fingerprints requires at least 200 lines/inch for adequate resolution. This equipment provides 280 lines/inch.

EVALUATION

Conclusions based on an evaluation period from March 1 to July 31, 1975:

- Police statistics reveal an average time-saving of approximately 10 hours per arrestee as a result of using the CATV system. The average elapsed time between arrest and arraignment in non-CATV cases is 15 hours and only 5.13 hours for cases handled over the cable system. The saving results from reduced prisoner transport to the Police Administration Building initial processing. However, the estimate of time saved may be artificially high. The CATV sessions are currently handled on a "priority" or "expedited" basis. If the city were to extend the CATV processing procedure to all districts, is likely that the average elapsed time between arrest and arraignment would be higher than 5.13 hours, however, the increase might not be substantial.

- Cases involving homicide, rape, narcotics, and drunken driving are not being processed over the experimental system. In addition, all arrestees are supposed to be informed of a "right to refuse" to be processed over CATV. They are given the option of being transported to the Police Administration Building for processing and preliminary arraignment. Reportedly, the arrestees have invariably opted for the CCTV procedure, possibly becasue they were not always advised of the transportation option.

- During interviews with prisoners, it was observed that the sound quality given by the system was not entirely satisfactory. Both the interviewers and the clients had occasional difficulty understanding each other. The need for the police cell-block personnel to be properly trained in the operation of the CATV system, as well as in the initial intake procedures, such as fingerprinting and photograph, was recognized.

- The prisoner is told that a public defender will be present at the preliminary arraignment. However, at the preliminary arraignment the CATV camera is focused exclusively on the judge's face. Unless someone informs the prisoner, he will not be aware that there is a public defender present in the courtroom. The public defender is aware of this problem and he may talk with the arrestee publicly over the CCTV system or privately using a telephone provided for this purpose. Either form of communication causes a disruption in the proceedings and does not allow for quick, confidential conversations between the arrestee and attorney.

- The CATV system, as presently used for conducting preliminary arraignments, involves a trade-off for prisoners. On the plus side the CATV system offers promise of substantially decreasing the time they are detained after arrest and will permit many, if not most, to await arraignment in a relatively more comfortable environment in the cell block which is a cleaner, quieter, more relaxed, than the congested Police Administration Building "tank". Greater dignity is

preserved for the prisoner in the district environment.

On the negative side, arraignment over CCTV may complicate communications between the prisoner and the Public Defender. The prisoner is more dependent upon police personnel to explain the significance of the procedure.

On the whole, it seem likely that the use of the system benefits prisoners more that it harms them. The elimination of long delays is a serious consideration.

- Between the dates of July 8, 1974 and July 29, 1975, 349 arrestees were given preliminary arraignments over the CCTV. These cases were handled between the hours of 9 a.m. and 5 p.m., five days a week, from the North Police Division Headquarters at Broad and Champlost Streets.

- The training program offered over the cable system is considered by the Police Department to have reduced the cost-per-student for retraining; to have increased the quality of the training program; to have reached a greater number of students and assured a uniform quality of teaching throughout the different police districts.

- The Police Department also considers the roll call activities over cable to be successful. They feel that the policemen tend to focus more on the TV set, paying more attention to the roll call activities, than if it were done in person.

- The Philadelphia Police Department system was taken as a model for the Criminal Justice Experiment in Phoenix, Arizona which uses AT&T Picture-phones.

- The Philadelphia Police Department intends to add all their computer-based communications to their cable network in the near future despite some objections voiced from the local Bell Telephone Company.

## RELATED PROJECTS IN PHILADELPHIA

The Municipal Government, in conjunction with the Philadelphia Police Department uses a computer-based system for dispatching policeman to answer emergency telephone calls on the 911 exchange. The telephone operator types the information into a terminal as calls are received. The dispatcher retrieves the information entered by the telephone operator, and contacts a police patrol car by voice radio.

In addition to the 911 telephone number, another number, 321, exists for non-emergency telephone calls. Thirty telephone operators handle all the calls.

The average time needed to retrieve an emergency call and put the information in the computer is about 30 seconds. An automatic switch connects the call directly to hospital and fire department headquarters. Total 911 and 321 calls average 75,000 to 80,000 per day.

The existence of auto-dialers connected to alarms on business premises constitutes a problem. There are 2,700 of these known to be installed, and many more than this number exist. Twenty-four telephone lines are required to deal with some four to 20 calls per day from the auto-dialers, as they cannot be turned off remotely once they have been triggered. They then tie up a line even though the call has been received. Auto-dialers can also set up multiple calls to various places.

About 98 per cent of the calls made by the auto-dialers are false alarms. This compares with a 20 or 30 per cent false alarm rate on dialed calls made to the emergency 911 number. The city administration has tried to require that the auto-dialers be licensed but has failed to get City Council approval.

The telephone bill for the municipal services in Philadelphia amounts to $3,700,000 annually.

Telesystem Cable Co. in Philadelphia has 4,000 household subscribers. It wished to offer a security system to their clients. The Police Department advised them that they would have to be responsible for the devices they installed and the transmission and routing of calls to the appropriate municipal agencies (hospital, fire department, police, etc.). Apparently, the cable company did not proceed with these plans because they did not wish to assume these responsibilities.

In addition to the police communication systems, a closed circuit TV subway surveillance system which cost $975,000 to build has been operational since July 1977. These funds were received from the Housing and Urban Development Department (HUD), under the Model Cities program of the U.S. Government. A control centre with viewing monitors and loud speakers enable officials to observe activities in the subway stations where cameras are installed and to speak out to warn people to "behave". This is usually sufficient.

Presently, 8 stations are equipped with 6 to 12 camera positions (225 cameras total). The cameras are hidden and fixed but there are plans to add remote controls to them in the future. Transmission is by co-axial cable.

The control centre is located in the City Hall where three people monitor the TV images corresponding to the cameras in the subway. Camera views are switched automatically every 10 seconds using two switching consols. A particular image may be switched to a monitor for continuous vieweing. A test generator is used to superimpose the location, time and date on a selected image on the TV monitor.

Incidents can be recorded on 3/4 cassette video tape. A hot line is used for dispatching policemen to a site.

No protests about privacy infringements have been received concerning the subway monitoring system. This is attributed to an informal public consensus on the need for safety in the subway system. There are also plans to extend the system to all 65 stations of the Philadelphia subway system within the city limits.

Small business owners have expressed a desire for a street/entrance surveillance system outside their business offices.

# PICTUREPHONE MEETING SERVICE

A.T.&T., Basking Ridge, N.J.

October 21, 1977

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The Picturephone Meeting Service is a broadband black and white video teleconferencing system linking four cities: New York, Washington, D.C., Chicago and San Francisco. It is intended for meetings of groups of people rather than person-to-person use.

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Telephone No: 201-221-6510

The Picturephone Meeting Service has evolved from years of experimentation by AT&T with video teleconferencing systems and the regular Picturephone Service. The latter is basically a person-to-person medium of communications. The Picturephone Meeting Service is intended for communicating between groups of people, and provides a broad range of visual aid capabilities. It accommodated only two-node conferences at the time of the visit.

At present there are Picturephone Meeting Service studios in 14 corporate locations at AT&T in New York, Chicago, Washington, D.C., San Francisco and at various places in New Jersey. There are also firms with conference rooms equipped to link in to the Picturephone Meeting Service in each of these four major cities.

System Capabilities

The Picturephone Meeting Service uses black and white video as the communication medium. Three cameras are aimed at six participants, meaning that there are two participants viewed by each camera. These cameras are fixed, but their zoom and focusing lenses can be adjusted manually prior to a meeting if necessary. The choice of images sent to the other end is made automatically and continuously during each meeting by a voice-activated switch so that the picture transmitted is that of the person speaking the loudest. If a split screen option is used, all images are sent, combined in one video channel.

Two additional cameras are available in the studio at AT&T headquarters - one for documents, vugraphs and slides, and the other for blackboard presentations which can be remotely zoomed between an overview of the room and a close-up of the blackboard.

In addition, 3/4 inch videotape cassettes and films can be shown over the network. Some locations have portable cameras, wide angle lenses, and mirror arrangements. A facsimile device provides hard copy of documents shown on television.

Funding

The rates for a Picturephone Meeting range from $2.50 to $6.50 per minute:

| | |
|---|---|
| New York - Washington, D.C. | $2.50 |
| Chicago - Washington, D.C. | $5.50 |
| Chicago - New York | $4.50 |
| San Francisco - Chicago | $5.50 |
| New York - San Francisco | $6.50 |
| Washington, D.C. - San Francisco | $6.50 |

Users can have their own studios or can rent the AT&T facilities. A Picturephone meeting room would cost in the neighborhood of $60,000 to $100.000 to install. AT&T provides the electronic hardware such as cameras, monitors and switches. The customer provides the furniture, lighting, and acoustic treatment.

For most users, the main advantage of the Picturephone Meeting Service is the time-saving it makes possible, with money-saving a secondary advantage in some cases.

The service is mainly used for corporate meetings within AT&T. There are about 50 of these meetings per month. The most heavily used studio is the one at AT&T headquarters in Basking Ridge where it has become necessary to set up an extra room to accommodate the demand.

There are about 10 customer meetings per month. This low number is at least partly due to the early stage of development of the service. Only one individual in each city is dedicated to marketing the service.

There have been two residential calls in which the expenses were paid by the subscribers themselves. There was also a residential booth service in 1964-65 with 200 calls over a period of two years. People appeared to be satisfied with the service when they used it, but it proved to be difficult to create conditions in which extensive residential use was feasible.

# MINT

Department of Health, Education and Welfare Canada,
Ottawa, Canada

October 6, 1977
and
November, 1977

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MINT was a computer conferencing system developed by the Department of Health, Education and Welfare Canada for its own use. Mint was also adopted by other government departments.

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Hugh Pett, Computer Systems Consultant

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In April 1971, the Non-Medical Use of Drugs Directorate (NMUD) was formed as one of the eight directorates within the Health Protection Branch of the Department of National Health and Welfare, Canada.

In November 1972, a non-profit organization called "Memo from Turner" funded by an Opportunities for Youth grant was formed. The purpose of "Memo from Turner" was to mediate within and between peer groups working on innovative alternatives to traditional social systems.

In the spring of 1974, an agreement was reached between NMUD and "Memo from Turner" (MFT) to the effect that:

1. MFT would build an information retrieval and conferencing system for the use of the directorate.

2. The directorate would pay for the development of two systems.

The group developed an interactive system using a Delphi program with a message exchange capability and a mechanism allowing multiple participants to simultaneously interact with the same data base and event set.

The system was first accessed through the I.P. Sharp Network, by means of acoustically-coupled terminals.

In December, 1975, as a cost-cutting measure, the program was converted to run on the Sigma 9 computer at the Communications Research Centre, a Government organization. By August, 1976, a new FORTRAN version was working well on COMSHARE, a private service bureau. The FORTRAN program had the advantage of being more effective, transportable, and available, which could have reduced costs by about 35%. But the saving was offset by the addition of many new features.

It was at this time that the system was named MINT (Move Information No Time).

The system was mainly used to send messages and to hold discussions. The prime application was project control. It provided managerial tools which permitted people in Ottawa to direct activities in the regional offices of NMUD. Eventually, there were 15 to 16 terminals scattered across Canada, including three in Ottawa, two in Montreal and two in Winnipeg.

FUNDING

All the funds of the MINT system were provided by the Non-Medical Use of Drugs Directorate. Annual costs were about $170,000, which included network costs (COMSHARE), terminal rentals and contract programming. Not included were salaries (2 man-years), office space, and other overhead costs.

A typical message using the MINT System cost between $1.00 and $1.50.

About eighty members of the department had access to the system. The degree of use depended on the level of interest in each region. For example, in Vancouver, it was only used an average of once a week, while in Winnipeg, it was accessed many times each day. It proved to be an alternative to the telephone as a mechanism for communicating among a highly mobile group, with between 10 and 70 messages sent daily.

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# EIES

New Jersey Institute of Technology (NJIT), Newark, N.J.

October 26, 1977

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The Electronic Information Exchange System (EIES) is a computer conferencing system developed by Prof. Murray Turoff at The New Jersey Institute of Technology and funded for experimental use by the National Science Foundation.

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The Electronic Information Exchange System (EIES) was developed at the New Jersey Institute of Technology by Murray Turoff, with a support grant from the National Science Foundation, Division of Science Information Services. The system went operational on an experimental basis in October 1976.

Some of the features of EIES are based on those developed for an earlier system called EMISARI (Emergency Management Information System and Reference Index) which was first used by the U.S. Office of Emergency Preparedness (OEP) in 1971.

EIES is designed for maximum flexibility and ease of use in teleconferencing via computer, rather than for the utmost efficiency in terms of computer utilization. It has the following features:

- Conferencing: A common space where a particular group (usually between five and 50 people) can hold a discussion on a topic and obtain proceedings for later reference.
- Messaging: A private space where an individual can exchange information with any other member in a conference.
- Scratch Pad: A personal space for text editing.
- Bulletins: A public space for reports and newsletter-type items which can be sent to the members of all on-going conferences.

Other features of the EIES include a directory of participants and groups of participants, a powerful text-editing system and a voting system. The system is segmented so that a user need learn only those features he wishes to use at the time. The user can also write his own procedures.

EIES was being tested by the National Science Foundation as a communications device which would allow small groups of researchers with common interests to exchange information during the course of particular projects funded by the National Science Foundation. In 1977 four such projects were approved by NSF, out of 12 submitted:

- Technology for the Handicapped: HEW is trying to formulate categories for types of handicaps (30 people from various institutions).
- General System Research Community (32 users). General system theorists constitute one of the few research communities that is deliberately trying to integrate a wide variety of scientific disciplines.
- Social Networks (40 social scientists). This group is investigating human communications in various settings.
- Futures Research Methodology: A group of people interested in discussing and improving methodology in futures research.

In 1978, three new operational trials began. These are LEGITECH, a network of state legislative science advisers; JEDEC, a set of standards setting groups sponsored by the Electronic Industries Association; and a third group studying mental workload.

The people using EIES do so as a "member" or participant in a conference. They have to be motivated to access the system regularly and to engage in free and daily time-consuming exchanges if the system is to have any noticeable impact upon group communication or productivity.

A pilot field test of EIES was held in Sweden with 300 participants. The System was used for conciousness-raising sessions with ordinary people.

During the first three months of this experience the participation by the users was very uneven. Some people invited to use the system either never signed on at all or only used it once or twice.

However, some participants began to access the system for an average of an hour or more a day, doing the bulk of their professional communications through this medium. When someone begins to receive thirty or more messages or conference entries a day over the system, a new human problem begins to emerge, that of "information overload" - how to cope with the volume of data that keeps coming in. For example, some participants with hard copy terminals began making jokes about needing bigger waste baskets and more filing cabinets.

The most frequent complaint during the pilot period was that the features, the interface, and the system documentation kept changing as the system was built to specifications and as it was altered according to the expressed desires of the users. This generated a great deal of frustration among the participants.

Some reasons why people did not use the system were the lack of strong motivation to use the system to communicate with other conference members, the perceived barriers to easy use such as confusing instructions, and system failure due to network problems.

Murray Turoff defined a "fanatic" user of EIES as someone who is using the system at least daily. On this basis 25 per cent of users are fanatics. One curious observation is that almost all woman users (80 per cent) are fanatics. Mr. Turoff reported that the women professionals felt that they used the system to compensate for not talking in face-to-face groups where males seemed more dominant. He also felt that many male users preferred to have a tiny delay in which to think about their answer before replying to a question or comment.

Mr. Turoff also remarked that Swedish society is fairly introverted and this factor seems to correlate with high usage of computer-based communication systems.

The main hardware components of EIES are two INTERDATA 7/32 minicomputers (0.5 Megabytes of core) each connected via separate disk controllers to a DIVA DD/32 dual-disk system, with a capacity of more than 200 million bytes, which was to be replaced by a TRIDENT system. Only one of the minicomputers is needed to operate EIES. The other minicomputer is for research and computer science education, but it can take over operation of EIES if a problem develops with the first processor.

The software is based upon a round-robin service doctrine in which service is given up by a user whenever an I/O (input/output operation) is executed. The "intelligent" I/O routine passes control to a scheduler which chooses the next user in turn who is not waiting for an I/O service operation to be completed. At certain places in the program, virtual I/O's are used to ensure that no unfair allocation of service can occur. The result is a multi-user system regulated by events rather than time slicing, an arrangement which appears to be efficient for a system that is communications rather than computations oriented. Three service priorities exist. Text-editing has the highest priority, followed by sending or receiving text, information retrieval and filing, and finally by search operations which product a virtual break.

One interesting special feature is the incorporation of "Hal Zilog", a microprocessor that can respond to messages from other conferences with a host of special analysis and display graphics routines. Hal also operates his own dialer and can phone other computers to obtain information from data bases located elsewhere. This allows the conference system to become the prime interface for a group utilizing a variety of computer systems for some common objective.

The present system can handle about 1,000 users without adding on additional core memory or a new disk. EIES can be accessed through the TELENET network.

## FUNDING

The EIES system uses approximately $200,000 worth of computer hardware at the central location.

EIES received $600,000 from NSF for an initial operating period beginning summer 1975 to November 30, 1977, and an additional $300,000 for the next year's operation. Murray Turoff expected between 300 and 400 professionals to use his system in 1978. Some $220,000 is earmarked for computer support and the remainder is allocated for the rental of terminals to access EIES. The NSF grant is renewable each year.

Additional costs include the TELENET charges which average $3.50/hour and are covered by separate NSF grants to groups using EIES.

## EVALUATION

EIES was being viewed as a quasi-experimental system in a field trial stage. The various participants were chosen so as to include groups with different sizes and with different scientific specialties. The evaluation consisted of a series of measurements of system usage related to the information seeking, communication, and document production activities of the members of each scientific group. It was conducted mainly by pre-use and three month follow-up voluntary questionnaires. Unstructured interviews carried out with selected members of the groups and conducted in person, by telephone, and/or

by sending messages back and forth over the computer system were also undertaken. In addition, each group of scientists included, in its NSF proposal for use of the EIES system, a plan for assessing the system's impact upon their particular group and the productivity of its members. The division of mathematical and computer research funded a study of an across-group assessment of the impact of the use of EIES. The major observation to date stemming from the evaluation is that the majority of the scientists have not integrated the time they spend using the system with their main preoccupations and priorities. Most of them tend to regard it still as a spare time activity. This appears to be primarily due to the low benefit perceived from use of the system. There have also been a number of practical and logistical problems, most of which are associated with the relative newness and limited scale of the system.

## COMPUTERS MAIL VS. COMPUTER CONFERENCING

Murray Turoff feels that universal computer-based message systems will take a long time to develop because of the common user and system interfaces and protocols that must be developed for a public system. However, a number of major American corporations currently interested in the Office of the Future concept may develop and market prototype systems fairly soon. Mr. Turoff feels that the advantage of a computer conferencing system is that it can be tailored to the needs of particular groups, creating a number of smaller, dissimilar but more specialized systems.

## OTHER PROJECTS

Rozanne Hiltz, Upsalla College, replicated a series of classic small group communications experiments using EIES as a substitute for face to face communications. She used Bales Interaction Process Analysis to measure the types and phases of interaction behavior in 12 task-oriented groups having to solve a standardized set of problems with no single correct answer. Ms. Hiltz found that the computer system permitted a more idiosyncratic behavior by group members.

Apparently the system reduces group pressure for conformity by individual members. For example, in a face-to-face problem-solving situation, a five-to-one split on the decision to take is very rare. Using EIES, five-to-one splits occured much more frequently, with dissident members conserving their point-of-view. Mr. Turoff remarked that the reaction of people and the procedures they adopted when using computer conferencing systems, has not yet been sufficiently examined to be able to draw clear conclusions about the effects of this type of system on people and what functions they wish to incorporate into these systems.

## FUTURE ACTIVITIES

Murray Turoff expected to develop more fully the text-editing sub-system of EIES, and to refine the user interface for easier access to different sub-systems. A tree search is then initiated to allow the users to reach the particular function desired. This search procedure is illustrated in the "User's Guide for Electronic Information Exchange System."

Mr. Turoff hopes to expand the use of the system to further NSF-funded groups and then to distributed working groups generally.

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# MAILBOX

I.P. Sharp Associates Limited

Toronto, Ontario

September 28, 1977

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MAILBOX is a computer-based message system for A.P.L. users offered over I.P. Sharp's packet switched network. This system was designed for simplicity of use. MAILBOX has an estimated 1,000 users distributed worldwide.

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I.P. Sharp Associates (IPS) is a company offering computing services to organizations throughout the world. Its MAILBOX service is a computer-based message system for A.P.L. users which was created in 1970 to solve internal communication problems brought about by the geographic dispersion of IPS branch offices. For example, IPS had 34 offices in 12 different countries on three continents. Moreover, it had only 250 employees in total, 100 of whom were situated in Toronto. The offices of IPS in Toronto, Ontario and Sidney, Australia, where working days do not overlap at all, would find communications difficult without the MAILBOX service. In addition, the cost of maintaining regular contacts by telephone, at these distances, would be very expensive.

The MAILBOX service was made commercially available by the company to facilitate communications between IPS and its customers, and as an internal service offering to other geographically-distributed companies using I.P. Sharp's services.

The headquarters of I.P. Sharp Associates Limited are in Toronto. The company has branch offices in Canada, the United States, Holland, England, Belgium, Denmark, Germany, Sweden, Switzerland, Puerto Rico, Mexico, and Australia.

About 1,000 people use MAILBOX. In addition to the 250 employees of IPS, there are approximately 750 users of the service in other organizations.

Each company receiving MAILBOX services is given a code number. Those users with code 0 (IPS staff) can communicate with all users. Other users can only communicate with users having the same code as they have or those users with code 0. No MAILBOX code directories or lists of user names are published. Subscribing companies are not able to contact each other through this service. IPS cannot offer inter-company message transmission services in Canada because it is not a common carrier.

IPS created its own packet switched network in September, 1977, using 46 micro-computer-based nodes, two host computers located in Toronto and Rochester, and leased data lines.

IPS has also installed nodes in cities where it does not have a branch office. It will increase its present network to 70 nodes, and hopes to have the necessary technology ready to support 1,000 nodes within the next two years. The network has built-in fault diagnosis. Response time is fast, usually less than one second.

The computer language used throughout the system is APL. Users can write their own programs, a practice which is generally thought to be advisable for a specific task.

Service Features

"Messages may be classified by the sender as URGENT, REGISTERED, CONFIDENTIAL or PERSONAL, and they may also be carbon copied to other individuals or groups.

"The MAILBOX contains a text editor so that the originator of a message may make changes to the text, to correct typing errors or perhaps rephrase certain sections. The text editor also allows for the message to be reformatted if it is to be printed by the recipient in the form of a document or formatted report.

"A message remains in the system until all its designated recipients have accepted it. A recipient of a message is aware of the identity of all other recipients and, if he feels that it should be brought to the attention of others not in the original distribution list, then he may forward it without the necessity of retyping it.

"A user of the MAILBOX has the ability to enquire about the status of messages. He may ask about the number of messages which are awaiting him, their classification, and also the disposition of

messages which he has previously sent. He may ascertain the MAILBOX codes of other users, the identity of a user with a particular code, the composition of a group and the groups to which any individual belongs." (From IPS brochure.)

Other capabilities of the MAILBOX system include sending "blind" multiple messages (people receiving the message are not aware of the other recipients) and a "link" ability (two or more people, if logged on, can send information to each other in real time). A "help" function enables the user to choose from a set of options if he becomes stuck in the message process.

Security:

The "log-on" procedure is simple and secure: The user has an access code and a password which may be changed when desired. Within the MAILBOX service, certain mistakes are tolerated, but if a user tries to access somebody else's MAILBOX the session is aborted. Security aspects are very important for IPS, as their customers, usually large multinational companies, use IPS computing power and storage for sensitive information (e.g. their financial plans).

Usage:

The staff of IPS are the heaviest users of MAILBOX. They receive, in general, 10 messages per person, per day. The received messages are not stored in the computer's memory although the user has this option. A complex or simple filing and retrieval system can be constructed by the user to store his messages. The need for such a filing system has not yet been sufficiently demonstrated to cause IPS to standardize one.

Between 20 and 30 special interest groups subscribe to the MAILBOX service. The people in these groups can only send messages to each other. I.P. Sharp's biggest client in the United States for this service is Xerox. In Canada, Massey Ferguson, and the Canadian Government are the heaviest users.

Funding

The development costs associated with a MAILBOX program were estimated as approximately two man-months work by internal staff, the equivalent of two months salary of a qualified computer programmer.

There are no specific charges for the use of MAILBOX as such. IPS revenues are obtained from the use of the computer system. Specific amounts are charged per connect hour, per character transmitted, and per CPU unit.

Ian Sharp calculated the cost of an average size message - between 5 and 10 lines - to be about 60 cents to send and 60 cents to receive. If users add additional features for formatting, filing and retrieving the message or add fancy "headers" to the message, or tabulate data, costs are higher.

Evaluation

The MAILBOX service itself offers a simple and rapid means of communication to members of a group, and is especially valuable if the group is geographically distributed. Although the service is relatively expensive, the timeliness of the message and its reliable delivery are often worth the expense. The cost of such a service to a company is not extreme. However, the outlay in computer terminals and transmission costs can be considerable, and the lack of availability of terminals can inhibit use of the service.

The absence of typing skills does not seem to be a barrier to using MAILBOX except in one application, the "link" feature. The message one person types is seen by the recipient of the message as it is being typed. Exchanges occur, and mistakes in them lead to incorrect communications. In general, people do not use built-in redundancy structures while typing as they do while talking. One solution would be to use a voice recognition device which transfers speech into a printed message. Unfortunately, these devices are not yet perfected and are still very expensive.

In a sense, MAILBOX can be considered a passive service: if you do not log in to the system, you do not receive your messages. This may be considered a disadvantage as the user must exert himself and learn new procedures to receive the service. This is in contrast to other forms of communication such as regular mail and telephone calls where the message is delivered to the receiver. However, a distinct advantage is the ability to schedule precise times to deal with correspondence regardless of normal mail collection hours or a secretary's routine.

## Limiting Factors

MAILBOX cannot be offered to customers outside North America at present time due to certain restrictions imposed by Teleglobe Canada and the National PTT (Post, Telephone, Telegraph) organizations in Europe. IPS is not restricted from using MAILBOX in countries outside North America for its own internal communication purposes.

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# ONTYME

TYMNET, Cupertino, California.

November 11, 1977

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ONTYME is a commercial message store-and-forward service that is also available in-house to some 500 employees of Tymshare Inc., an international computer service company.

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Tymshare, Inc, was founded in 1966 to become an international computer service corporation. Since 1971, its TYMNET network has provided communications for the delivery of Tymshare remote computing services. Shared use of TYMNET began in 1972, and in 1976, a subsidiary of Tymshare - Tymnet, Inc.-received F.C.C. approval to operate TYMNET as a common carrier facility providing value-added network* services to the public.

Tymnet reaches about half the population of the U.S. and leases about 100,000 miles of line up to 9600 BAUD. Since August, 1977, Tymnet has been offering Ontyme, a message store-and-forward service which is directed at the Telex and TWX market.

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* "A value-added network utilizes the existing common carrier network for data transmission while providing the additional services of interfacing the users' computers and terminals, routing messages to their destination while guaranteeing their integrity, and allowing small users to take advantage of the economies of scale inherent in large communications systems by pooling their demands for service. Thus, a customer need only connect his/her computers or terminals to a value-added network in order to gain instant access to other computers and terminals throughout the nation (and through interconnections to other parts of the world) with no required communications development of his/her own part." (M. Abrams, R. P. Blank, and I. W. Cotton, Computer Networks: A Tutorial. New York: IEEE, 1974, p. 1-1).

Two versions of OnTyme are being developed. One is an in-house system that started running on a Honeywell 636 computer in August 1977. It filled the gap until a version based on the PDP 10 computer was completed. The PDP 10 is generally available within Tymshare Corporation and the system will function as a large scale intercompany switch.

Some of the main features of OnTyme are:

- The assignment of a master message number to each message for overall control purposes.
- Notation of time and date on each message sent and received.
- Ability to send to multiple users and predefined groups of users.
- The assignment of output sequence numbers for user control purposes.
- On-line storage of recent messages for immediate retrieval.
- Archival copies of messages on tape for longer term retention needs.
- Provision of traffic analysis data to facilitate control of usage and cost.

The message switching system OnTyme is offered by TYMNET both as a public message switching service and as an in-house switching system.

The in-house version of OnTyme offers some additional features:

- Tailoring to meet the unique requirement of each customer.
- Support of a wide variety of communications facilities.
- Interface to other computer systems.
- Along with switching, simultaneous execution of user written programs.
- Backup by the public message switching service.

There are 40,000 sessions per day on the network involving more than 2,500 ports. The average session duration is 25 minutes. The network contains over 260 nodes and handles over 300 million characters per day.

There are 4 network supervisiors (a supervisor is a program on an INTERDATA 7/32). Only one supervisor is active at a time. If it goes down, another one takes control.

The network supervisor handles all logins (i.e. verifying user names and passwords, and building paths) and maintains network control. When a link goes out or a host or node goes down, the operators at the network control center are informed by the supervisor within seconds.

Organizations such as government agencies, hospitals, university service bureaus, manufacturing companies and oil companies use TYMNET for applications such as time-sharing, order entry, accounting and statistics, access to data bases, CAI, text editing and message switching.

Messages that are not delivered are kept for three days in the account of the person to whom they are addressed, and then sent to a central mail room where they will stay for a further three days. They will stay another 90 days in storage before they are thrown out. The function of the mail room is to provide a central point, where companies can verify that their transmissions are being received and processed.

Tymshare Internal Use of Message Store and Forward

Of the more than 1600 employees of Tymshare, approximately 500 are presently affected by the internal use of the computer-based message system.

The average user apparently picks up his mail at least once a day. Typical message length is from 250 to 600 characters.

FUNDING AND COSTS

Tymshare's revenue in 1976 was in excess of $80 million and was expected to be in excess of $100 million in 1978.

The charges for OnTyme public message switching service are based upon a number of variables:

- Monthly service charge of $100/customer.
- Length of time terminals are connected, which depends on the type of access location (high density, low density, foreign exchange, or WATS) and the operating speed of the terminal selected by the user (110-300 Baud or 1200 Baud). These changes range from $0.04 to $0.25 per minute with a minimum connect time per connection ranging from 2.5 minutes to 1 minute.
- Number of characters transmitted ($0.12 per thousand characters at 110-300 Baud and $0.05 per thousand characters at 1200 Baud).
- Number of messages sent ($0.05 per message sent).
- Amount of user file storage ($0.03 per thousand characters per day).

With these rates, the cost for a typical message (500-1000 characters) range from $0.20 to $0.80, and can be expected to average $0.30 to $0.40. The costs depend on the amount of editing being done and the typing speed of the user. The whole tariff structure is continually being revised.

The cost of the in-house version of OnTyme varies depending upon hardware configuration and the degree of customization. Small single processor systems with normal tailoring can be expected to cost about $150,000; large redundant systems with extensive tailoring can be expected to range up to about $300,000.

EVALUATION

If there is sufficient volume on a private system, it would appear to be less expensive than OnTyme. The changeover appears to be at roughly 2,000 messages per month.

Buffer terminals are likely to be used for message preparation to reduce communications costs, primarily because typing speeds are much slower than the speeds in which the terminals are normally capable of operating. Looking ahead a little bit it would appear to be possible to support about 1,500 users on a total of 6 PDP 10's on-line at the same time. If the ratio of inactive to active users were 20 to 1, a total user population of 30,000 could be served. This is still a long way from a system capable of serving the millions of users of communications in the offices of the future.

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# TELEMAIL

(Telenet Message Services)

TELENET COMMUNICATIONS CORPORATION (TCC)

Washington, D.C., U.S.A.

October 14, 1977

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Telemail is a computer-based message service intended for mass market business applications as well as for computer users.

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The Telenet Communications Corporation (TCC) is considered to be a common carrier by the FCC. It was established on April 16, 1974 to acquire and operate communications facilities for the purpose of providing a public packet-switched data communications service throughout the United States. The service was introduced August 16, 1975 among seven cities. It has since expanded to include more that 150 customer host computers located throughout the USA (1). It provides local access in 80 US cities and there are two TIPS in Hawaii. It also provides service in Canada and is accessed from outside North America.

TELEMAIL - Telenet Message Service

An early TCC interest was the provision of a computer-based message service, but regulatory decisions left it unclear as to whether the corporation had the authority to offer one. In an effort to resolve the uncertainty, TCC, in August 1977, filed an application with the FCC which asked for authorization to provide two specific services:

- Direct terminal-to-terminal communications in real-time, with conversion of codes and transmission speed if necessary. (The right of conversion was essential, because, while the network does not distinguish between terminals and computers, the company's authorization to conduct business does.)

- Terminal-to-computer-to-terminal communications, interactive store-and-forward service which would provide delayed delivery of a customer message.

Temporary authority was subsequently granted.

The new message service, TELEMAIL, was to be initially available only in the USA, but could eventually be extended into Canada.

While the impetus for the development of the service lay to some extent with demand for message service from many of TCC's 150 customers, most of whom have private computers, the system has been designed for the mass market, not just computer users. It has been kept simple in its operation.

It is recognized, however, that one of the major deterrents to the widespread introduction of computer-based message service it that computer terminals aren't widely available yet in the business community. And at present, with their cost ranging anywhere from about $1,000 to about $2,000, an office manager would find it difficult to justify such an expenditure just to accomodate a message service. Only when costs come down, and computer terminals are as ubiquitous as the typewriter, can the service be expected to expand.

Experience suggests that about 80 per cent of messages on the service will be intracompany. If there are more than a few hundred users on a computer-based system, a potential problem has been identified: Wrong addresses will replace wrong numbers, but on a more serious level. Wrong telephones numbers are immediately identified because of the direct response at the other end. But with a computer-based message system, the sender often gets no confirmation that the address reached is the one desired.

System Capabilities

TCC has designed an advanced nationwide packet-switching network which includes seven major switching centres and 74 secondary central offices that serve as concentration and network access points. These offices are linked by tens-of-thousands of miles of high-speed digital and analog communication lines leased primarily from AT&T. They provide a variety of completely independent access ports including those for public dial telephone, private dial telephone, private dial TWX, and leased lines, both asynchronous and synchronous.

The network is capable of supporting a wide variety of computers and terminal devices. The use of speed and code conversion and proprietary software interfaces permits otherwise incompatible devices to communicate with one another. Powerful error-control software provides essentially error-free communications, and computer-based switching techniques establish connection between any two communicating devices within a fraction of a second.

TCC is involved with other organizations in providing this message service to its customers. For example, it has leased 10 per cent of one of the Bolt, Beranek and Newman (BBN) Tenex computers at a cost of $5,000 a month; worked with Bell Canada on the interconnection of the Telenet and Datapac networks, and is interconnected with the TWX network. Although there is no contact between TCC and AT&T, these two companies have common interests which results in on-going contact and consultations. Between 30 and 35 per cent of Telenet expenditures are with AT&T.

An In-House Message Service

With more than 100 employees in 12 locations, Telenet uses several computer-based message services for internal management purposes. All are based on a Digital Equipment Corporation PDP 10X computer at BBN in Boston, and are compatible in the sense that any messages can be sent from any system and read in any other.

Among the systems included are: Tenex and Hermes from BBN; MSG from USC-ISI Stanford Research Institute (SRI); EIES from the New Jersey Institute of Technology and the message systems of Computer Corporation of America (CCA) and Scientific Time Sharing (STS).

Many staff members at TCC worked on the ARPA network and are familiar with message service. This, coupled with the enthusiasm of Larry Roberts, the main proponent of message service at both ARPA and TCC, may account for the fact that TCC has more terminals than employees.

The number of messages generated each day is about 200, which averages out to between one and two per employee. In fact, about one-half the employees are active users, and this includes the 30-odd people who work on the eighth floor of the downtown Washington headquarters. They use message service to communicate among themselves.

The average cost of a message is roughly 65 cents, not including terminal rental or communications costs, but only processing time.

BBN systematically collects statistical data on the message traffic.

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Educational Research Services

University of Alberta, Edmonton

November 9, 1977

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The Division of Educational Research Services has operated an active computer-aided-learning centre since 1968.

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The main activity of Dr. Hunka's group is the dissemination and preparation of educational material by way of computer-aided learning systems (CAL). This activity began in 1968 with the rental of an IBM 1500 system. IBM intends to phase out its support of the 1500 by 1980, which is causing a substantial problem for the project. Other IBM 1500 systems are used for CAL at the Rochester Institute of Technology (New York) and Sherbreek-Sherfield (Connecticut).

The main component of the IBM 1500 system is the IBM 1130 computer. The system does not have remote capabilities at present because of the large bandwidth requirements for the channels between the computer and each terminal. There are 22 terminals in one room of the education building. Each IBM 1500 CAL terminal is equipped with an image projector, CRT display, keyboard, and an audio play/record unit.

The system was in use for a total of 26,000 student terminal contact hours in the last year. The down time was less than 1 per cent. The hours of operation are from Monday through Saturday, 8 am to 10 pm (14 hours / day) plus Sunday afternoon. On Saturdays and Sundays student operators are used.

The approach to CAL in this group is to design self-contained educational packages. The professor interacts with students only if the material in the package is not understood, or if further explanations are desired. This contrasts with the convential approach of giving a lecture and using the system for practice runs only.

The courses currently available and their average student time to completion are:

| | | |
|---|---|---|
| 1. | Statistics | 80 hours |
| 2. | Electrical Theory | 75 " |
| 3. | Mathematics | 25 " |

| | | |
|---|---|---|
| 4. | Cardiology | 30 hours |
| 5. | Patient Simulation | 30 " |
| 6. | Data Processing Fundamentals | 25 " |
| 7. | CARE (Education course for training handicapped developed by Pennsylvania State) | 40 " |
| 8. | Coursewriter Authoring Language | 20 " |
| 9. | French - High School | 20 " |

Other courses of shorter duration (6 to 12 hours) include: Children Education; Anesthesiology; Pharmacology, Educational Finance, Macroeconomic Theory and Tools; Introduction to Computer Science; APL Microbiology, and Nursing (immunization instruction for midwifes in the North). Further courses are planned if the IBM 1500 is still in service.

The system is also used by the Royal College of Physicians and Surgeons for examinations (30 hours of special examinations, in French and English); continuing medical education; quizzes for self-evaluation, and patient simulation. Eventually, PLATO terminals will be purchased for this application.

The terminal load during weekdays is variable, possibly because students have to combine CAL periods with regular courses. During weekends, the terminals are uniformly busy. Some people live 30 or 40 miles out of town and find it easier to commute during the weekend in order to spend longer hours with the CAL system. All the CAL courses (except the RCPS examinations) are available to everyone, although students must register to take a course for credit.

It used to require 200 hours of preparation time to develop one hour of courseware. Now, the time involved in authoring a document has been reduced by the use of more efficient software. In the Cardiology course, for example, the average production time is around 30 hours. Typically, these 30 hours of preparation are distributed as follows: an hour or two of initial author time; three to four hours of author-programmer interaction to make sure that the program does what the author wants it to do; and twenty hours of program corrections and changes in real-time.

The document preparation procedure is: system software capabilities are outlined so that an author acquires an understanding of the system potential; specific requirements relating to course content, including students' characteristics, are established; a programmer converts these requirements to a computer-executable form. The whole process is not difficult, but is much more time-consuming than regular course preparation. The staff consists of two systems analysts, one programmer, and three operators.

## FUNDING

The project is funded by the University of Alberta. Currently the IBM 1500 rents for $12,000 per month. Over the past nine years, the average cost per month has been $10,000. The salaries for five staff members averges $5,000 per month plus the cost of supplies (audio tapes, disks, etc.). A proposal was made for a complete Computer-Assisted Instruction Facility necessitating a grant of $600 thousand for 200 terminals serving urban and rural areas over a period of 5 years. This project has not been approved yet.*

*S. Hunka and E.W. Romaniuk, "A Research and Development Proposal for the Establishement of a Computer-Assisted Instruction Facility" submitted to the Ministry of State for Science and Technology by the Division of Educational Research Services, Faculty of Education, The University of Alberta, Edmonton, Alberta, June, 1974.

EVALUATION

One of the most successful courses is Cardiology, which is used in several other institutions including the CAL system of Heidleberg University. Cardiology is a high-cost course to teach ($1,500 to $1,800 per course), with low student volume, so the CAL course saves the university money. As well, it appears that after taking the Cardiology CAL course, a student's performance is as good as, or better than, those of students trained by more conventional means.

Some advantages of a CAL system are that the students work at their own pace and that good teachers create a permanent record of their instructional logic. However, the introduction of CAL displaces professors from their conventional role, and this creates tension.

In high-enrolment CAL courses at the University of Alberta students have to double up on the 22 available terminals except for exams. The advantages of using CAL do not seem to decrease in these cases, but the average duration of the course for each student increases by about 15 per cent.

FUTURE PLANS

The main thrust of Dr. Hunka's efforts to find a successor to the 1500 system involves obtaining microprocessors (three have been ordered: MICRO, PET, and Radio Shack) and to try to develop more intelligent terminals with voice recognition capabilities that would be able to process the course material locally with occasional interaction with the central computer.

He is also attempting to acquire PDP-11 mini-computers to take the place of the central computer. He has applied to the Mutta Foundation for a $14,000 grant to buy a PDP 11 from Bell Canada. In his view this would be preferable to most of the other alternatives available to him, but it may require a greater amount of computer software development

than is presently possible within the limited resources of the Educational Research Service. Two people are currently working on the translation of the courseware from the IBM 1500 to a UNIX system which permits the operation of up to three different CAL languages simultaneously.

The Computer Centre of the University of Alberta is also exploring the possibility of using the PLATO System. While this system is extremely sophisticated, it also has the disadvantage of needing a great deal of extended core (ECS) to set up a lesson. The PLATO terminals are also quite expensive - about $10,000 each.

The Centre wishes to acquire terminals that could be connected to telephone lines to provide computer services to nearby schools. Eventually terminals for home use could be borrowed from local libraries.

A discussion of the issues to be resolved in order to deliver the kinds of courses that are presently on the computer system to people's homes included the following points:

1. A terminal unit of some type would be needed in the home, to handle graphics and textual material (e.g., the pictures used in the French course could be replaced by cartoons).

2. The home TV set is not precise enough for color illustrations and so could not be used to take the place of the still picture projection system that is used in the current terminals. The resolution of the TV set is insufficient for images such as X-rays and medical pictures.

3. The audio section of the course would have to be delivered in synchrony with the images to each individual home.

4. A keyboard would be required to interact with the system.

All of these problems can be solved technically, and eventually this type of service could be offered either via cable or via telephone lines, as video does not seem to be a prerequisite. The need for still images could be met in other ways. The cost of this type of service will probably remain high in the near future.

Vice-présidence aux Communications

University of Quebec

Ste. Foy, Quebec

August 24, 1977

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The University of Quebec is an institution with constituent units and affiliated research organizations distributed throughout the province. To ensure it has the communications links demanded by its particular structure, the University has created a multi-purpose telecommunications network (data, audio and video teleconferencing, and computer-aided learning). It recently installed the "PLATO" system to support its tele-teaching activities.

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The University of Quebec was founded in 1969 as the first public university in the province. This institution functions as a distributed university with campuses throughout Quebec. A number of research organizations and specialized schools are affiliated with the University: l'Ecole Nationale d'Administration Publique, l'Institut National de la Recherche Scientifique, l'Ecole de Technologie Supérieure, la Télé-université, and l'Institut Armand Frappier. To keep vital links operational between the University campuses and affiliated organizations, communications networks at many different levels (data, audio, video) have been gradually implemented since 1970. The University has also recently installed the PLATO system as a support for its tele-education program.

The University of Quebec uses mainly internal funds to install and maintain its communications systems. A department of the University, la Vice-présidence aux Communications, has the responsibility to plan the shared communications systems of the university.

The University of Quebec sees itself as a "development agent" within Quebec society, providing university education and research activities for the greatest possible number of Quebec citizens. In this context, communications play an essential role and the creation of a multi-purpose distributed network for the university community is a primary goal. The University considers this communication network a shared resource which permits decentralized teaching, research and administration as well as functional communications among its component organizations.

The shared communications services are at the disposal of University departments and affiliated organizations for internal use only.

The University of Quebec has major campuses in Montreal, Quebec City, Chicoutimi, Trois-Rivières and Rimouski, and two centers of higher learning in Hull and Rouyn. In addition to providing links

between these sites, the University's telecommunications system connects the many research centers of l'Institut National de la Recherche Scientifique which are scattered throughout the province, and the Institut Armand Frappier, the Ecole de Technologie Supérieure and the Ecole Nationale d'Administration Publique.

Given the particular communication problems facing such a large university community dispersed over a vast territory, a number of technological innovations had to be implemented in the telecommunications networks. In this sense, the University has undertaken technology trials as well as service trials.

The staff of la Vice-présidence aux Communications travelled widely in Canada, the United States and Europe to evaluate existing telecommunications services and their relevance and applicability to the University's communications problems. They were particularly interested in audio and video conferencing systems and computer-based education and information systems.

The audio conferencing system which was ultimately introduced uses Centrex lines and broadband links leased from Bell Canada.

As new communications services are implemented, the University renegotiates its contracts with Bell to provide for additional transmission capacity.

The services introduced to date include:

Audio conferencing system - 1970
CCRI (computing network) - May 1971
BADADUQ (tele-documentation network) - 1975
Plato (initial phases) - May 1976
TACO (Processing of acquisitions and cataloging by computer - 1976
Video conferencing system - September 1977

The telecommunications networks are operational 24 hours a day except for the video-conferencing facility.

Audio Conferencing

The audio teleconferencing facility permits direct dialing among the local telephone exchanges on the various campuses. The operator sets up the conference by dialing the telephone numbers of the participants over the University's Centrex lines. Each telephone line is tied into a conference circuit by pushing an appropriate button on a console.

It takes about 10 minutes to set up the teleconference circuits. The first console Bell Canada built for the audio system could link seven sites at one time for one conference only. The second console, built by Pylon for Bell Canada, can connect up to 16 sites, and the number of simultaneous teleconferences has been increased to five.

The following statistics taken from "Télé-conférences à l'Université du Québec":* shows the use that has been made of the audio conferencing.

| | 1972-73 (4 months) | 1973-74 | 1974-75 | 1975-76 | 1976-77 |
|---|---|---|---|---|---|
| Number of teleconferences per month | 13 | 16.3 | 15 | 15.6 | 29.3 |
| Average length of a conference | 1h11m | 1h23m | 1h22m | 1h18m | 1h7m |
| Average number of sites per teleconference | 4.4 | 4 | 3.8 | 4.4 | 5.3 |
| Average number of persons per teleconference | 6.5 | 6.4 | 7.3 | 6.2 | 7 |
| Average number of persons per site | 1.5 | 1.6 | 1.9 | 1.6 | 1.3 |

*See References

Two studies* of the system's use indicate that, in general, users feel that the teleconferences are shorter, more formal, more tiring and more direct than face-to-face meetings. Teleconferences also seem to generate their own style of meeting, and parallels between teleconferences and face-to-face meetings become more difficult to establish as people use the new medium more frequently.

Two distinct types of teleconferences have emerged at the University of Quebec: télé-réunion (tele-meeting) and télé-travail (tele-work). Télé-réunion refers to urgent or regularly scheduled meetings. Télé-travail refers to consultation and co-ordination activities. At first télé-réunions were much more prevalent. Now there are as many, if not more, télé-travail conferences.

The audio conferencing system is currently being used almost to its maximum capacity. If the University wished to make this service available to other members of the University community, additional dedicated telephone lines would have to be added to the University private wire network.

The average cost of a one hour teleconference linking the seven main points in the networks was calculated at $93.76 in 1975.

The two audio teleconference consoles are leased from Bell Canada for $750.00/month. This figure does not include the lease of the Centrex lines.

Video Teleconferencing

The video teleconferencing system went into operation in the fall of 1977, with courses initially scheduled for an average of 25 hours per week between Montreal, Chicoutimi, Trois-Rivières and Quebec City.

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*See References

The University of Quebec is now providing video conferencing rooms on each of its main campuses. This service will be used for teaching, administrative meetings and tele-work's consulting and information exchange activities. The audio is always two-way, while the video is one-way or two-way, depending on requirements.

The teleconferencing room has been designed to be as similar to a classroom as possible so that professors and students will feel at ease. The use of fluorescent light diffused by grids below the light fixtures provides a natural light, and the air conditioning system is almost noise-free.

A large screen monitor and nine small 9" monitors positioned near the students' seats receive the images from the distant site. The large screen was thought to be necessary because it tends to create a greater impact on viewers and holds their attention. Two cameras are placed on either side of the large screen monitor so that the participants in the different rooms feel they are looking at each other directly. A third camera is placed at the back of the room to view the professor at his desk and the blackboard behind him. One of the two cameras associated with the large screen monitor is placed so as to be able to transmit color slides or vu-graphs projected on the surface of the professor's desk. All three cameras are remotely controlled by a control room technician. Images are transmitted in colour over the large screen monitor and on the small monitors next to each student.

A video-disk system provides back-up images over the student monitors for special teaching applications. These smaller monitors form an independant sub-system and different visual information may be shown on this system and the large screen monitor simultaneously. The audio signals are captured by multi-microphones, filtered and mixed through a sophisticated audio console. A 2 wire/4 wire interface, made according to the University's specifications, allows the audio system to be connected to the University's Centrex lines. The video

conferencing room is partially automated to give the professor remote control of the projection of film, video slides, foils and graphs.

The University of Quebec leases back-up microwave links from Bell Canada for this service. The University submits a schedule for the video tele-teaching planned for each semester and telecommunications resources are allocated in accordance with this schedule. The microwave links may not always be available to the University as Bell Canada reserves the right to use them in emergencies. However, the tariff for this service is well below what the University would be charged if it leased equivalent microwave links on a full-time basis. The University's system ties into the Bell Canada teleconferencing network which gives it very great flexibility in covering the territory served by the constituent units of the University.

PLATO

The University of Quebec signed a five year contract in May 1976 with Control Data. This contract allows the University to experiment with PLATO (PLATON in French), a computer-based communication and education system with audio-visual peripheral equipment.

PLATO allows a student to acquire knowledge at his own rate of learning. It is perhaps the most sophisticated and comprehensive computer-mediated instruction system now available. A number of software and hardware innovations, such as a touch-sensitive plasma panel, has made it a multi-purpose education system that both children and adults can easily use*.

PLATO has a message and computer conferencing sub-system which is being used extensively at the University of Quebec. Up to 32 PLATO terminals can be linked together for information exchange or teleconferencing applications so that each person sees what is typed by

*For further information see references.

the others. Each participant is alloted a horizontal portion of the display screen.

A PLATO central computer, a Control Data Cyber 73-26, was installed in the Centre Commun du Réseau Informatique, the University's main computer center. The Quebec center now serves 50 terminals in several Canadian universities.

The University of Quebec has started a program to adapt PLATO to the needs of the French-speaking world. A glossary of terms, user manuals and translations of user support programs are being produced, and a library of courses in French has been developed. Moves have also been made, with the help of Control Data Belgium and Control Data France, towards establishing on-going co-operation between the Quebec center and the other centers of the French-speaking world.

Costs of Operation

The purchasing and operating costs of PLATO terminals have steadily declined since 1976. The cost of a terminal has dropped from $12,000 to $6,700 and the operating cost from $128 to $49 per month. In some cases, one telephone line may be used for as many as 16 terminals because of "smart" statistical multiplexing.

BADADUQ (Banque de Données à Accès Direct de l'U.Q.)

BADADUQ is a bibliographic search and retrieval system of the University of Quebec which contains about 350,000 records. The University also subscribes to the CAN/SDI, COM/OLE, MEDLINE, SDC and Lockheed data bases as well as to MARC, the National Library of Canada bibliographic system.

Omnibus Network

In July 1976, the University of Quebec and the Quebec Ministry of Communications signed an agreement authorizing the University to set up a project called the Omnibus Network as part of the Hermes (or CTS) program. A joint Canada-U.S. experimental program was carried out for two years on the Hermes Satellite.

Objective of the Omnibus Network project was to establish a multi-directional and multi-purpose network to provide rapid communication services between the constituents and organizations affiliated to the university, irrespective of their location within the province. Four principal activities were defined: tele-documentation, tele-teaching, teleconferencing and data communications.

Between July 1976 and February 1977, the University implemented 12 projects using approximately 300 satellite hours.

GUISE (Groupe d'Utilisation Intensive du Satellite en Éducation)

The University of Quebec, at the invitation of the Quebec Ministry of Communications participated in an extensive series of video teleconferences between Quebec and France, using the Franco-German satellite, "Symphonie".

Evaluation*

The University of Quebec began holding audio tele-conferences over "speakerphones", a type of loudspeaker telephone then available from Bell Canada. All tele-conferences were booked with Bell Canada's conference service and used their switched telephone network. University staff felt that this situation had several disadvantages:

- The speakerphones used were apparently not adapted to group discussions. The microphone was not sensitive enough and the loudspeaker not powerful enough for clear audio communications. The University of Quebec used Bell Canada operators to set up the conference calls, and these were tariffed as if they were a series of inter-city person-to-person calls. The cost of the conference was felt to be excessive expecially as the University already had a private line network.

To remedy this situation, the University asked Bell Canada to supply them with Western Electric 50A conference units, a complete portable plug-in unit designed expressly for group meetings. As well, after a series of meetings with University of Quebec engineers, Bell Canada engineers developed a prototype conferencing console that is still in use. Thanks to these improvements, the main technological problems have been solved and as a result, tele-conferences have multiplied at the University.

In general, the users and administrators of this system are satisfied with the teleconference service. About 90 per cent of the users considered that by using this service they have significantly diminished the number of trips they would have had to take to fulfill their commitments. The administrators felt the same or increased

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*Taken from "Les Téléconférences à l'Université du Québec".

satisfaction with the teleconferencing systems as with face-to-face meetings.

The users of the system also felt that the audio teleconferencing service was well adapted for discussions, allowed more rapid decision-making and information exchange; on the other hand they felt that the system was not suited for establishing new contacts.

One of the most important perceived reasons for user satisfaction is the convenience of the system. Most people are less than five minutes away from a teleconference room; the telephone links can be set up rapidly and the equipment is reliable and easy to use. Intensive use of the system may, however, engender scheduling and communication problems.

The University has set up a procedure for audio teleconferences: the people holding the conference notify the University's telephone operator who sets up the connections and, participants must all be on line before the conference circuits are activated. Many users would prefer to dial-up the conference themselves, saying this would save them time, but the University staff thinks that this would be a mistake because users might dial wrong numbers that could produce malfunctions and wrong connections, which would be frustating for them and for other participants.

In general, the higher a person is placed in the University hierarchy, the greater is the preference for using the audio and video teleconferencing systems. To be sure, audio and video teleconferences do not replace face-to-face meetings. The University of Quebec considers them to be complementary, leading to an improved decision-making process, but at times teleconferences generate even more travelling as people start to work together as a group.

Future Plans

The University of Quebec wishes to improve the audio conferencing system by making it more accessible, by investigating visual support systems to enrich the audio link, and by improving the quality of telephone connections.

The University aims ultimately to establish an integrated and multi-purpose network carrying a variety of signals between all its campuses and its affiliated organizations.

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# STANFORD INSTRUCTIONAL TELEVISION NETWORK (SITN)

Stanford University

Stanford, California

November 14, 1977

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The Stanford Instructional Television Network (SITN) is an interactive educational system with one-way video and two-way audio. It is currently operational 12 hours a day on four channels and serves hundreds of professional engineers, managers, and staff from about 50 San Francisco Bay Area companies and research institutions.

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Although it wasn't realized at the time, the first step towards the establishment of Stanford University's Instructional Television Network (SITN) was taken in 1950 when Dr. Frederick E. Terman, author of "Radio Engineering" went to teach there. He was instrumental in obtaining the University's agreement to the admission of part-time students. In 1953, he founded the Honors Cooperative Program (HCP), a daytime graduate program for part-time students already employed as engineers and scientists in industry. Fee assistance is provided by the students' employers.

While attending classes with regular graduate students ensured that the part-time student was getting the best instruction Stanford had to offer, it also had disadvantages. For one thing, the workday was interrupted, not only by class time, but by transportation time. One large company reported that the amount of time lost annually because of driving and parking was equal to $2\frac{1}{2}$ man-years of engineering time. This problem made it difficult to attend even one course per term, let alone two, unless they were consecutive. Some potential students were unable to study at Stanford because it was too far from where they worked.

In an effort to overcome these disadvantages in their part-time program, Stanford examined the use made of closed-circuit television at several other universities, notably the University of Florida which connects its main campus with a number of remote classrooms. In 1967 Stanford initiated a feasibility study to consider linking its classrooms with remote classrooms in some 20 to 30 organizations which had employees in the part-time graduate program. It was proposed that employers assist with the capital cost of the facilities. The incremental cost of operating the system was expected to represent only about a 25 per cent increase in the existing fees.

The Stanford Instructional Television Network (SITN) was built in 1968-69 on a shared cost arrangement with industry. It is now used for

live instruction 160 hours a week, and in addition, carries continuing education short courses on videotape.

In order to have flexibility and growth potential, Stanford selected microwave transmission for reaching its remote students. The Federal Communications Commission (FCC) assigned it four Instructional Television Fixed Service (ITFS) channels.

At the University end of the Network there are four classrooms equipped with television cameras. Two rooms have two cameras--over the instructor's desk and at the rear of the room. Two newer rooms have an additional overview camera at the front. Each camera has remote-controlled tilt-pan-zoom capabilities.

Television monitors placed between each two students are equipped with microphones having a push-to-talk switch. A classroom student's voice on-mike is heard throughout the network.

Associated with each classroom is a monitoring room that can be used for overflow from large classes, for seminars and small classes, or for closed-circuit television lectures.

Each televised class has a production staff consisting of one student operator who is responsible for the camera controls, switching, audio control and the talk-back system. A licenced engineer in the master control room supervises the student operators.

A 260-seat auditorium has been outfitted for televising or receiving large seminars, guest speakers, and special events. It has two overview cameras and one desk camera, an 8X10-foot television projector, a movie projector, an equalized sound system and a microphone at every second seat.

Television signals from the classrooms are carried by coaxial cable to the master control room where they pass through a master switcher which can connect any room to any other room and to any transmission channel. The signals are relayed on a microwave link from the master switcher to a transmitter about seven miles from the campus. There they are converted to the ITFS band for transmission over the Bay area.

At the receiving locations, the ITFS signals are converted to the standard VHF frequencies through a special down converter. Cable video distribuiton is used for routing the signals within the remote location.

Participating organizations furnish their own classrooms. Most have outfitted at least four so that four courses may be received simultaneously. Each remote facility is equipped with a talk-back FM transmitter which permits students in these locations to communicate with everyone in their class, whether on or off the campus. The transmitter can be switched to any of the four channels, although a single transmitter can operate on only one frequency at a time. The transmitters are keyed remotely when a student depresses a microphone switch.

Network member organizations are permitted to make videotapes of the Stanford lectures for use by students to make up missed classes or for course review.

Class notes, homework assignments and examinations are delivered and picked up daily by two Stanford couriers. Because Stanford operates under an honor code, remote students normally take written examinations in their own classrooms.

Funding

Development, design and construction of the Stanford Instructional Television Network cost an initial $625,000 plus $100,000 for subsequent additions.

The operational cost is about $200,000 a year, which includes the salaries of 8.5 full-time people — (a director, assistant director, secretary, two couriers, a chief engineer and two engineers), 30 part-time student operators, video tapes, office supplies, cars and other transportation.

The auditorium, which was designed by an audio/visual architect, cost about $150,000, including $12,000 for the video projector.

Participating organizations assume three financial obligations:

- Initially they contribute a share of the capital cost. Capital payments range from $2,200 for small organizations to $39,600 for the largest. These payments may be lump sum, or spread out over five or 10 years.

- The second obligation is to equip the classrooms receiving the programing. This cost varies, depending upon the availability of space, the number of classrooms and their design. The cost of classroom equipment ranges from approximately $9,000 to $21,000. A receive-only classroom costs about $2,500.

- The third obligation concerns the cost of enrolling students. When they join the Network, organizations become eligible to sign an agreement to participate in the Honors Cooperative Program. Tuition, charged on a per unit basis, does not exceed 1/15th of the total quarterly tuition charge for full-time students. In addition, a matching fee, intended to assist in defraying the cost of educating part-time students, is paid to the academic iepartment in which the

student is registered. A television surcharge, initially set at $20 per unit, is added to the tuition-matching fee to help meet day-to-day network operating expenses.

Organizations which, at the time of the visit to Stanford, were members of the Instruction Television Network were:

Aeronutronic-Ford, Palo Alto, CA
Amdahl Corporation, Sunnyvale, CA
American Micro-Systems, Inc., Santa Clara, CA
Ampex Corporation, Redwood City, CA
Ampex Videofile, Sunnyvale, CA
Argosystems, In.c, Palo Alto, CA
Avantek, Santa Clara, CA
Berry Research Corporation, Sunnyvale, CA
Bechtel Corporation, San Francisco, CA
John A. Blume and Associates, San Francisco, CA
BNR, INC., Palo Alto, CA
Boole and Babbage, Inc., Sunnyvale, CA
CMX Systems, Sunnyvale, CA
ESL, Inc., Sunnyvale, CA
Fairchild Camera & Instrument Corp., Mountain View, CA
Fluor-Utah Engineers & Constructors, San Mateo, CA
Frequency West, Inc., Santa Clara, CA
GTE/Sylvania, Inc., Mountain View, CA
Genesys Systems, Palo Alto, CA
Hewlett Packard, Palo Alto, CA
Hewlett Packard, Cupertino, CA
Hewlett Packard, Santa Clara, CA
Hewlett Packard, Sunnyvale, CA
Hewlett Packard, San Diego, CA
Hewlett Packard, Santa Rosa, CA
Hewlett Packard, Boise, ID
Hydrocomp, Inc., Palo Alto, CA
IBM Corporation, San Jose, CA
IBM Corporation, Los Gatos, CA
IBM Corporation, Palo Alto, CA
Informaiton Terminals Corp., Sunnyvale, CA
ISS, Cupertino, CA
Kennedy Engineers, San Franciso, CA

Lawrence Livermore Laboratory, Livermore, CA
Lockheed Missiles and Space Co., Sunnyvale, CA
Monolithic Memories, Inc., Sunnyvale, CA
NASA/Ames Research Center, Moffett Field, CA
National Semiconductor, Santa Clara, CA
Pacific Gas and Electric Co., San Francisco, CA
Quantic Industries, San Carlos, CA
Rolm Corporation, Cupertino, CA
Sandia Laboratories, Albuquerque, NM
Sandia Laboratories, Livermore, CA
Singer Simulation Products Division, Sunnyvale, CA
Scientific Micro-Systems, Mountain View, CA
Standard Oil Company, San Francisco, CA
Standard Oil Company, Richmond, CA
Stanford Research Institute, Menlo Park, CA
Systems Control, Inc., Palo Alto, CA
Teledyne Microwave, Mountain View, CA
Vidar Corporation, Mountain View, CA
Watkins Johnson Company, Palo Alto, CA
Xerox Palo Alto Research Center, Palo Alto, CA

Both Stanford University and the Association for Continuing Education (ACE) offer courses on SITN. Stanford provides 150 courses a year in engineering sciences, computer science, math, physics and statistics. ACE televises 80 courses in business administration, management development and a variety of general interest subjects. Many of the ACE courses are designed jointly by ACE and the member companies.

Employees of high technology organizations may enrol in Stanford courses in one of three categories:

- Honors Cooperative Program - open to fully matriculated Stanford graduate students. They have the same privileges as other Stanford students, plus the advantage of being able to attend classes on a part-time basis while earning regular salaries in industry. They are encouraged to maintain an average course load of five to six units per quarter. A faculty advisor is assigned to each participating student to assist with program planning and any special problems which may arise.

- Non-Registered Option - is intended for individuals possessing at least a Bachelor's degree who wish to take graduate courses at Stanford, but who are not matriculated Stanford students. This program is available only by television in remote classrooms. The students receive all class materials, do homework and take examinations. They are tested and graded to the same standards as matriculated students, but their marks do not influence those standards.

- Television Auditor - employees of Network member organizations may enrol in any televised Stanford course unless the class size is limited. Handouts are provided. Because auditors are not formally enrolled with the University, they do not hold student registration cards; do not have access to libraries or computer facilities, and do not receive testing and grading services.

There are about 5,000 off-campus enrolments per year including both Stanford and ACE students. Assuming an average of 20 hours per course, there are about 100,000 student-hour of network usage annually.

## Tutored Videotape Instruction (TVI)

In October 1973, Stanford began experimenting with a new method of instruction which makes use of unrehearsed, unedited videotapes of regular classroom courses which can be produced at very low cost. The videotapes are used for the instruction of small groups of students, typically three to 10, who are assisted by paraprofessional tutors as they watch the tape. This gave rise to the name Tutored Videotape Instruction.

Experience over the past three years has shown that TVI is most effective when a small group of students and the tutor watch the tape together, and least effective for a single student, with or without tutor. Also, students learn best which the videotape lecture is stopped frequently, for example, every five to 10 minutes, for periods of three to five minutes. Periods of interaction of such frequency and duration are, of course, impractical in a conventional classroom situation.

The TVI sessions usually run one week behind the live lectures on campus.

## The Use of Satellites

The use of satellites for education has been called the ITFS of the sky. It is predicted that most of the course material presently distributed by videotape will be distributed live via satellite if there are enough receiving locations to make the system cost-effective.

At present, more than 80 per cent of all video-based off-campus instruction in engineering is supplied by members of the Association for Media-Based Continuing Education for Engineers Inc. (AMCEE), of

which Stanford is one. These institutions provide videotapes of live microwave broadcasts of actual classroom activities directly to subscribing corporations.

The National Institute of Education (NIE), has funded six people from AMCEE to make plans for satellite networks and write a proposal for an operational satellite network.

Evaluation

One-way video transmission combined with two-way audio provides a highly effective live classroom situation in which all students can see and hear the professor, and can ask and be asked questions.

The relatively small storage capacity for visual material provided by the picture tube when compared to classroom blackboards can be augmented by the use of handouts.

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# The Spartanburg Consortium

Spartanburg, South Carolina

May 1-3, 1977

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The Spartanburg project was one of three projects funded by the National Science Foundation to study the use of two-way cable for the delivery of social and administrative services. This project was designed to test the acceptability and efficiency of different modes of communication as well as to provide specific adult education courses: high school equivalency, day-care training, and early childhood parenting courses.

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The National Science Foundation decided, in 1974, to fund a series of projects to study the use of two-way cable for the delivery of social and administrative services. The Rand Corporation received grants of about $2 million to design a study for the evaluation of certain service applications including: provision of adult basic education and high school equivalency education; training day care personnel, and establishing inter-institutional communications between sets of government-funded agencies. Funds for implementing this project were then given by N.S.F. to a consortium of organizations which included Rand Corporation, the Spartanburg Technical College; 22 Day Care Centers in Spartanburg; the Department of Social Services of South Carolina; the Council for the Aged of South Carolina, and Telecable of Spartanburg, operated by Telecable Corporation of Norfolk, Virginia.

The project was operational by February, 1976. Its services ended in May, 1977 and the project report was issued by the end of that year.

The project was designed to provide answers which would influence thinking and policy-making on the choice of communication-systems and the types of communication-interactions needed in specific situation. It had three objectives:

- To test two-way technology.
- To develop the software for the support of the service functions.
- To run a marketing test evaluating subscriber reactions to the services offered.

Three key questions emerged as the basis for specific research goals: What was the value/impact of providing: two-way video service; one-way video service with subscriber data responses, and one-way video service with subscriber telephone responses, in comparison with providing a conventional one-way video service?

## THE SYSTEM

### 1) The User Terminal

The user terminal was a small black box about 2 inches by 2 inches by 10 inches which had eight vertical buttons, numbered and lettered, and a ninth button at the end of the row of eight which was called the send button.

The eight buttons were used to send back different data signals. For example, button 1 might mean "I understand"; button 2, "I don't understand"; button 3, "give an example" (etc.). The ninth button had to be pushed to release the data signal punched up on one of the other eight response buttons.

The terminal was designed to have eight buttons so as to be compatible with TouchTone telephones, and with pay TV terminals currently being developed with eight buttons.

The Television Studio

The television studio was on the cable company's premises and was equipped with two black & white Sony ½" cameras; a TV monitor connected to the mini-computer for the retrieval of data; an audio-video mixer, and a blackboard.

A telephone in the television studio was modified so that people could call in and have their voice rebroadcast through the television audio channel to the other listeners for questions and discussion periods.

The Cable System

The cable system was designed as a hubbed single cable plant with 27 downstream channels to the subscriber and 4 return video channels. All forward and return channels are capable of carrying color video without objectional distortion. For this project, Telecable agreed to provide a mini-computer which sent out pulses to all the modems in the participants' or subscribers' homes, polling their responses and processing this information for display. Because of limitations on hardward expenses by NSF, only inexpensive, off the shelf, 1972 technology was used.

Location:

Spartanburg is one of the most important textile centers in the United States. Many foreign textile companies have branch offices and plants in Spartanburg. About 2,500 Swiss and German families with upper and middle management jobs live in this area.

Rand Corporation chose this site for several reasons:

- According to an IBM study, the Spartanburg cable system was one of the five best operational bi-directional cable systems capable of carrying return data signals.
- Certain socio-political conditions in Spartanburg favored the development of service offerings which Rand wished to evaluate. For example, Rand was interested in giving adult education courses over cable, and fully 62 per cent of the Spartanburg population had not finished high school. They also wanted to serve those people working in day care centers who needed to upgrade the quality of their work, and co-ordinate their programs and information with other day-care centers.
- Telecable, the cable company in Spartanburg also had a fairly large subscriber group (approximately 8,000 households).

Rand Corporation contracted and worked with 90 state and local agencies to define the services which would be most suited to the Spartanburg population. Between 30 and 40 services which could be offered over the cable network were catalogued. However most services required a point-to-point two-way video system for teleconferencing applications (i.e. specific people speaking directly to other specific people). Among the remaining potential service offerings, an adult education project, a child care project and a day care center project were implemented. A series of programs for senior citizens was also televised.

Adult Education Courses

Spartanburg has three public colleges averaging about 500 students each, and two private colleges. The need for adult education is particularly acute because 62 per cent of the adult population does not have a high school education.

Courses developed to prepare students for the General Educational Development (GED) test that is necessary to obtain a high school equivalency diploma, were chosen as one of the representative service applications for the cable project.

Before taking the course 30 students were given a three hour placement test. Of the 30, 10 took the pre-GED course during daytime hours; 10 took the GED course at night and the remaining 10 did not choose to take the course or were situated in an area which was not served by the cable company.

One basic adult education course encompassing grades 5 to 8; three adult education courses comprising grades 9 to 12, and a professional course in accounting were given in conjunction with the Spartanburg Technical College. The program was designed to enable students to pass the several-hour, multiple-choice exam required for a high school equivalency diploma. The teachers from the Spartanburg Technical College giving these courses also taught regular classes which served as control classes at the college. The cable classes were taught in the morning and the normal classes were given in the afternoon. Students in the adult education course given over cable paid $30 for books and tuition, the same as if they were enrolled in regular classes.

The adult education courses were given over midband cable channels so that they could be accessed only by subscribers with converters. Students enrolled in the courses received the temporary loan of a converter free-of-charge, and their cable service and installation was provided without charge for the duration of the course.

The teacher used a small television studio located on the cable company's premises for a classroom. The students received both audio

and video signals from the studio and could send back an appropriate response, via the nine button data terminal, to the mini-computer in a nearby room. A television monitor in the studio, connected to the mini-computer, provided a visual display for each student's response.

Three types of student - teacher interaction were possible using this system. Two of these three modes of interaction were teacher-initiated.

The first, or formal mode, was used by the teachers to measure student response, as in a multiple - choice quiz, and to obtain statistics on these responses. A hard copy printout of these statistics could be generated by the teachers.

The second, or work mode, was student-initated. By pressing different buttons on the data terminal, the student could send signals back to the teacher, such as "slow down", "don't understand", "give an example", etc. These signals were displayed next to the student's name on the TV monitor in the studio.

The third, or informal mode, was teacher-initiated and resembled strongly the formal mode with the following exception: no statistics could be generated on the students' answers. During the course the teacher used the work-mode most often.

The class routine often took the following format: The teacher would take a roll call asking the students viewing the class to punch the "roll call button" on their terminal. The students' names would appear with a check mark next to them on the TV monitor. The teacher could then go into the informal work-mode and teach new material. Or it might be a quiz format, using the formal teacher-initated mode, with simple or multiple-choice questions. The answers were displayed next to the person's name on the monitor. The teacher could then

initate a personal discussion with each student, encouraging some to answer differently or asking them why they chose the answer they did. The names of students who did not respond were also shown on the TV monitor, and the teacher could selectively question them.

To create graphic material, the teachers used a punch-out machine with a variety of letter styles and sizes called a Varafont which costs about $1,400. The type of print produced by a Varafont is very easily picked up by the television cameras.

In Service Training of Day-Care Personnel

The purpose of this service was two-fold:

1) To improve the quality of work in the day-care centers by changing the attitude of the staff. This was done by giving them a more professional self-image through up-grading their job, and by stimulating them with new ideas and methods obtained from video programs and educational packages. A second goal was to facilitate the exchange of information between the different day care workers.

2) To set up a controlled experiment to measure the impact of two-way video communication as opposed to one-way video with two-way audio, and one-way video only.

In Spartanburg 2,388 children were enrolled in day-care centers. There were 51 licensed facilities in the county, and all were invited to participate in the project. Twenty-two centers in the area served by the cable company agreed to take part.

- Six centers with a total of 12 people were a control group. They received written eductional material, but no video programs.

- Sixteen day-care centers could receive the TV program from the studio. Eight of those 16 centers, with 17 people total, could only receive the video program and could neither talk back nor send video signals back to the studio.

- Six centers involving 22 people could send audio and video signals back to the head end. These six centers had access to the cameras 70 per cent of the time.

Only 20 centers completed the project. The educational packages, the video programs and the cable service were provided without charge to the participants.

All three groups received an incentive package set composed of three different boxes containing educational materials, at the cost of $28 each.

The video programs were presented as specific curriculum modules which were organized in three steps:

- Presentation and illustration of specific educational principles
- Demonstration of the relationship between these principles and a child's performance
- Discussion on principles and performance as they relate to real life experiences.

Starting January 1976, this service was offered for 13 weeks, Monday to Friday, 1-2 p.m., on cable television. During the last week of the course a review program was produced. Total production yielded 65 hours of two-way interactive program.

A related experiment offered a first-aid training course over cable with two-way video to participants at the City Hall, a hospital, and several recreation centers. Eight programs of one hour each were produced and these programs and others were shown for a week and a half, starting one Monday and finishing the Wednesday of the next week. Two-way video was used in the same way as in the day-care project.

Early Childhood Parenting Courses

This series of programs was aimed at introducing Piaget's theories on child development to parents with small children. The need for this type of information became apparent during the day-care programs. Many parents did not know the normal stages of physical and mental development of their small children and were often worried about their children's progress. An important part of the program, often requested by the parents, was an explanation of the child's language and speech development.

This project employed trained research assistants. Cost to the participants was $7.50. They received booklets and sheets of material on child development. Four tests were developed to examine the parent's understanding of the course material:

- The first was a cartoon booklet which presented situations or facts with which participants could agree or disagree. This test was also used as a control for literacy.

- The second was a situations booklet which portrayed, for instance, the age and the development of the child and a situational context. Participants were asked to agree or disagree with what the child was saying.

- The third instrument was a scale used to identify the age of the child, based on what the child could do.

- The fourth was an in-depth interview with the people taking the course.

The researchers from Rand also wished to compare the effects of one-way video with a telephone answer capability, to one-way video with a data terminal answer capability. A randomly-determined half of the group taking the courses was loaned a nine button data terminal. The other half of the group was encouraged to use the telephone for asking questions and participating in discussions during the programs. In practice, however, everyone could use the telephone if they wished.

There were fewer telephone calls placed to the studio than had been expected during the program. About 75 per cent of the participants replied that they had not wanted to interrupt what was being said because they found the presentation interesting.

The Senior Citizens' Program

These programs emphasized the philosophical and practical aspects of aging, and valorized the experience and recollections senior citizens possessed. All the regular CATV subscribers in the area could view the series which was presented every Monday and Wednesday from 11 a.m. until noon.

This program could be produced in a TV studio, on the cable company's premises, or originated from three other locations within housing projects. Only one return video channel to the head end was provided, and the video signals had to be switched if more than one location was originating program material.

The TV studio used for this program possessed two color cameras. The three remote locations employed black and white cameras because their studios lacked adequate lighting. Eventually, black and white cameras will probably be used in the studio as well. All the camera operators were senior citizens or retired people, and the number of participants averaged between 10 and 15.

Feedback problems with the existing audio facilities forced the use of a separate transmitter/receiver for the program.

This series of programs was not financially supported by Rand. A $13,000 grant and a $3,000 grant from various state committees paid the salary of a full time research animator and other minor expenses. The studio, the equipment and the technicians needed to run the equipment were furnished at no charge by the cable company. Senior citizens donated their time to help produce these programs. Subscribers were not charged extra for these programs which are part of the cable company's effort in community programming.

## FUNDING

### Revenues from the Trial

- no revenues were anticipated during the trial;
- services were either free, or a small registration fee was changed to cover document and mailing costs;
- the cable subscription and installation fees were not charged to people participating in the project. Recipients of the adult education programs were often disadvantaged financially, and would probably not have been able to pay them. Had they been charged, they would have been paying more to take the course over cable than if they enrolled in the normal college classes.

- the consensus of the project staff was that the adult education courses given in the trial would not generate a positive cost/benefit ratio unless the class size was larger than 30 students.

Financial Assistance

The National Science Foundation grants covered the bulk of the expenses. The first grant, for $700,000 covered the design phase of the project. A second grant, given a year after, for $1.1 million provided the funds to implement the study design. Rand Corporation provided the technical support staff for this project.

Facilities

The Spartanburg cable company (Tele-cable) donated offices within their building for the support staff working on this project.

Capital Cost

- The computer interface
- 70 modems
- 70 handsets
- High speed printer
- Small hardware additions/modifications $65,000
- 8 black and white cameras (Sony ½")
- 10 modulators
- Small items $40,000

Rand Corporation would have preferred to build more redundancy into the computer system, but could not afford it. The National Science Foundation limited the amount of money that could be spent on hardware items to 10 per cent of the total NSF subsidy. The incremental cost of making the cable plant operational for two-way service was small.

Operating Cost (2.5 years)

For the duration of the project, the costs incurred by the cable company were approximately $40 per household (including labour and parts) to install and remove the data terminal, and for several service calls.

The maintenance cost of the two-way cable plant was more than twice the cost of maintaining a one-way cable system. Production costs for the adult education course averaged between $30 - $35/hour. This figure included the teacher's salary and the salary of the one cameraman/technician.

Salaries and Overheads (2.5 years)

Subcontracts:

1. $140,000 - technicial support from Tele-cable.

2. $ 80,000 - contract with Spartanburg Technical College for three teachers, full time.

3. $680,000 - two full time project managers in Spartanburg
   - office supplies and related costs
   - develop of measurement devices and research assistants to administer these tests
   - program operator ($150,000).

## EVALUATION

### Adult Education Project

- Students taking these classes over cable may have been functioning in an environment which is closer to that of the GED exams than the students in a regular technical college class. The students at home were perhaps more isolated, and had to think out answers to the teacher's questions alone, as in a test situation.

- In the cable classes, students were called upon to answer more often. Their responses appeared instantaneously on the TV monitor. The teacher could selectively question those who had answered incorrectly or had not answered at all and discover their learning difficulties. This technique may favour shy people, problem learners, or students not used to oral exchange.

- In the regular Technical College courses, 16 per cent of the class time was given over to substantive discussions. In the cable classes, discussions held occasionally over the telephone could be heard by all the students because they were rebroadcast over the regular audio facilities.

- The teachers found the cable project self-motivating and felt thay had a better teaching control in the cable classes. The teachers felt they could handle a larger class, up to 30 students, with the existing computer system design. Large classes, up to 100 students, might be handled with modifications in the computer software. The computer could automatically process the information/responses generated by the students and display to the teacher only certain student names, perhaps those students that did not answer a question correctly or those that have not been given special attention recently.

- The teachers noticed that even if the TV image was fairly redundant-a "talking head" type of program-people continued to listen. In brief, the teacher and the students felt that the program was not a TV program in the accepted sense.

- The teachers felt that the data terminals were not reliable enough for use after the project was terminated. However, they did indicate that they would like to teach a variety of courses over cable (including accounting, crafts, care of house plants, etc.) if the terminals were improved.

- The Varafont machine, which produced the graphic material for the teachers proved very important as a technical support. It was fast, economical, simple to handle and the teachers could use it themselves.

- Retention of the information presented in the cable and regular GED classes was measured in a pre-test, post-test design a year after both series of classes were terminated. Students taking the cable classes scored 82 per cent and students taking the normal classes scored 85 per cent on the retention test.

- It was observed that it took twice as much time for the students to do the in-class individual work over television than in a conventional classroom. It was argued that this was due to the presence of the teacher in a conventional classroom while the television screen showed an empty blackboard during these periods. An experiment was conducted in which the teacher would appear on the screen, saying nothing and looking bored. This was intended to remind the student that the teacher was waiting for them and consequently the time the students took to do their individual work was shortened.

- Students were generally satisfied with the cable courses. They did not feel alienated while using the data terminals and they remarked on the amount of personal attention they received from the teacher even if oral conversations were limited. Many students used the telephone to communicate with the teachers about a specific problem. The unreliability of the data terminals seems to have been the major point of grievance.

Day-Care Project

- Of the centers using the two-way video system, all but one used the system often. However, a majority of people in the centers felt that one-way video with two-way audio, using a microphone at the day-care center, would be satisfactory.

- The centers using one-way video could see the televised exchange between the teacher/animator in the TV studio and the day-care staff at the centers with two-way video capabilities. The presence of cameras and technicians bothered some people. They were somewhat embarrassed and felt they concentrated too much on their own television image.

- Most people also felt they would have learned less without the two-way video system. The program sections which included the two-way exchange seemed more natural and realistic. The two-way communication also helped people identify with each other. When tested, the control group receiving one-way video only, had learned less than the other two groups.

- Participants felt that the programs should be given three times a week instead of four or five times a week, over a 10 to 13 week period. Several of the day-care staff felt that the program should involve the children to a greater extent.

- As a result of the day-care project, contacts between participating centers increased and have been maintained. The group as a whole has a better image of itself as professionals.

- Relative to other existing alternatives, this project proved to be cost effective way of training day-care personnel. This project generated 1,300 person hours of training courses.

Limiting Factors

The data terminals did not operate perfectly. One person's return answer sometimes was mixed with another person's answer causing confusion. This affected the psychology of the class or group and created a lack of confidence in the technical systems.

The delay time on answering back for the data terminals was virtually negligeable for a group of 10-12 people. If more people were added to the group however, the delay time would increase exponentially as the number of people using the system increased.

Many people did not understand the two-way capacity of the cable. They were frightened by it, thinking that by having a data terminal in the house, there was a possibility that they were being spied on, or that their privacy was being infringed. A greater acceptance of this technology came from middle class people who did not react as emotionally to the two-way system or the terminal in their home.

The modem, located in people's homes under their TV set, put out harmonies that interferred with programming on other channels.

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New York State Department of Education Telecommunication Project

Amherst/Tonawanda/Buffalo, New York

(TEL-CATCH)

Sept. 29, 1977

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This is a telecommunications project for the education of homebound handicapped children. It uses a modified TICCIT system: full-motion video downstream via CATV and data upstream via telephone lines.

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The TEL-CATCH project originated within the New York State Department of Education in conjunction with the Mitre Corporation. Its official starting date was July 1, 1974 and it became operational in September 1975. Its main objective is to demonstrate the effectiveness of computer-based instruction delivered via closed-circuit television to severely multi-handicapped students in a metropolitan area with cable television capabilities already established.

The project was originally funded for a period of two years by the Bureau of Education for the handicapped of HEW, but the New York State Department of Education gave new grants and the system is now fully operational and growing slowly.

TEL-CATCH is one of five telecommunications projects funded by the Bureau of Education of the Handicapped in 1974. The other four projects are: Exceptional Child Centre at Utah State University (Telepac); Teaching Resources Centre at the City University of New York; Achievement Centre for Children at Pardue University (FEATT); and the University of Kentucky project.

Another project similar to TEL-CATCH began in 1977 at the Human Resources School in Long Island, N.Y. Its planners look to the TEL-CATCH project as a model for accessing a computer from home.

TEL-CATCH was started in Amherst, N.Y., a Buffalo suburb, but because of changes in ownership and organization of the CATV companies in the area, the project was extended west to the Kenmore-Tonawanda district and its equipment was moved west to a room leased in a school. This change meant that TEL-CATCH was potentially available anywhere in the western region of the state of New York.

There are basically two types of TEL-CATCH services. The first is provided by playing a video-tape on request. If there are no requests,

two tapes are played continuously every day. The second service is provided by interaction through a keyboard and coupler to a data base on a disk. The data base on a disk is generally structured in the form of a series of questions and answers, with the path through the set of possible questions in any given area of interest being determined by the answers to previous questions.

While this type of service is often referred to as a computer-aided learning facility, in this particular case there are also a number of games available. These seemed to play a very important role in the use of the system in the homebound children's homes.

The project can serve approximately one hundred families during the development phase. It can provide different programs to ten homes simultaneously, but anybody with a TV converter can monitor any of its 10 channels. So far there has been a good balance with respect to usage. There have been no problems with saturation or with people leaving their terminals connected.

The system has the capability of sending messages through the computer (mailbox service) from a student to the operator or vice versa. The operator can also link to a channel or send a message to all channels. The operator can find out who uses a channel through a computer printout.

Students were recruited directly and confidentially by contacting the parents of handicapped children. Lists of handicapped children were obtained through local agencies for the handicapped.

The acceptance of this system by the students and their families is most enthusiastic. Parents would do anything to keep the project floating.

TEL-CATCH is administered by the United Cerebral Palsy Association (UCPA) of Western New York. The cable television operator in Tonawanda is International Cablevision which provides five TV channels free of charge to TEL-CATCH. With the extension of TEL-CATCH into the urban area, the COURIER cable company of Buffalo will also participate with 10 TV channels available, but only five in use initially. Both CATV operators agreed to use compatible head-end equipment.

The educational programmes have been obtained from a variety of sources in addition to the original MITRE programming for the TICCIT system. While this has resulted in a greater variety of programmes, it has also made their debugging more difficult.

The first system package was the Hewlett-Packard's COPAL, a package consisting of 300 lessons. In thee second phase the Curriculum Corporation Company provided the GED course-reading, language and arts programmes appropriate for grades 3-6. A third set of materials, appropriate for secondary level students, includes arithmetic drill and practice and simulation games. This set contains contributed materials prepared by computer users and distributed by the computer manufacturer, Hewlett-Packard. The staff of TEL-CATCH added spelling exercises.

There also are some 60, 20-minute, demonstration and talk-show videotapes for parent training which can be requested by telephone, subject to availability of a TV channel and an operator to mount the tape.

The users of the system are children with a persisting handicap - not necessarily palsy - which will keep them homebound for a long time. The only exception are visually-handicapped children who can not watch regular television.

Some 40 children in homes in Amherst and Tonawanda (suburbs of Buffalo) and two institutional middle class family settings have access to the system. Potentially, 100 handicapped children in the area could use the system.

Hardware

This computer-based system has CATV downstream and the switched telephone network upstream because the Amherst cable does not have two-way capability. It uses a modified version of the TICCIT system made up of the best of TICCIT adapted to the specific needs for this project.

A special keyboard developed by MITRE (a modified IBM selectric keyboard) is connected, through an acoustic coupler, to the home telephone. The home TV receiver, with a converter tuned to one of the available TV mid- or super- band channels, is ready to receive the menu, instructions and programmes. The system has capabilities for scrolling the text up and down and for restoring a page of material. The cost of the terminals is about $300.

The number of students that can use the system simultaneously is ten - the number of available ouput video channels. Each channel has its own modulator and character generator.

FUNDING

The original funding from the Bureau of Education for the Handicapped (HEW) totalled $738,404 for two years. It covered the period July 1, 1974 to June 30, 1976, and included capital costs. About $250,000 from this grant was spent on hardware equipment.

Since July 1, 1976 the project has been funded by the New York State Department of Education at Albany. In 1976-77 the State funding was around $190,000 but during the year 1977-78 it will be lower.

The current funding only covers the costs of operation, personnel and maintenance. The TV channels are provided free by the operators, but the project pays for any maintenance fees related to it. There is also a provision to terminate the contracts with the CATV operators in the unlikely event that the project adversely affects a participating, CATV company.

The TEL-CATCH service has demonstrated savings in cost over the previous methods of education for the handicapped. The real savings are manifest when the costs of transportation of handicapped children are considered. They typically range from $10,000 to $25,000 per child per year.

EVALUATION

This project shows a number of indications of being one that meets a very strongly felt need, but for which the only economic justification is the present very high cost of education for the handicapped.

A five-year programme has already been built for the expansion of this system. High in the list of priorities are: acquisition of a new disk storage device; video tapes machines; image digitizer for graphics applications; multiplex equipment and frame grabbers. There are no future plans for the use of two-way video.

Another immediate goal is to create a comprehensive educational program.

# Massachusetts General Hospital/Bedford V.A. Hospital/Logan Airport

## Telemedicine Network

## Logan Medical Station

## Boston, Massachusetts

August 17, 1977

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This telemedicine project was the first of its kind and has been described in many published studies of telemedicine. The prime objectives of the project were to determine where interactive television was best employed within the medical system and to provide fuller utilization of the skills of health care professionals via telecommunication links. The project was operational from 1968 to 1975.

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The Medical Station at Boston's Logan Airport was created following a freak accident in 1962. Radio reports of the accident brought spectators to the scene and the resulting traffic prevented emergency vehicles from reaching the airport. Consequently, many injured people died who might have been saved by prompt medical attention. As a result the Massachusetts Port Authority contracted with the Massachusetts General Hospital to staff a new medical facility at the Airport. Dr. Kenneth Bird was named the Director of the facility.

Soon after the medical station opened, Dr. Bird identified the need to see patients who could not be moved at times when neither he nor another physician was present. He applied for and received a Public Health Service grant for assistance in acquiring a live TV interconnection between the Airport Facility and Massachusetts General Hospital (MGH). The grant was approved, but problems in finding microwave channels acceptable to the Federal Communications Commission delayed the start of operations until April, 1968. As the result of the success of this project, a telemedicine link between the Massachusetts General Hospital and the Bedford Veterans Administration Hospital (BVAH) was established in March, 1970. All three locations could be linked in a telemedicine network.

The project was sponsored by: the Massachusetts Port Authority, the Massachusetts General Hospital, the Bedford Veteran Administration Hospital and the United States Public Health Service - Department of Health Education and Welfare. Its objectives were to determine how and when interactive television could be best employed, given the resources and limitations of the system. It was intended to provide fuller utilization of the skills of health care professionals by using telecommunications channels to deliver services quickly and reliably at a distance, and to study and cultivate the patient's acceptance of this system.

Other objectives included:

- the gathering of data to encourage and implement research projects wherever possible
- the testing of interactive television not only for medical applications but as an interface between medical resources and non-medical teachers and students in the education system
- the assessment of the requirements of the users of this type of interactive system and the development of technology in response to such requirements
- the study of ways of adapting this technology to medical personnel with minimal departure from traditional practice
- the development of economic models which would predict the cost effectiveness of future telemedicine systems
- the dissemination of the information obtained by research efforts on the use of this telemedicine link.

The telemedicine system provided independent microwave links between LOGAN and MGH, and between MGH and BVAH. They could be interconnected at MGH. One video channel and two audio channels in each direction connect the distant locations to MGH. One of the audio channels was used for data transmission.

Logan Medical Station

The Logan Medical Station was equipped with two television cameras: one operated by the nurse or assistant and the other one controlled remotely by the physician at MGH. A third camera for the examination of slides was connected directly to a binocular microscope through a binocular tube and a dual viewing adapter. Simultaneous viewing of specimen slides directly through the eye-piece by the person operating the microscope, and via the television image by the physician,

was accomplished by fixing the camera to the other tube of the dual viewing adapter. Four lenses provide magnifications of 40X, 100X, 450X, and 1000X. Normal room lighting used in the consultation room required the use of a low-light-level television camera.

The physician controlled a remote camera which provided face-on close-up views of the patient and his injuries. A second camera, controlled by the nurse provided a view from another angle. It also permitted viewing of areas not easily accessible to a camera in a fixed location and provided extreme close-ups through the use of a fixed focus lens extenders.

The physician could view each video image sent from the three medical station cameras by pushing appropriate buttons at a control panel located at MGH. He could write orders or sign prescriptions by means of a tele-writer multiplexed directly to the microwave transmission system.

Physicians could hear heart and lung movement by means of an electronic stethoscope positioned by the nurse under their direct supervision. The patient's electrocardiogram, pulse rate and waveform, respirations and systolic blood pressue were also transmitted electronically.

Bedford V.A. Hospital

The telemedicine link at Bedford V.A. Hospital was similar to the Logan installation. It possessed the same diagnostic facilities with the addition of X-ray viewboxes for screening films made at Bedford Hospital.

The Bedford-MGH link had four facilities not found at Logan:

- A remote-control camera enabled patients to see the remote physician. The camera had a zoom lens for choosing close or distant views, and remote controls for panning and tilting. This equipment proved to be particularly important in the treatment of psychiatric patients.

- A switch which, when activated, permitted a wide angle view of the Massachusetts General Hospital telemedicine room in which the distant physician was sitting. A special camera mounted high on the wall of this room allowed MGH patients and staff at Bedford to see who else was in the MGH room with the doctor.

- An electronic cursor, a white moveable dot, which allowed the MGH physician to point to or outline an area of interest on the pictures being sent from Bedford Hospital. Medical staff at Bedford saw the cursor superimposed over the video image on a large TV monitor. This was useful for examining and discussing microscopic slides and camera close-ups of the patient.

- A second camera located in the Bedford telemedicine room was equipped with a special lens adapter to provide very large close-ups of the patient. The degree of magnification is 10X. The lens adapters were used extensively in dermatological transactions.

The Bedford telemedicine suite included a large viewing room which accommodated up to 20 people. There, videotapes were screened and telemedicine transactions in progress were viewed. A video tape recorder allowed the replay of certain medical interactions for teaching purposes. Psychiatrists and their patients used this facility for "self image" confrontations.

Massachusetts General Hospital

The telemedicine room at the Massachusetts General Hospital and the diagnostic room at Logan Airport were equipped in a similar fashion. The MGH facility was equipped with the electronic cursor equipment used during teleconsultations with Bedford Hospital staff. The room was large, accomodating as many as 10 participants, which made possible group interaction between consultants or psychiatric residents at MGH and patients at Bedford Hospital. In addition, six or seven rooms at MGH had outlets allowing them to be connected to the telemedicine link using mobile equipment on carts.

Project Personnel:

- The director of the project, Dr. Bird was a practicing physician.
- The staff consisted of one other medical doctor, several nurse-practicioners, a secretary/receptionist and a part-time technician.

  At the start of the project the nurses received an orientation course designed to give them several weeks of specific work experience in various intensive care units.

  The technician, employed on a part-time basis, was mainly responsibile for keeping the microwave links between the three medical facilities operational.

Service Description

Telediagnosis was the first service offered through the system.

The Logan Airport facility offered medicial services to airline personnel and passengers, with nurse clinicians on duty twenty-four hours a day and physicians in attendence during peak passenger flow periods each morning and afternoon. At the onset, this project was to determine how well a nurse clinician would perform in a highly responsible position without the direct supervision of a physician, but with the physicians able to respond promptly by telephone to a radio call signal when diagnostic or theraputic problems arose.

It was subsequently thought that the ability to see and examine a patient at a distant site using television images might enable a new type of medical care to emerge. As a result, on April 8, 1968, the first two-way microwave telediagnosis transaction took place between Logan Medical Station and Massachusetts General Hospital.

Patients were taken to the diagnostic room where standard and telecommunications equipment was installed. All medical transactions were carried out with the help of a nurse clinician who elicited a patient history, defined the patient's problem, and carried out an appropriate physical examination. If she felt that the patient should be examined by a physician, the interactive TV link was used.

The physician could see and talk to the patient. He might ask the nurse clinician to provide him with a visual description of the patient; to reposition the mobile camera for better visualization, or to use other diagnostic aids (i.e. stethoscope) to convey information to him.

The nurse might review the findings with the physician, and depending on the circumstances, the patient might be present. The indicated treatment was entered into the patient's chart by using a telewriter.

Experience at the medical station indicated that 50 per cent of the patient visits resulted in problems being handled by the nurse only, using physician-established procedures. About 25 per cent required physician-nurse consultation via the telediagnostic link without the presence of the patient, and the remaining 25 per cent required physician/patient interaction with or without the nurse's presence.

Other Services

- In 1969, a study was carried out to determine if a well baby clinic could be conducted via telemedicine links. Dr. Rudolf Toch was the physician for this clinic. The shift from face-to-face encounters to mediated TV encounters seemed to have been accomplished with relative ease.
- After 1970, a number of teleconsultation transactions between Bedford VAH and MGH were carried out.
- A speech pathologist at the MGH Tele-center was able to diagnose patients with speech disorders at the VA Hospital. He also trained physical and occupational therapists at Bedford Hospital to carry on daily speech therapy. The speech therapist would then evaluate the patient's progress a week later.
- Psychiatrists at MGH provided consultation services to patients and the psychiatric staff at Bedford. Individual and group therapy sessions with patients were held, as well as several ward conferences attended by both MGH and Bedford staff.

- A total of 68 "tele-rounds" were completed, featuring case presentations by physicians at Bedford which were followed by the examination of the patients, a review of the auscultatory findings transmitted by electronic stethoscope, and an examination of pertinent radiographs by staff physicians at Massachusetts General Hospital.
- Transactions in dermatology and drug addiction therapy were also accomplished between the two hospitals.

FUNDING

Grants

| | | | |
|---|---|---|---|
| Logan | 3/1/67 - 2/29/68 | $157,822 | Department of Health, Education and Welfare |
| | 3/1/68 - 2/28/70 | $160,292 | Department of Health, Education and Welfare |
| Bedford | 1969 | $ 91,500 | Veteran's Administration |
| | 1970 | $137,600 | Veteran's Administration |
| | 1971 | $103,200 | Veteran's Administration |
| | 1972 | $ 51,300 | Veteran's Administration |
| | 1973 | $186,399 | Veteran's Administration |

Note: In fiscal year 1973, $127,408 was expended by V.A. at Bedford for the project.

The I977 operating budget for Logan medical facilities was $332,224.

EVALUATION

A study of over 14,000 patients was carried out during a two year period of the project commencing April, 1968. According to Dr. Bird, this study clearly established the feasibility of offering diagnostic services to a remote site. He also believes that the nurse clinician

plays an indispensible part in the service, and that without this person, the emergence of telediagnosis might not be possible.

This telemedicine project was the first of its kind and consequently was a highly researched and studied project. In 1975, funds for the telemedicine project and staff were cut off. The microwave link remained open and operational.

Many physicians were decidedly reluctant to use the telemedicine system, and there seems to have been some resistance to teleconsultation activities with the hospitals, which were perceived as an invasion or an intrusion into the physician's own sphere of influence. Dr. Bird feels that physicians must be sold on the idea that telemedicine is not a replacement but an augmentation of the physician's role. To achieve this, an excellent telemedicine system must exist, with appropriate technology and especially competent support staff, who can assume on-going responsibility for patients.

Dr. Bird believes strongly that telemedicine interactions do not replace the physician or relegate him to a different role. On the contrary, the concept depends a great deal on the physician and his special skills. Telemedicine interactions do, however, require an appropriate task definition and apportionment with the professional nurse in her capicity as a nurse-clinician.

Some benefits of telemedicine that Dr. Bird stresses are the increased availability and optimum allocation of the physician and other health service professionals and personnel, and the reduction in travel time of both the physician and the patient.

He also feels that the fundamental doctor-patient relationship is not only preserved, but at times even augmented and more criticially focussed, using telemedicine links. From his experience on this project, Dr. Bird thinks about 85 per cent of all physician-patient telemedicine contacts are as good as if the doctor was indeed present.

The first 200 patient transactions between Logan and MGH were evaluated in depth. Physicians wished to examine the feasibility of arriving at a reasonable disposition of cases. These evaluations reflect not only the capacity and utility of the telemedicine link as a communications system, but also the standards of physicians working within the context of a teaching hospital. These standards may not be universally relevant. Both the physician making the disposition via television, and the physician directly observing the transactions through a one-way mirror, participated in the evaluation. When asked the following question: "Was it feasible to arrive at a reasonable disposition?", the physicians replies were:

| | Telediagnosis Physician | Direct Observer |
|---|---|---|
| Feasible | 64.5% | 96.5% |
| Minor Reservations | 30.0% | 1.5% |
| Major Reservations | 4.0% | 1.0% |
| Not Feasible | 1.5% | 1.0% |

The difference in response between the two physicians in the "minor reservations" category may reflect the telediagnosis physician's personal feelings during the transactions and the direct observer's non-involvement in the diagnosis. Despite these minor reservations, both physicians concluded that the feasibility of making a reasonable disposition was better than 64 per cent.

During the following three years (1971-1973), more than 3,600 telemedicine transactions were performed in pathology, speech therapy, psychiatry, drug abuse, alcoholism, medicine, dermatology, nursing, social work, dietetics, radiology, and neurology. An overview of these transactions is presented in Annual Report (see reference 5). Educational activities were facilitated by the construction of a mobile camera console which permitted the orgination of teaching sessions from six different sites linked by a cable system to the MGH telemedicine center.

A study of the audio characteristics of the telemedicine network was undertaken. The results indicate that the audio transmission was entirely adequate with no degradation of speech or of auscultatory sounds in terminal-to-terminal communications. However, while a simulation of seven terminals transmitting in a tandem configuration showed satisfactory speech transmission, the frequency response was not found to be good enough for auscultation. Circuit adjustments or equalization would be needed to meet the requirements of this type of audio transmission. During 1971-1973, the system reliability was evaluated at 99.4 per cent, with an average repair time of 4.26 hours.

The last grant given the Logan-MGH-Bedford telemedicine project expired June 30, 1974. Nevertheless, Dr. Bird has managed to keep the telemedicine network operational, although the use of the system is low.

## FUTURE DEVELOPMENTS

The many benefits derived from teleconsultation between the Bedford VA Hospital and the Massachusetts General Hospital suggested there would be benefits from the extension of the telemedcine network, with its interactive health care services, to other VA facilities in the region.

A feasibility study was undertaken to examine and plan a three-step expansion program. Upon completion, the proposed network would have connected eight VA hospitals, three VA out-patient clinics and four teaching hospitals. The minimal capital requirement was estimated at $3,500,000; and the annual operating cost at about $836,000 in 1974. The expansion plan was never implemented.

A year ago, Dr. Bird used the Boston Catholic TV Network, which serves most of North-Eastern Massachusetts, to give a series of 30-minute talks to nurses. They were well received.

Physicians practising in Massachusetts must take 50 hours of post graduate courses a year to satisfy the Massachusetts Medical Society requirements, and Dr. Bird is interested in providing some of these courses over TV. He is also preparing a project with Boston College to televise "Grand Rounds" on a regular basis. Several have already been broadcast. These programs would not be bi-directional. The participants would receive the TV signals only, and telephone calls would be placed to communicate with the originators of the program. This type of endeavor is particularly interesting in view of the concentration of hospitals in Boston: 75 hospitals within a 10-mile radius.

Another project which might be considered is the creation of a teleconsultation link between MGH and its satellite clinic for ambulatory care in Chelsea.

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# STARPAHC

Papago Indian Reservation, Arizona

November 16, 17, 1977

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This NASA-developed program, STARPAHC (Space Technology applied to Rural Papago Health Care), uses capabilities derived from space technology to effectively extend a physician's skills and knowledge far beyond his physical location.

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The STARPAHC project was undertaken by NASA as a result of a 1971 request from the President's Domestic Council that it study and recommend solutions for one of the most pressing health problems in the USA -- the delivery of health care to remote areas. It was an opportunity to demonstrate some of the uses which could be made of communications technology developed for life support systems in space, and obtain data that could be useful in future manned space flights.

In 1972, the Papago Indian Reserve in Southern Arizona was selected as the site for the project. The selection gave rise to the name STARPAHC -- Space Technology Applied to Rural Papago Health Care.

The system was defined and designed in 1973. Equipment was assembled, installed and tested in 1974, and the project became operational in April 1975 for a two-year program. Since April 1977, it has been the responsibility of the U.S. Department of Health, Education and Welfare (HEW).

Objectives

Areas in which NASA hoped to provide data which would be useful for health care in space included:

- development of the physician/paramedic link
- clinical evaluation of advanced bioinstrumentation
- development of computer support for remote health care
- integration of video viewing and display devices
- definition of skills, training and procedural requirements
- evaluation of existing techniques for space application
- identification of areas needing more advanced technology
- refinement of protocols and techniques

In response to the original request for information on improving health care in remote areas of the US, the project would examine:

- improved communication methods
- mobile health clinics
- advanced health care equipment
- computer aids
- assistance to allied health professionals and health education programs.

STARPAHC Participants

- the Papago Indian Tribe and its Executive Health Council
- the HEW Health Resources Administration
- the Indian Health Service Center for Research and Development
- the NASA Office of Manned Space Flight
- the Lyndon B. Johnson Space Center, Life Sciences Directorate, Bioengineering Systems Division
- the Lockheed Missiles and Space Company, Inc. (contractor)

Among the reasons the Papago Indian Reservation was selected for the project was the community's willingness to support the cost of the system after the project ended; its willingness to accept primary health care from physician's assistants, and because it had a medical records system containing complete medical histories of nearly all residents of the reservation which would provide a valuable base for one of the principal technical services which would be available -- a computer file of medical histories available in print-out to the paramedic personnel in the mobile health units.

The beneficiaries of the STARPAHC program would be the eight-to-ten thousand permanent residents of 75 villages on the Papago

reservation, and the two-to-four thousand who lived outside the reservation's boundaries, but returned to the reservation for health care.

The Papago Tribe governs itself through a tribal council, and has complete police jurisdiction on the reservation. The average family size is 4.8 people, with a median age of 21 years. Santa Rosa and Sells are the largest towns on the reservation. HEW's Indian Health Service administers health care on the reservation through a hospital at Sells and a part-time clinic at Santa Rosa. A large, well-equipped Indian Health Hospital in Phoenix has many specialists on staff.

In addition to the medical centres, the STARPAHC system includes a Mobile Health Unit, a clinically-equipped van-type vehicle staffed with a physician's assistant, a laboratory technician and a driver.

Its communication capabilities include microwave transmission of two-way shared television, and two-way voice and data transmission through the Quijotoa Relay Station to the Health Services Support Control Center at the Sells hospital. The Control Center is staffed by a system operator and the hospital physicians. At the Santa Rosa Clinic, a Local Health Service Center staffed by a physician's assistant functions as a fixed remote clinic. VHF transmission of voice and data between all locations is also relayed through the Quijotoa Relay Station for use as back-up, and for when the van is moving.

The facilities available in the mobile unit include:

- An examination room with examination table, color television camera, color televisoin monitor, microscope, data keyboard and alphanumeric CRT display.

- An X-Ray room with X-Ray equipment, film developing chemicals and black-and-white television camera and monitor.

- Reception Area/Lab room with a trinocular microscope, NASA biomedical instrumentation, electronics rack, silent teletype and medical records.

- A Telecare Unit, a suitcase-size portable mobile health unit, containing a selection of medical equipment for emergencies and housecalls to bed-ridden patients.

The Phoenix Referral Center is a dedicated room in the Indian Health Hospital where access to specialists is provided through audio and slow-scan television links with all system locations. In addition, the Tucson Computer Center and the San Xavier Clinic provide STARPAHC with data system access to the Indian Health Service health information data base in Albuquerque.

The original funding for the STARPAHC project was $11 million. This was cut to $3 million because the Papago Indian Health Service already had a computer, and subsequently, a half million dollars was added for back-up. Of this $3.5 million made available through NASA, $230,000 was for the Mobile Health Unit. In addition, the project received contributions of facilities, personel and supplies from the Department of Health, Education and Welfare.

Medically-trained Community Health Medics, commonly known as physician's assistants, are located at both the fixed clinic and the mobile clinic. They administer health care to patients under the direct supervision of the physicians located miles away in the Sells hospital. Radio and TV hook-ups permit the physician to see the patient and such things as visible symptoms, X-rays and microscope slides. Dialogue between the physician and either the assistant or the patient via the radio link, facilitates diagnosis and enables a treatment to be prescribed.

Should the physician wish to consult with a specialist at the Phoenix Indian Health Hospital, the system enables him to transmit views of wounds and lesions, and X-Rays from either clinic to the specialist's station using slow-scan TV. There is also a direct telephone line for private consultation with the specialist.

The Mobile Health Unit visits four villages on a preselected route scheduled from Monday through Friday. The unit is set up on a concrete base at each site, and the driver connects to a ground terminal and points the microwave disc on the van roof towards the relay station. An operator at Sells directs the remote-controlled relay station disc toward the van.

The driver is from Santa Rosa, the medical crew from Sells. All travel to the mobile site each day, an arrangement which represents a trade-off between staff and patient transportation time.

The Evaluation

- Most of the technology in the mobile unit is used infrequently. In the two years of the STARPAHC project, two-way video was used in only some 460 of a total 1042 consultations. The general feeling seems to be that the visual capability does not generally add much to the consultative process, except in certain emergencies where its use is regarded as essential. The quality of the television signal is not a major factor in assessing its value.

- The background experience of the Community Health Medics is a factor which affects the use of the video link. Medics who were recent graduates used it four times as often as those who were experienced. The degree of experience of the physician at the other end of the link did not appear to affect usage.

- A significant factor in the success of the mobile unit would appear to be the Indian community's previous experience with the Community Health representatives located in all villages for about a decade. The Indians turn to these representatives when they have a health problem, and this usually generates a referral to the mobile unit.

- An unexpected complication arose concerning the updating of patient records. Although the mobile units are equipped with terminals to allow the staff to update patient histories stored in the computer, in practice, the written record of each visit is taken to the Indian Health Centre near Tuscon where it is keypunched by a professional -- apparently because the mobile's staff made too many mistakes.

- An exhaustive study of travel savings found that the amount of travel saved was negligible -- one trip out of 10 -- because of the large number of referrals generated by the mobile unit.

- During the two-year NASA participation in STARPAHC, there was a well-accepted medical information retrieval and computer-based message system in operation using a Variant computer at Sells. It was shut down in May 1977 because there was too much heat and dust to permit reliable computer operations.

- Initially many of the doctors involved in STARPAHC complained bitterly about having to use the system. They tended to feel that the medical assistants in the mobile were treating patients for whom they, the physicians, were not directly responsible. This attitude was particularly prevalent among newly-arrived doctors, just out of medical school and used to the procedures in large city hospitals. It was not unusual for them to order $150 obesity tests or other expensive tests.

After about one year, their attitude started to change. As they gained a greater understanding of the value of the mobile unit, a willingness to regard its patients as their responsibility began to emerge. It was found that it is necessary for a physician to have such a sense of responsibility before effective use can be made of the telecommunications equipment. For example it seems that doctors did not mind receiving calls, but were reluctant to go to the conference room only 100 yards away.

A majority of the patients like the STARPAHC system, and preferred to go to the mobile unit rather than the health centres at Sells or Santa Rosa.

Most of the doctors liked STARPAHC, largely because of the improved access to medical care for their patients. They felt the system had potential value but were concerned about the amount of time lost when they had to leave patients to go to the special teleconsultation room, or when equipment had to be set up or malfunctioned.

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"On - Demand Programming"

Télécable - Vidéotron

St. Hubert, Québec

August 5, 1977

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Télécable - Vidéotron offers eight channels of on-demand programming to its subscribers. Customers access this service by telephoning the cable company and scheduling the program they wish to view. A catalogue of programs is published twice yearly.

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Télécable - Vidéotron became active as a company in 1964. In 1974, its first two-way cable system was built in St. Jérome. It served as a technology and new services test bed for the St. Hubert franchise which went into operation in September, 1975.

Vidéotron introduced new experimental services: Selecto-TV in 1972; St. Jérome bi-directional services in 1974; and St. Hubert on demand services in 1975.

These were mainly on-demand television, and classified text information meant to complement broadcast television rather than serve as a substitute for it. Since 1975, Vidéotron has concentrated on improving existing experimental services.

The company has two stated objectives:

- To provide the diversity of programming that its subscriber group requires.
- To provide a network acceptable and accessible to producers of entertainment and information programs suitable for cable TV.

One of the main goals of the system planners is to provide a variety of auto-programming capabilities and a diversity of programs "on-demand" for the purpose of increasing the penetration of their CATV system.

Above average penetration has already been achieved for the St. Hubert system. This franchise on the South Shore of the St. Lawrence includes about 60,000 households. According to a December 1976 survey, Vidéotron had 27,070 subscriber households for a penetration of 48% in this area.

These households are primarily French, middle-class, and composed mainly of families (50% of the population is less than 20 years of age). The average level of education is less than 13 years of schooling. The largest fraction is composed of non-specialized workers (39%) with specialized workers (30%) and professionals (20%) together constituting half of all subscribers.

The St. Hubert cable system provides 32 video channels to the subscriber and two return channels from selected points on the network, usually public institutions.

As well as standard devices, headend equipment includes a PDP-8 minicomputer (to be replaced by a PDP-11); 36 Sony 3/4" video recorders modified to allow automatic switching and rewinding of cassettes. There is also a small TV studio with two cameras for community programming, and a mobile van for local news and reports.

The projects Vidéotron has sponsored are oriented towards replying to two questions:

- What type of information and entertainment services do people want in their homes?
- What types of services are possible and appropriate using state-of-the-art technology?

The definition of new services and the provision of these services is also dependent on the technological constraints of the system. Vidéotron's projects can, therefore, be classified as both service and technology trials.

Selecto-TV

Le Vidéographe, an experimental center for the production and distribution of video programs, sponsored the Selecto-TV project jointly with Télécable-Vidéotron. In 1972, three Vidéotron systems, Beloeil, Mont Laurier and Gatineau, agreed to participate in the Selecto-TV experiment. The same basic procedure was followed in all three projects.

- The cable-subscriber was provided with a pamphlet describing each videotaped program and giving a telephone number to call to ask for the viewing of the program of his choice, on a pre-arranged "Selecto-TV" date.
- During the experiment, the cable company reserved one or more channels for the transmission of programs and one channel exclusively for the use of a team of animators which answered telephone calls in the cable company's TV studio; received peoples' enquiries and comments; encouraged them to call in; described fully the programs to be presented and took note of the audience's requests for the showing of particular video tapes.
- When more than one program was requested for the same channel at the same time, the animator encouraged people to call in and vote for the program of their choice.

At Vidéotron-Beloeil, the Selecto-TV experiment lasted 10 days and there were 3,210 telephone requests for a program or to talk to the animator. Vidéotron-Beloeil had 4,000 subscribers at that time.

At Vidéotron-Gatineau, 3,463 telephone calls were received over a 10 day period. This cable system had about 5,000 subscribers at the time.

Vidéotron-Mont Laurier, with 1,600 subscribers representing a 90 per cent market penetration, had 3,724 telephone calls in 10 days.

Evaluation

There was no in-depth analysis of the Selecto-TV experiments. Le Vidéographe wished primarily to find a way to show its productions and receive a critical feedback on them. It hoped to create a dymanic exchange between the animators and the audience on the quality of productions and on the viewing and voting process. It was interested in observing and changing the communication patterns between audience and animator, and felt strongly that the spectator, habitually passive, should become implicated in the choice of his viewing material.

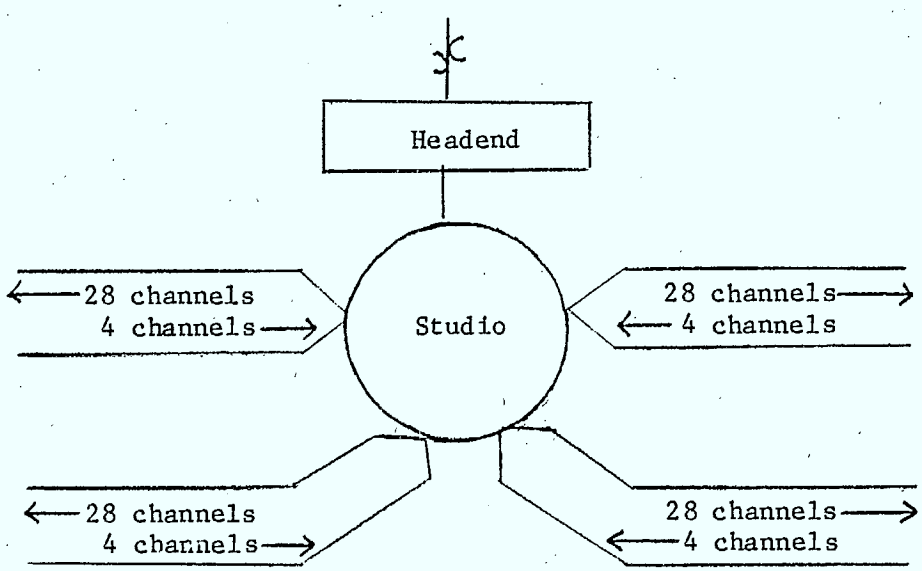
Judging from the number of telephone calls received during these experiments, viewers are receptive to this concept. However, it was not clear which element was the motivating one. Did viewers respond because they could choose the program they wished to see or because of the "hot line format", which allowed them personal contact with an animator on TV? Also, these experiments occured in small communities where many people knew each other and they might simply have wished to see their neighbors' taste in programs. Or maybe it was the use of a voting mechanism for the choice of documents to be viewed. This voting system constituted a collective game which may have excited the viewer's interest in participating. The personality of the animator was also an important variable.

The program receiving the best votes consistently fell into three categories: those made by people living in that locality; those with erotic or sexual scenes, and children's programs or cartoons.

## The Saint Jérome Project

The Selecto-TV experiment greatly influenced Vidéotron's thinking on the type and format of the additional services it might offer, but it was not until the acquisition of the St. Jérome franchise of 1974 that Vidéotron had the opportunity to test different format and content hypotheses. The maximum number of channels available in the company's cable systems before 1974 was 12, and most of these were in use as broadcast channels according to CRTC regulations. The St. Jérome system, however, has 32 channels and is fully bi-directional with four return channels.

The design of the system is a hub with five branches:



Each branch could deliver 28 different video signals to the subscribers and four different video signals back from the subscribers to the head end. Because of limitations of the head end video switching equipment, the maximum number of return signals which could be received at any one time was four, not sixteen.

A special video socket in each subscriber location permitted the origination of video and audio signals from homes and from important institutions and public areas in St. Jérome. Among these were the Church and Presbytery, the sports arena, all the old age homes and playgrounds, the 22 primary schools, the high schools and the CEGEP (Junior College) of St. Jérome, and the mayor's office.

Among the many experiments carried out by the staff of Vidéotron-St. Jérome were the following:

- Vidéotron bought four mobile video kits which included a Sony ½" camera and VIR unit and offered to lend them free-of-charge to anyone wishing to originate local programming from any site, home or institution which was already cabled. If the program was particularly interesting, they offered to cable the originating site.
- Vidéotron tried different programming ideas using the bi-directional capacities of the system. For example, two old age homes were connected so that the residents could talk back and forth to each other. Community games shows or hot lines used much the same format as Selecto-TV, with an animator in the cable TV studio presenting ideas and opinions, or refereeing a game, and receiving comments and votes from the spectators via either telephone or two-way cable.

- For the first time Vidéotron personnel tried out the auto-programming idea, setting aside eight channels dedicated to particular subjects (art, science, etc.) and to specific clienteles (senior citizens, children, etc.).

Evaluation

These activities were not evaluated in depth, but Vidéotron did examine the popularity or demand for the various types of services offered over two-way cable in St. Jérome as a prelude to designing the St. Hubert system. For example, Vidéotron seems to have concluded that the most cost-effective design for an interactive system is to render both audio and video bi-directional between the cable headend and the main community institions and organizations only. Subscribers using the St. Hubert system are not able to originate video signals from their home as is done with the St. Jérome system.

The auto-programming project in St. Jérome was not as popular as it might have been because of the limited number and variety of the audio/visual programs. The project staff personnel was just inexperienced . The time-base correcter needed for playing the $\frac{1}{2}$" video tapes was not functioning well and an important part of the community and local programming as well as the auto-programming documents were in this format.

The on-demand project at St. Jérome terminated when the St. Hubert system started operations, however, in Fall 1977, Vidéotron-St. Jérome, with a greater variety of and more experience, reintroduced the service.

Télécable-Vidéotron-St. Hubert

The St. Hubert project was sponsored and evaluated independently by The National Film Board, Radio Quebec, and Vidéotron-St. Hubert.

This CATV company offers 32 channels: 13 for broadcast, 10 channels for local information (text) and 9 for on-demand programming.

The 10 Local Information Channels operate 24 hours a day, providing weather, TV guide, Calendar of Social Activities, Videoteque (new programs not in catalogue), Shopping Basket (consumer guide to prices), S.O.S. (emergency telephone numbers), Classified Ads, Visual Arts, Local News,and Auto-Programming Guide (titles/schedules of requested programs).

The nine Magazine Channels for "On Demand Programming" are available 24 hours a day for arts and local productions, cultural and social activities, sports and leisure activities, student's, social affairs, senior citizens, sciences and education, children, and community events.

These 19 non-broadcast channels operate 7 days a week. On-demand programs are requested by telephone. There is no additional charge to the subscriber for this service. The only constraints on this service are the availability of the magazine channel dedicated to a particular subject, and the number of times a particular program has been shown in a given time period. Reservations for longer than several days in advance are only allowed in the case of schools showing educational programs for their students.

A staff of 30 people work in the programming department. In addition, several people working in shifts are needed each day to answer the telephone, schedule the subscriber's choice of program and put it on air. The viewer calls a special telephone number which connects him to the auto-programming desk where questions about programs will be answered and a time and channel set for the program to be shown. During this call the subscriber may see the animator with whom he is speaking by selecting a TV channel dedicated to this use.

Télécable-Vidéotron can be expected to make use of new developments in technology when they prove cost effective. At the present time, however, the company feels that changing the home terminal to make it interactive and capable of handling new services would be uneconomical for them. On-demand programs are, therefore, still requested by telephone, and all the hardware is off the shelf.

Vidéotron has not yet acquired the number and variety of programs it should have for the auto-programming project. It acquires about 100 each month and has a total of about 3000. Consequently, some people do not access this service or access it infrequently. In particular, not all government or non-profit organizations who produce interesting programming have obtained universal rights to these documents, so cable companies cannot show these programs to their subscribers. Many educational and public-oriented institutions are aware of this problem but have not yet found equitable ways of reimbursing the participants in a program which was not specifically produced with universal rights. Consequently, many interesting archived productions cannot be shown as yet.

Interfacing with community organizations to produce new local programming is still a major task. A production association between a cable company and local organizations takes time to develop.

Evaluation - by Vidéotron

In a brief market study carried out by Vidéotron in July, 1976, 700 questionnaires were sent out to subscribers chosen at random. Two hundred and seventeen completed questionnaires were returned. Each questionnaire had sixty-four questions. Three televised sessions with an instructor showed people how to fill out the questionnaire.

- When asked which service was most attractive to them in deciding to become subscribers, respondents answered:

| | |
|---|---|
| "Local Information" television | 9.5% |
| "On-Demand" television | 44.7% |
| "Traditional" television | 37.6% |
| "Community" television | 8.2% |

- However, when asked to list by order of importance these same services respondents answered:

| | Choice 1 | Choice 2 |
|---|---|---|
| "Local Information" TV | 5.6% | 12.8% |
| "On-Demand"TV | 15.3% | 44.2% |
| "Traditional" TV | 69.3% | 14.1% |
| "Community" TV | 7.9% | 23.0% |
| "Hot Line" | 1.9% | 5.9% |

- About 47 per cent of the people questioned used the printed catalogue to order programs, while 13 per cent used the vidéothèque channel to find the subject titles and descriptions.

- When asked if one or more of the family members requested the auto-programming documents, the replies were as follows:

| | |
|---|---|
| More than once a week | 9% |
| At least once a week | 12% |
| At least every two weeks | 9% |
| At least once a month | 14% |
| Less than once a month or never | 51% |
| No reply | 5% |

- In addition to the former question, subscribers were asked if they watched the on-demand channels. The replies were 92% affirmative and 6% negative.

  In terms of number of hours of TV viewing, the subscribers' responses indicated:

| | |
|---|---|
| Over 21 hours | 37% |
| 11 to 21 hours | 26% |
| 6 to 10 hours | 28% |
| Less than 5 hours | 5% |
| No answer | 4% |

- A number of subscriber comments indicate three main areas of interest:

  1. The request most often heard is for a channel reserved exclusively for feature films.

2. Educational programs are requested. The most popular are those which offer practical information (wood working, handicrafts, cooking, etc.) and those dealing with social and family preoccupations (psychology, sexuality, etc.).

3. The third area mentioned was health care and preventative medicine. Vidéotron receives many requests for films on subjects such as abortion, drugs, venereal disease, and natural childbirth.

Approximately 33 per cent of all sample households have one TV set. Households with two TV sets represent 45% of the sample group and 18% of all households having two or more TV sets (63%) is high compared to the Quebec average of 32%.

Evaluation by Radio Québec

Radio Québec undertook a study of the viewing patterns associated with certain programs it had produced which were included in the on-demand selection. As well it conducted short interviews, in December, 1976, with 68 subscribers who phoned in to schedule documents for their own viewing. According to the findings:

- 50% of the people interviewed said they used the printed catalogue to find and order programs for viewing, while 2% said they used the vidéothèque channel; 18% said they were familiar with the program, having seen it already on TV, and 16% said they heard about the program from friends.

- The estimated frequency of telephone calls for information and scheduling purposes at the on-demand desk was one call every five to 10 seconds from 8:00 a.m. to midnight. From midnight to 8:00 a.m., the frequency of calls was about one every five minutes.

- In the small sample of people interviewed, their own estimate of the frequency of their requests for on-demand programs per week was:

| | |
|---|---|
| 15 times and more | 18% |
| 7 to 14 times | 22% |
| 1 to 6 times | 46% |
| Once in a while | 9% |
| No response | 5% |

- A breakdown by age of the people interviewed showed two main categories of users:

| | |
|---|---|
| 826 to 39 years of age | 29.2% |
| 12 to 17 years of age | 36.9% |

- Very few users of this sample were senior citizens. The number of children in this sample (9%) is considered very low. If more programming for children was available, researchers estimate that 26% of the users would be children under 12.
- The proportion of male users was 57% and female users 43%.
- Housewives represented 26% of the users, students 46%, and working people 23% of the interviewed sample.
- Subscribers who frequently ask for on-demand programs also tend to be heavy consumers of other TV entertainment. The majority view over 30 hours of programming a week.

In brief, despite the relatively small number of programs available, over 50 per cent of all Vidéotron subscribers ask for on-demand programs at least occasionally. Over half of that group request programs more than seven times a week. This service seems to provide an incentive for subscribing to Télécable-Vidéotron, enabling the company to increase its penetration in the St. Hubert area.

Funding

The St. Hubert system is privately financed by Télécable-Vidéotron. Headend equipment costs are close to $1 million dollars. This includes equipment such as: the mini-computer, time base converter, cassette recorders and modulator/demodulators. A mobile unit was also acquired for $100,000.

The cost of operations for all the locally-originated material is about $450,000 per year. This includes the salaries of about 30 people (1977-78) but does not include amortization costs and interest.

The user pays a $20 installation fee and monthly subscription fee which includes the rental of the channel converter.

Vidéotron had estimated a three to five year period for recovery of its initial capital investment but due to a higher penetration rate than anticipated for the St. Hubert area, this was accomplished in under 3 years.

Future Services

- Instead of the ten local channels offering text information relating to local help and services, Vidéotron would like to offer full motion color information packages.

- Vidéotron strongly feels that the concept of on-demand programming is a valid one and will keep the nine "magazine" channels for this purpose. Efforts will continue to be made to find diverse and interesting programs for these channels, and they will be catalogued to new ways using key words and subject indices.

- An objective for the future is the introduction of a Pay-TV system through which many new specialized services could be provided. Another area of interest is the interconnection of cable systems for the shared distribution of programs, thereby obtaining access to a greater population and reducing the cost per subscriber.

- Vidéotron feels that a new home terminal with interactive capacities will be needed if more new services are to be introduced. Eventually, it intends to offer its "local information" services on a digitally encoded basis to terminals with frame generators in subscribers' homes. The creation of a Pay-TV network in Quebec could provide the extra needed revenue and new equipment to do this.

- By Spring 1978, Vidéotron will expand its subscriber base and will also be offered services to communities adjacent to St. Hubert: Longueuil, Brossard, Laprairie, Delson, St. Constant, Ste. Catherine, Chambly, Carignan, Richelieu and Marieville.

- To counter the overload situation on the auto-programming channels and to provide more flexible programming, Télécable-Vidéotron is building a distributed hub system.

The hubs are interconnected but their channels can be programmed independently. In this way, specific channels can be used to serve a smaller subscriber group. It is estimated that in the near future, different programs could be provided to between 1,000 to 1,500 subscribers per month. Vidéotron intends to use optic fibers to interconnect its distribution hubs when feasible.

- Vidéotron plans to retrofit their other systems on the South Shore of Montreal: Beloeil and St. Bruno, giving them a partial two-way capacity which would result in the creation of a flexible hubbed network for that region.

- The high costs of TV production, especially for premium entertainment, may motivate Télécable-Vidéotron to form an association with other cable companies in Quebec for the creation of a Pay-TV network and related production facilities. The Ministry of Communications for Quebec has already outlined certain modalities for such a plan.

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# IDR System

Reuters, New York, N.Y.

October 28, 1977

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Computer-controlled delivery of customer-selected alphanumeric information is being marketed by Reuters to the business community. They are considering a similar service for the home.

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Reuters was founded in April 1850 by Paul Julius Reuter, who used pigeons to fly stock market prices from Brussels to Aache. Today, the organization has more than 1,000 correspondents reporting news around the clock in some 200 countries and territories. It also has one of the largest, privately-leased, world-wide, communications systems which interconnects large, computerized, message-handling systems and data banks.

Reuters North America is one of three operating divisions. Its headquarters is 1700 Broadway, New York City. Outside North America, the company operates two divisions: Reuters World Services, serving the news media, and Reuters Economic Services, supplying a wide array of specialized information to the business community. Reuters' head office is at 85 Fleet Street, London.

In April 1971, Reuters introduced NEWS-VIEW teletext service, a cycled, two-channel news package available on cable television. One channel carries general news. The other carries financial information on weekdays, and sports at night and throughout the weekend.

Late in 1972, Reuters North America, through IDR Inc., a subsidiary, developed a high speed information retrieval system. It was field tested in 1974 on the Manhatten Cable system in New York. It went into operation in New York City the following year.

The IDR system uses a combination of computer, cable and television technology to deliver data at a speed of more than four million words a minute (4.2 million bits per second). This speed is attained through a transmission technique that sends out packages of 32 characters of information at a time from a computer disk.

Transmission is one-way on a continuous basis, with the central computer constantly retransmitting the same set of information. IDR-supplied equipment picks out information for the subscriber as it flows by. All the data is repeated every three to five seconds.

Information is gathered and processed at Reuters' central computer system, known as Cable Head, which has a capacity of 600,000 words. From here, information is moved via satellite to the cable system's head end for transmission through a cable channel.

The subscriber equipment includes a keypad to request information, a control box to capture it, and a video screen to display it. The centralized computer system, located at Reuters, tells the control box what information the subscriber is entitled to receive. Each item of information is coded. The subscriber taps the appropriate codes on the keypad to retrieve and display the desired information.

The display on the screen is alphanumeric. The maximum number of characters is 16 x 64 for the IDR system and 16 x 32 for NEWS-VIEW.

The information carried by the system is grouped according to subject, and each group has an identification code. Within the group there are further codes relating to each item. News items are displayed as full screen headlines with a code alongside. The complete text of a particular story can be displayed by keying the appropriate code. (A sample of the index has been provided at the end of this report.)

The information is provided in two other modes -- cycled and fixed. In the cycling mode, the screen display changes automatically every 15 seconds. In the fixed mode, after information is selected, "pages" can be "turned" using special keypad buttons.

The system information is based on Reuters' news files, stock and commodity exchanges, foreign exchange quotations and money market rates. Manhatten Cable supplies a racing service produced by Reuters from information supplied by the publishers of the Daily Racing Form.

The fees for the Reuters services range from $300 to $1,500 a month, depending upon the subscriber's selection.

Having demonstrated the viability of the IDR system, Reuters is now working on the development of a small and economically-priced terminal for the home market which would allow cable television subscribers to call up news and other information on the home TV set. In addition, the business service is being expanded to include other cities in the United States and potentially in Canada using satellites and microwave transmission.

Samples from a Typical IDR Group Index

GROUP 3 LIVESTOCK

| | | |
|---|---|---|
| Page: | 100 | Index |
| | 100-104 | Futures Markets Commentaries |
| | 105-108 | News Headlines (Livestock) |
| | 160- | Market Quotations -- 160 Iced Broilers - CBOT |
| | | 161 Live Cattle |
| | | 162 Feeder Cattle |
| | | 163 Live Hogs |
| | | 164 Pork Bellies |
| | | 165 Shell Eggs |

GROUP 6 BUSINESS NEWS

| | | |
|---|---|---|
| Page: | 100 | Index |
| | 101 | Stock Market Commodity |
| | 102-104 | Stock Market Indicators |
| | 105-106 | News Headlines (Business/General) |
| | 107-108 | Commodity Market Trends |

GROUP 25 NYSE and AMEX TICKERS

| | | |
|---|---|---|
| Page: | 100 | NYSE TICKER |
| | 101 | AMEX TICKER |

GROUPE 127 NEWS-VIEW (All in Cycling Mode)

| | | |
|---|---|---|
| Page: | 1 | Long Island Railroad Delays/Weather/Ski Report |
| | 2 | Domestic and International News |
| | 3 | Sports News |
| | 4 | Financial News |
| | 5 | Financial Statistics |
| | 8 | Racing News |
| | 9 | Consumer Drug Guide* |
| | 10 | Consumer Shopping Guide* |

| | |
|---|---|
| 11 | Cablevision Systems' "Congratulations Neighbors" |
| 12 | Cablevision Systems' Movie Guide |
| 13 | Cablevision Systems' Local News |
| 14 | Cablevision Systems' Local News |
| 15 | Cablevision Systems' Advertising |
| 16 | Cablevision Systems' Children's Channel |

(*The Consumer Guides are compiled by Vector Enterprises for Cablevision Systems, Inc of Long Island, N.Y.)

GROUPE 28 LONDON COCOA/COFFEE/SUGAR PRICES

| | | |
|---|---|---|
| Page: | 100 | Cocoa |
| | 101 | Coffee (Robusta) |
| | 102 | Coffee (Arabica) |
| | 103 | Sugar |

GROUP 29 MONEYGRAPH/I.M.M.

| | | |
|---|---|---|
| Page: | 100-119 | Reuter Moneygraph |
| | 120-126 | I.M.M. Prices -- 120 Mexican Peso |
| | | 121 Dutch Guilder |
| | | 122 Swiss Franc |
| | | 123 British Pound |
| | | 124 Canadian Dollar |
| | | 125 German Mark |
| | | 126 Japanese Yen |

GROUP 98

| | | |
|---|---|---|
| Page: | 0 | New York Stock Exchange 15-Minute Delayed Ticker |

# TOCOM II

## WCATV, The Woodlands, Texas

## TOCOM, Inc., Dallas, Texas

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The TOCOM II System provides security and alarm services over cable television. The TOCOM System at Woodlands, Texas is probably the most representative of the seven which are currently operational.

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| Contact | WCATV | TOCOM |
|---|---|---|
| | Ben Rozac,<br>General Manager<br>Woodlands CATV, Inc.,<br>2407 Timberlock Pl.,<br>The Woodlands, Texas<br>77380<br>U.S.A. | John Campbell,<br>Chairman of the Board<br><br>Michael Corboy<br>President<br><br>TOCOM, Inc.,<br>P.O. Box 47066<br>Dallas, Texas,<br>75247<br>U.S.A. |
| Tel. No. | 713-367-2288 | 214-253-3661 |

This business was started in 1951 when John G. Campbell founded the CAS Manufacturing Company of Dallas, Texas, a firm which in 1958 built the first solid state CATV amplifier and in the mid-60's built the first solid state CATV head end. In 1972 a test bed for the TOCOM system (TOtal COMmunication) was completed in Irving, Texas, and since then six additional TOCOM II systems have been installed. Irving is still used for experiments and it recently became the test bed of a new TOCOM III system which employs microprocessor technology. The goal of the TOCOM system is to provide low-cost useful services.

All six operational TOCOM II systems have been installed on demand, usually in new towns. The system consists of three primary elements: a bi-directional cable distribution system; a computer-controlled central data terminal and the remote units.

The bi-directional cable distribution system may be either single or dual trunk configuration, and exhibits a downstream transmission bandwidth from 40 to 300 MHz to allow for 26 channels of television reception. The system also exhibits an upstream transmission bandwidth in the 5 to 25 MHz range for data return. The Central Data Terminal is capable of polling 60,000 remote units every six seconds.

Each subscriber on the system is provided with a remote unit that includes a 26-channel converter; an RF receiving section; a crystal-controlled digital transmitter for return signals and a digital control system. Each Remote Unit has a ten-digit ID Number, which provides for addresses for 1024 subscribers, of which only 1000 (0 to 999) are used. Each group of 1000 subscribers are assigned a 100 kHz frequency band, and up to 60 groups can be accommodated in one trunk.

The system has many applications, among them alarms (fire, burglar and medical emergency), polling and subscriber response, medical monitoring, meter reading, remote control, pay TV, amplifier status monitoring and computer controlled Automatic Gain Control and computerized billing.

FUNDING

TOCOM is a small company which grossed between $3.5 and $4 million in 1976. Selkirk Holdings, a Canadian firm, recently acquired a one third interest in the firm.

The TOCOM home terminal presently costs about $300. It includes a 30 channel converter as well as the logic for two-way interaction via narrow-band transmission to the head end.

The Woodlands is a satellite city about 30 miles north of Houston with a total area of 20,000 acres available for development. Some 700 acres have been developed and about 1,100 homes are occupied, 200 are ready for occupany and 300 are under construction. All lots are fully serviced. This caused initial problems for the TOCOM operation on the site, but they disappeared with the formation of a construction subsidiary which was responsible for digging trenches and laying cable. Eventually, the other utilities were contracting with the TOCOM construction company to place all utilities.

Residents of The Woodlands (near Houston), Texas have the option of not subscribing to the TOCOM II services in their community; subscribing to TV service only ($7 per month); subscribing to security services only ($5 month); or subscribing to the full-service package ($12 per month). All service charges are flat-rate monthly charges which are independent of the number of outlets, or number or type of alarm devices in the home. If the subscriber desires security services, he must purchase a home terminal unit. Some builders purchase the units in advance and supply them with the house.

At present TOCOM's WCATV operation in Woodlands offers the following services:

1) Broadcast Television - six stations.

2) Local Origination: four channels for weather, local, regional, national, financial, and sports news.

3) Access: WACTV provides a television studio and production facility. In addition, three channels are reserved for use as education access, government access, and lease access by appropriate agencies.

4) Security Service: fire, police and medical alarms.

Fire alarms are initiated by automatic smoke and heat sensors installed in the home and are automatically printed out at the Central Data Facility, at the Emergency Services Dispatcher, and at the Fire Station, typically within 20-30 seconds of the time the alarm is initiated.

Police alarms may be initiated in the home manually, or by optional instrusion detection systems that utilize the same police alarm circuit.

Medical Alarms (request for medical assistance) are manually initiated by the resident and are routed to a 24-hour Emergency Medical Service that is prepared to respond, administer first aid and/or life-support services, and provide transportation to nearby medical facilities in life or death emergencies. Outside ambulance services are normally utilized for transportation of non-critical cases.

If communications between the central computer and a home terminal unit are lost for any reason, an alarm is generated which automatically identifies the home. This type of alarm is typically investigated immediately by both WCATV personnel and by the local police, to determine the reason for the loss of communications.

What follows is an example of a typical alarm printout. The first line is that data retrieved from the home terminal unit and the CPU clock. The second line is retrieved from the computer memory and describes the user.

| GP | ID | FIRE | MEDICAL | POLICE | MONITOR | DATE | TIME |
|---|---|---|---|---|---|---|---|
| 2 | 49 | CLR | CLR | *ALARM! | CLR | 11/11/77 | 11:55 47 |

| CODE | PHONE | ADDRESS | LAC | NAME | EMP | SSAP |
|---|---|---|---|---|---|---|
| 201004 | 3671180 | 2107 W SETTLERS WY | 220 | PAEZ, JUAN | YNY | L7212 |

| GP | ID | FIRE | MEDICAL | POLICE | MONITOR | DATE | TIME |
|---|---|---|---|---|---|---|---|
| 2 | 49 | CLR | CLR | *CLR | CLR | 11/17/77 | 11:55:59 |

| CODE | PHONE | ADDRESS | LAC | NAME | EMP | SSAP |
|---|---|---|---|---|---|---|
| 201004 | 3671180 | 2107 W SETTLERS WY | 220 | PAEZ, JUAN | YNY | L7212 |

LAC: L - number of levels (storeys) in the house
A - number of adults living in house
C - number of children living in the house.
EMP: E - authorize forceable entry (Y or N)
MP - type of burglar alert system
M - motion detector inside the house (Y or N)
M - perimeter windows/doors (Y or N)
SSAP: key number of the home control panel for the key

Presently, relevant medical history of residents is in printed form. WCATV is working on an automated retrieval system which, upon a medical alarm, will produce a printout of a summary form of the medical history.

EVALUATION PHASE

The average time from the time the detector goes off until the truck arrives at the location is two minutes. The fire department is learning how to deal with emergencies on a short notice. They are evolving towards using small 3/4 ton, 2-man crew vehicles. This can be contrasted with the average residential fire in the USA which goes unreported for 18 minutes.

In alarms with no fire the distinction should be made between false alarms (malfunction of equipment or deliberate triggering) and unnecessary alarms (as a result of normal usage, such as a fireplace giving too much smoke. The ratio of unnecessary alarms to false alarms has been found to be about 100 to 1. Unnecessary trips in response to alarms are minimized by a telephone based verification procedure.

The medical alert system is useful for a variety of different reasons ranging from minor and major accidents to heart attacks.

The perimeter alarm systems are installed at the time that the house is built at a cost of about $4 per opening (door and window). They can also be provided after the house is built at about 4 times that price. The basic statistic quoted about Woodlands is that 42 per cent of the homes have perimeter protection systems and the rate of unsuccessful attempts at forced entry is exactly the same.

In general, the security, fire and medical response teams in the Woodlands have been enthusiastic about the advantages of the TOCOM system, leading to the conclusion that any difficulties such as high unnecessary or false alarm rates are minor compared to the benefits of better protection.

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## MANHATTAN CABLE, NEW YORK, N.Y.

October 27, 1977

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Manhattan Cable, due in part to the composition of its subscriber group, has been active in leasing channels for business services such as Reuters' Monitor service, and in public access television.

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New York's Manhattan Cable, a subsidiary of Time-Life Inc. since 1975, serves 91,000 subscribers in South Manhattan, an area where reception tends to be poor because of the high buildings. Cable penetration is between 40 per cent and 50 per cent. Because there are 13 broadcast channels available to the community, Manhattan provides a diversity of services, with emphasis on public access programming. Its basic fee of $10 per month includes rental of a converter. Both the company and its customers generally have a liberal attitude towards the content and style of the programs shown.

PUBLIC ACCESS PROGRAMMING

Public access programming started 6 years ago. In the last three years, Time-Life has invested some one million dollars in access activities. Some 50,000 people pay 60 cents every two weeks to obtain the public access schedule of programs in "Cable TV World", which describes all cable programs on Teleprompter Cable TV and Manhattan Cable TV, including all Home Box Office services and public access channels.

Manhattan Cable has allocated four channels for public use and four channels for government use. Two of the public access channels are available at no charge for up to 1 hour/week for non-commercial programming. One of these two channels is for series programs in the same time slot each week, and the other is for special one-time only programs or for preemptable series.

One leased channel is available for $25 per half-hour. Its programs must be locally produced and may include commercials. The fourth public access channel is the program guide.

The city government channel is reserved for community-oriented programming by local elected officials, city departments and agencies and Community Boards. Scheduling for programming on this channel is arranged through the Office of Telecommunications of the City of New York.

Twenty hours (40½ hour tapes) of pre-recorded programming are shown on the public access channels per day, for a total of 600 to 800 programmed hours per month. These figures include programming originated from Teleprompter Corp. which has the franchise for North Manhattan. The two cable companies interconnect to exchange public access tapes and live commercial programming.

Manhattan Cable also broadcasts live programs from the studios of two independent production centers: E.T.C. and Automation House, which are both non-profit organizations. Average E.T.C. rates are between $25 and $30/hour for a black and white production. House rates for a color production, on 3/4 cassette tape using professional help, average about $100.00/hour.

Most productions are created in a studio rather than by using portapac equipment. Manhattan Cable used to teach people how to use portapaks, but this function has been taken over by other institutions who loan their equipment to students or professionals. Some fifteen to twenty organizations produce more sophisticated programming at a cost between $1,000 to $1,500 per show. They finance their productions by buying a half-hour time slot for $25 on Manhattan Cable's lease channel, then selling $75/30-second commercial spots for this time slot.

Manhattan Cable has about 30 phone-in shows a week and encourages this type of programming.

There are no ratings, or statistics of the number of people watching each channel. The only feedback Manhattan receives is through telephone calls and community participation in the production of programs.

Manhattan Cable has two leased channels for commercial program use. The rate is $100 per hour. Programming on these channels can be produced outside of New York.

The cable company has reserved one channel for its own use. It is available for commercial leasing (business applications) at the rate of $200 per hour.

Reuters News Agency's MONITOR service, including the financial information packages, is offered to the business community on one channel. Manhattan has a 10-year lease with Reuters.

FUTURE PLANS

Because Manhattan Cable already has a Pay-TV service, a possible next step might be to charge for certain professionally-made and locally-produced programs. The originators of these programs would then be able to finance their productions, and Manhattan Cable would acquire revenues by providing the billing mechanisms for these programs. Audience response would encourage successful programming and discourage unpopular shows. This "open market" solution might, however, discourage minority group programming and diminish the concept of free public access for all types of presentations, including unpopular ones.

In time, the networking of successful public access programming might provide a viable alternative to current commercial broadcast fare and second run movies. Another possible service for the future is a "video juke-box.

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- Rate Sheets for Portable Equipment Rental and Experimental TV Co-Op Studio Rental

Cable TV World Magazine,
505 Eighth Avenue, Suite 1804,
New York, N.Y. 10018

# MRC-TV

Metropolital Regional Council, Inc.

New York, U.S.A.

October 27, 1977.

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MRC-TV is a two-way, black and white television system which provides audio-visual interaction among government officials in the New York area.

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The Metropolitan Regional Council of New York (MRC) has been in existance since 1957. Its primary aim is to foster cooperation and coordination among some 550 agencies and governmental units in a 10,000-square-mile area including parts of three different states and 22 countries.

In 1969, faced with growing communication problems, MRC received a $50,000 grant to conduct a feasibility study into using television as a solution. The first phase of the evaluation procedure, which ran from June, 1971 to the end of March, 1972 (references 1,2), developed an evaluation methodology and gathered baseline information on the nature of intergovernmental communication in a metropolitan environment. The report on Phase I evaluation was used, in part, to guide the planning and operation of the MRC-TV system.

The second phase began in June, 1972. At this point the MRC-TV system had already been designed, equipment had been constructed and was in the process of being delivered. The first experimental program of MRC-TV took place in July, 1973.

MCR-TV is a television system which provides two-way, black and white, audio-visual interaction among government officials located at a central facility at the World Trade Centre Building in downtown Manhattan and at 13 outlying locations (10 two-way and three one-way, receive only). Eventually, the system should include 17 locations, each equipped to reach subsites in their near vicinities through one-way receiving communication channels.

One main transmitter in the central facility broadcasts omnidirectionally to the remote facilities via two pylon antennas located on the roof of the World Trade Centre. Each of the 10 two-way remote sites is equipped with two parabolic antennae which are used to receive and transmit.

Four low-power omnidirectional antennae are used to relay the received program from the remote site to additional receive-only locations scattered within a 10 to 15 mile range, such as borough and village halls, fire stations, police stations, hospitals and neighborhood community centers.

The main purpose of the MRC Television Network was to save travel costs, and to encourage interaction among officials. Before the television conferencing network was operational, for example, there was some difficulty getting certain officials to attend meetings. Now, the system operates for an average of four to five hours daily, and officials should find it easier to attend meetings using the system.

MRC-TV publishes and distributes a regular monthly program schedule. Specific program announcements are sent to a list of invitees two weeks prior to any given program.

Although MRC-TV was conceived primarily for governmental communications and elimination of administrative problems (see reference 5), its biggest success appeared to be the training of government employees. Local governments used the system instead of sending employees to schools and colleges. As a result, man-hour loss and travel time were greatly reduced.

During the six month period from January 1 to June 30, 1977 (see reference 8), for example, MRC-TV produced 268½ hours of live training distributed among twenty In-Service Training Programs.

The courses included:

| Offered for College Credit | Number of Hours |
|---|---|
| Public and Business Administration: A Comparative Approach | 20 |
| **Offered for Secretarial Development** | |
| Elementary (basic) Business English | 20 |
| Advanced Business English | 20 |
| **Offered for Increased Supervisory & Managerial Performance** | |
| Handling of Discipline & Grievances | 6 |
| Management of Time Workshop | 6 |
| Management of Objectives | 12 |
| Effective Writing Workshop | 7 |
| Program Evaluation, Performance and Planning Techniques | 3½ |
| Problem Solving and Decision Making Workshop | 6 |
| Report Writing (special) Improving Writing Skills | 6 |
| **Offered for Specialized Training** | |
| Criminal Investigation for Law Enforcement Personnel | 40 |
| Alcohol Education Workshop | 5½ |
| Pesticide Management | 8 |
| Drug Abuse Education Program | 3 |
| New York State Child Abuse and Neglect Training Project | 55 |
| Urban Conversational Spanish | 37½ |
| The Federal Register - What It Is and How To Use It | 2½ |
| Equal Employment Opportunity and Affirmative Action | 6 |
| Impact on the Corrections System; Court Decisions and Prisioner Rights | 2 |
| Law Enforcement Workshop - An Economic Analysis of Organized Crime | 2½ |
| TOTAL HOURS | 268½ |

The following is a breakdown of the number of government employees who were trained over the MRC-TV network during the January-June, 1977 time period:

| COUNTRY | NUMBER OF PERSONNEL TRAINED |
|---|---|
| Bergen | 87 |
| Essex | 230 |
| Middlesex | 172 |
| Union | 240 |
| Paterson | 25 |
| Nassau | 487 |
| Rockland | 60 |
| Islip | 110 |
| Westchester | 86 |
| Stamford | 96 |
| Federal Plaza | 185 |
| New York City | 471 |
| TOTAL TRAINED IN REGION | |
| January - June, 1977 | 2,249 |

Local Government Seminars (See reference 8)

In addition to the televised training courses, MRC-TV also continued its use of the system for seminars and issue-oriented discussions.

In large measure, the approach taken was increasingly oriented to pragmatic solutions adaptable by officials and program administrators in a variety of jurisdictions.

A sample of this kind of programming would have to include:

Hostage Recovery
Bridge Deck Rehabilitation
Managing Public Housing
Federal Aid Week
New Jersey Uniform Construction Code

There are but a small portion of the kinds of "how-to" informational programs MRC tried to put into the reach of local administrators. The effort extended into such other areas as health service delivery, water quality planning, mortgage finance, energy conservation, and consumer affairs.

On the other hand, MRC did not give up the broad scale discussion of important regional issues for which no immediate solution is available. Believing that the ventilation of issues is an important step in reaching a consensus in matters of regional concern, the Council sponsored panels on redlining, unemployment, the fiscal crisis, land use and zoning litigation, property taxation, off-shore oil, and many others.

## FUNDING

The network was funded in a variety of ways. Initially, HUD provided certain staff funds, the U.S. Civil Preparedness Agency furnished some programming funds, and the participating municipalities supplied the hardware funds. In addition, the National Science Foundation funded a cost-benefit analysis of MRC-TV in cooperation with the Columbia Bureau of Applied Research. The annual operating costs of MRC-TV were about $150,000 at the time of the visit.

Future Plans

MRC's plans for the future include:

- Trying to get more communities into the system.
- Trying to get many more one-way sites (receive only).
- Improving on quantity and quality of programming.
- Producing up-to-date programs containing current issues relevant to muncipalities (e.g., law enforcement, firemen, etc.).
- Providing a direct link via microwave to the state Capitals of New York, New Jersey, and Connecticut, as well as possible microwave or satellite links to Washington, D.C.
- Organizing a face-to-face video teleconferencing meeting between the Mayor of New York and the Mayor of Los Angeles.
- Broadcasting relevant meetings and educational programs by connecting MRC-TV to cable companies. Specifically, MRC was close to an agreement with Cablevision, a cable TV concern supplying Long Island, Westchester and Bergen County, to furnish MRC-TV programs directly to home viewers (see reference 8). This had a number of implications: encouraging awareness of regional problems, and thus civic participation in their solution; identifying major regional actors and educating citizens to their ideas, and changing the entire way in which government communicates with its constituencies. The potential is obviously enormous, and Cablevision numbers its subscribers at over 70,000.

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# BERKS CABLE TV

## READING, PENNSYLVANIA, USA.

October 20, 1977

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Berks Cable, with support from the National Science Foundation, has sought to encourage community involvement of senior citizens through the use of the cable facility in Reading. Presently, a total of about 70 hours a week of locally-originated programming is being distributed by Berks.

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Berks TV Cable Company began operating in the city of Reading in 1964. Its local origination programming started in 1967 with a weekly programme entitled "This is your Mayor". Suburban TV Cable Company, serving the South and West of the city of Reading since 1966, began local origination in 1968. A year later the two cable companies interconnected for local origination. In 1970 there was a demonstration of a two-way programme between the Berks studio and a hotel in downtown Reading which may have been the first two-way programme ever presented on cable TV.

American Television and Communications Corporation (ATC) purchased Berks TV Cable Company in 1970 and Suburban TV Cable Company in 1971. ATC was founded in 1968 for the purpose of providing broadband communications services, including two-way cable, common carrier microwave systems and satellite systems. Its headquarters are in Denver, Colorado.

In 1971, the Alternate Media Centre (AMC) of New York University, in cooperation with ATC, established a public access centre in Reading at the Berks-Suburban system. Three years later, they formed a consortium, together with the city of Reading, the Berks Country Senior Citizens Council and the Reading Housing Authority, to plan social and public uses for a two-way communication system in that city.

Their project was funded by the National Science Foundation (NSF), in May 1975, for a period of 30 months. NSF-funded Programming began in January 1976 and ended in February 1977. The NSF overall funding expired in December 1977, but activity is continuing, albeit at a reduced level.

The primary purpose of the research design was to determine the costs and benefits of using a system of interconnected neighborhood communication centers (NCC's) for the delivery of public services.

An initial decision was made to focus the research on the elderly population because senior citizens are major consumers of social and municipal services. Moreover, their lower mobility, relative to other age groups, increases their need for telecommunications. People over 65 comprise 15.8 per cent of the population of Reading, a city of 88,000 located approximately fifty miles northwest of Philadelphia.

As a site for an experiment, Reading had several distinctive features. It had a city-wide cable system on which two-way programs were being transmitted regularly. The members of the NYU-Consortium had worked together since 1971, 4 years before NSF funding; and in addition, the city had been responsive to the needs of its senior citizens.

The ATC-Berks TV Cable Company system is a 70-mile bidirectional, dual-trunk delivery system serving 35,000 subscribers with five lowband, 40 FM, seven highband, and two midband channels. Upstream transmission is provided via a second trunk cable. It accommodates up to eight television channels originating in remote sites throughout the cable system, and transported back to the head-end antenna site by a dedicated return trunk.

More than 25 channels are available off-air or imported from New York through microwave links. These, plus the locally-originated material, have to be squeezed into 12 channels available to a cable subscriber. The regular subscribers' system is not adapted for the use of converters. To help handle the program scheduling and channel switching there are two special-purpose programmable switching machines at the head-end.

For the senior citizens' program, three Neighborhood Communication Centers (NCC's) - Kenedt, Horizon and Hensler - could send video signals to the head-end. The NCC's were located at a multi-purpose senior citizens' centre, a public high-rise apartment building for 165

senior citizens and a public garden development for 118 senior citizens which is located within a larger public housing complex. Other two-way locations, such as the Mayor's Office, were added to the network on an ad hoc basis. The added locations were equipped with equipment which can be moved as needed.

Nine school districts are wired, and five of them have capabilities for two-way transmission. Each school district has been designed as a separate CCTV system with a control centre. This allows communications on five levels: (1) within specific school buildings, (2) between buildings within a school district, (3) between school districts, (4) between one or more buildings and/or districts and other entities in the community, and (5) from a school system direct to cable subscribers. There is also a two-way microwave link between Kutztown State College and the Berks Cable System.

Two of the three hospitals in Reading have elaborate studio facilities and a library of videotapes with educational material for staff members.

FUNDING

The NSF grant that started the project and consequently Berks Community Television (BCTV) was $875,000, of which no more than 10 per cent could be devoted to hardware.

The operating budget of BCTV for 1977/78 was about $100,000, which came from a number of sources, including the remnants of the original NSF grant and funds from various foundations and government agencies. There was no financial support given by Berks Cable with the exception of providing office space. BCTV asked the city to pay them $300 a week for services rendered in programming which brought the mayor and city councilmen to the public of Reading.

NSF provided a further grant of $25,000 to New York University (NYU) to study the transition period after the major grant ended. Some $40,000 of this is going to BCTV.

BCTV had a total of four full-time employees and eight part-time employees requiring a salary budget of around $75,000. Other operating costs were about $25,000/year.

The basic rate for the cable was $6.50 per month but this may be increased to pay for new services in the future.

In addition to the distribution of broadcast programs and the one-way local origination programs, the main interactive services between two or more locations of Berks TV Cable were programming for:

- Senior Citizens
- School programs
- Medical information

Senior Citizens

The participants in the senior citizen interative programs were the elderly themselves, those who provide them with services, and members of public and quasipublic agencies (See reference 5). The programming was planned and produced by the elderly and was molded by their interests. Three broad subject areas were emphasized: 1) outreach programs, which attempted to increase the number of senior citizens who take advantage of benefits such as food stamps; 2) informational programs, which helped people already enrolled in a program to take full advantage of its benefits; and 3) actual service delivery, which represented some of the services provided by Berks County Senior Citizens Council such as recreational activities, and crafts classes.

Most of the communication among the participating locations was through two-way video which enabled the participants to see and hear one another. Switching was managed by a program director located at the head-end. Occasionally, programs were produced utilizing a one-way video, open-audio mode.

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

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

The NSF-funded trial ended in February 1977, and the senior citizens programs have continued with local funds. This service, provided by BCTV and operating every weekday from 10 to 12 in the morning, is cablecast on an open channel with no converter required. It is taped for retransmission at 8 p.m. every day.

The most recent survey of the viewing public for the senior citizens programming showed that there are some 9,000 viewers, of whom 7,500 are senior citizens, one half of the 15,000 senior citizens population of Reading.

There was about a one per cent telephone-in rate representing about 90 calls during a two-hour show. The programs were being made available to the cable public at large, for both viewing and call-in.

School Programs

The users of the school television network have been many and varied. New concepts are constantly developed by the users. For an overview of usage and facilities the booklet "Berks Schoolcasting", (reference 4) is recommended. The following is an extract:

- Dissemination of instructional material to classrooms.
- Four way, simultaneous audio/video dialogue between the student councils of four local high schools.
- Two-way simultaneous audio/video dialogue between a political science class and Reading's City Council.
- Multi-directional programming between local schools and three senior citizen communication centres.
- Multi-directional programming between local high schools and Kutztown State College which offers college courses for advanced high school seniors.
- One-way audio/video programs produced by the schools for viewing by cable subscribers at home on Channel 5.

Medical Information

The two-way link between hospitals was used for a test of psychiatric evaluations via video.

Evaluation

The salient feature of the system was local access and participation. The important points considered were the peoples' values, needs and demands. Ratings didn't count, nor did the number of people watching a program. What did count was the continued production of programmes.

Critique

In spite of the success of local access, Berks CATV was planning to expand the number of channels to every home by using converters so that new services can be offered - particularly services like PAY TV. A main point that needs to be remembered from this experience is that local program origination is not uniquely a cable TV company responsibility. It is also a responsibility of the community, which must generate the programming, and should provide the crews for the camera equipment.

In a broader context - from the point-of-view of Berks' owner, ATC - the success of local access programming in Reading is unusual. It would appear to result from a unique combination of sponsorship, an aging community, lack of local competition and the availability of programming from nearly major centres. Technologically it works because of its simplicity.

ATC attempts to build up local access in other communities have been no where near as successful as in Reading, and generally the cable industry shys away from it.

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(2) Moss, M. L., "Interactive Telecommunications and Local Community Processes", paper presented at the Symposium "Communications in Wide-Band Distribution Networks with Backward Channel Experiences with Pilot Projects", sponsored by the Munchner Kreis, Munich, Germany, April 27-29, 1977.

(3) "Public Service Uses of Interactive Television", Interactive Telecommunications Research, New York University/Reading, Pennsylvania.

(4) "Berks Schoolcasting", booklet.

(5) Kay, P., "Social Services and Cable TV", Cable Television Information Centre, Peoria, Illinois, July, 1976, pp. III-37 to III-40.

# COMP-U-SHOP

Simpsons-Sears, Toronto, Ontario

September 28, 1977

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The COMP-U-SHOP service of Simpson-Sears is provided to registered catalogue customers so that they can enter their orders directly into the computer at Simpsons-Sears via TouchTone telephone.

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CONTACT: Mr. Duncan McAllyster, Systems Development Group
Mr. Lloyd Chiotti, Programming Manager

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222 Jarvis Street
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Simpsons Sears is a Canadian company, founded in 1953, and at the time of this visit, was owned 50 per cent by Robert Simpson Ltd. and 50 per cent by Sears-Roebuck. Its outlets include four catalogue centers, 650 sales units, 54 retail stores and more than 200 agencies. Its catalogue shopping service provides some 70,000 items which would be difficult to display in a retail store. In Toronto, catalogue orders constitute about 20 per cent of the phone calls handled by 350 Simpson telephone operators. The orders are written on special forms which are later coded and batch-processed by computer. They may be C.O.D. or on a Simpsons, Sears or Sears-Roebuck credit card. The merchandise is either delivered to the home or picked up at a catalogue store.

The increased use of computers to provide on-line information about inventories and customer credit, led to an experiment, in 1972, which allowed customers to enter their orders directly into the computer memory using a TouchTone telephone. Participating customers were registered with the company.

In 1977, a new experiment was developed which extended the service to customers without TouchTone telephones. These customers were required to read order codes to the telephone operator who would key them into the computer.

Both versions of the system are now in the Simpsons-Sears catalogue under the name "COMP-U-SHOP". The number is 416-364-8600.

The COMP-U-SHOP service was planned and developed by a Toronto group responsible for the systems development of Simpsons-Sears throughout Canada. The main objective of the service was to reduce the cost of providing operator-handled catalogue orders, and to develop

data for the planning of a large scale computerized system for on-line inventories, credit and customer account information.

The COMP-U-SHOP system was the first of its kind. It used a 12 button TouchTone keypad for data entry using the telephone switched network. In the first version of the trial, the customer dialed the number 416-364-8600 and the computer both answered the line and controlled the interaction. The customer entered the appropriate numbers, which were provided in a special form, when asked to do so by the computer. The computer prompted the user with a voice response unit which had a capability of about 128 seconds of conversation (about 200 words). The signals to the computer were the tones generated by a TouchTone telephone.

The computer waited about 30 seconds for the first digit. If it was not entered, it repeated the questions up to three times before terminating the conversation. Once the first digit of a number had been entered it only waited about 5 seconds for each successive digit. The computer did not repeat the numbers to the customer, so there was no verification of the order until the merchandise was received by the customer.

The TouchTone telephone was used as the order entry device because it was the only communications keyboard that was found in a significant number of homes - 15 per cent of homes with telephones in Toronto. Because even this fraction is relatively small when a entire city's population is the market, another version of the trial was initiated.

For this second trial, standard telephones were used to contact the operator who, in turn, used the TouchTone keypad to enter data. Bell Canada provided the circuits for the three-way interaction. The computer still had control of the process. The customer read the numbers requested by the computer, but the operator listening to the conversation did the keying into the computer. The operator did not talk to the customer unless difficulties arose.

The system was capable of transferring calls to the operator with an on-line CRT terminal.

Selection of Users

For the first trial, potential users were selected by making a list of the best catalogue-sales customers and asking Bell Canada to identify those who had TouchTone telephones. When asked to participate in the trial, about 2,700 registered.

Following the second trial, the system was made available to everyone, with operator assistance for those without TouchTone Telephones. About 3,000 customers were registered. This procedure was necessary to avoid repeated and wasteful entry of customer identification information.

Currently, the store operators get between 20 and 30 inquiries per week from people who want to register for this service. Not all customers want to go through this process. The credit authorization must be handled internally because Simpsons-Sears do not participate in any major credit card schemes other than its own.

Of the 3,000 people registered with COMP-U-SHOP, between 600 and 700 of them use the system regularly (ie: once every few months).

The system is operational from 8 a.m. to 12 midnight, Monday to Saturday. The operator-assisted version is available from 9 a.m. to 4 p.m. only. The average number of calls to COMP-U-SHOP is 50 out

of 80,000 to 100,000 orders per day in all catalogue sales offices in Ontario and Quebec.

## FUNDING

The COMP-U-SHOP system was funded internally by Simpsons-Sears. The total investment in the trials to date is not known, although it is probably not more than $50,000.

## EVALUATION

The two forms of the COMP-U-SHOP service were given evaluation trials of 3-months each. Simpsons-Sears prepared confidential reports on both.

The studies suggest that the COMP-U-SHOP operator could handle approximately three times as many calls than she could if she were conversing directly with the customer and filling in the normal manual order entry sheets. Accuracy in filling in the order entry sheets was also improved. In addition, Simpsons-Sears saved the postal costs associated with mailed confirmation of orders.

Other potential advantages appeared to be improved awareness of merchandise availability and fewer errors in filled orders because of computer confirmation of each order as it was received. Neither of these advantages were fully realized in the present system because the service did not reach a large enough population base. A Simpsons-Sears study showed that a positive cost/benefit ratio would be obtained if the service was implemented across the country.

## LIMITATIONS

There are some natural limitations to the expansion of the COMP-U-SHOP service use of the computer. If the COMP-U-SHOP service were to be used by a greater number of customers, such as the whole of Toronto, or eventually, the whole of Canada, problems would arise related to the generation of adequate access codes for all users; the sharing of the same access code by different individuals; the identification of individuals in a household; obtaining satisfactory credit authorization; and the updating of the registration information.

Part of the Simpsons strategy in extending the COMP-U-SHOP service to households not having a TouchTone telephone was to accustom people to using the same procedure when placing orders, regardless of the type of telephone used. Lately, many new push button telephones send out "digi pulse" signals, which are similar to rotary dial pulses, instead of the "TouchTone" signals required by the Simpsons-Sears' computer. This further limits the possibility of extending the COMP-U-SHOP service in its present form.

## FUTURE PLANS

Simpsons-Sears wishes to make increased use of the computer for catalogue order processing, keeping records of credit accounts and controlling its inventory. The establishment of these functions is its first priority.

Equipping all operator positions with a TouchTone keypad would be only a temporary measure, since many of the greater functions will eventually require a more diversified terminal with a alpha-numeric keypad for names and addresses.

## REFERENCE

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# PRESTEL (VIEWDATA) SERVICE

September 1978

Prestel, a British Post Office service, was the first videotex system to be developed and to be tested in a market trial. Both business and residence users will access Prestel during a year long market trial beginning early 1979. Public service in London was launched in March 1979 and the national public service was due to begin in the Fall of 1979.

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## INTRODUCTION

Prestel is the name given by the British Post Office (BPO) to its planned videotex service. Videotex is the generic name for interactive information retrieval using telephone lines and modified TV sets. This service concept was introduced to the British public late in 1978 via a market trial. In spite of market uncertainties, there is every indication that the BPO firmly believes that Prestel will be a success. Before market trial results were even obtained, the BPO has announced the London Public Service on March 1979. National Prestel service is slated for late 1979. Current indications (Oct. 1979) are that the BPO may be right, but perhaps not as soon as they had hoped.

Both the British Post Office and U.K. Information providers (IP's) have invested a great deal of time/money into the Prestel Service. The momentum generated by the BPO and I.P.'s may be sufficient to force the introduction of a full-scale national service.

## System Capabilities

The first computer center used for Prestel service was located at Gresham Street (London) and was equipped with four 70 megabyte discs which provided 280,000 frames of information, total. Storage space is needed for the operational software, so that 220,000 frames of information can actually be stored and displayed. Each addressable page of information can contain up to 26 frames.

A directory of Information Providers using the system was established with all relevant details (billing, usage, etc.) stored on a set of frames in the data base.

The System software was not yet designed for distributed data base operations. Each data base must be duplicated for each computer. For example, the computers at Norwich, Birmingham and London will each have their own set of identical pages. These data bases will receive their information from an update centre, located in London, which will be accessed by IPs wishing to input, delete or otherwise modify their information. The London Public Service will initially use the update centre computer and two service computers located at Wood Green and Fleet Street exchanges.

The British Post Office preferred the integrated modem design (integrated into the TV set), so that only one company or organization has responsibility for the maintenance of the TV with the modem in it. They also felt that it was easier to persuade people to pay a little extra for a TV set with an integrated modem than to buy a completely separate package which would connect the TV set to the telephone line. With the modem integrated into the TV set, the Prestel selector can also be used as a TV selector, to change channels and to turn the TV on and off. A group of eleven British companies have been responsible for the manufacturing of sets since the start of the market trial in January 1979. In September 1979, foreign set manufacturers were to allowed to compete.

The B.P.O. was planning to offer the following peripherals: a print-out machine and a simple cassette tape recorder which can be connected to the terminal.

Rental and Access Charges

As of September 1978, the British Post Office charged the user 0.5 pence for each frame viewed. An information provider can pay all the costs of the users' frame charges by having the British Post Office computer transfer the charges to him, whenever the information contains advertising materials or is public service information.

Charges to the user would be:

- connection charges free;
- the rental for a user terminal approximately 6 pounds per month more than a standard TV set (for a total of about 18 pounds/month);
- time usage roughly 8 minutes for 3 pence; and $0.5 pence per frame accessed

Additional charges levied by information providers for their particular frames will bring this price up. The maximum charge for each frame being discussed was 50 pence. The minimum charge would be providing the frame free.

The opinion of most information providers was that all the domestic Prestel sets were likely to be rented during the test market, probably on a direct replacement basis to those who already had them. Estimates were that the selling price of the set after the test market might be about 700 pounds and about 2 years later roughly 550 pounds.

For business users the charges were as follows:

- the rental of a user terminal was to be 18 pounds per month - (this is what is being charged to home users but many business firms do not already have color TV, so this 18 pounds is a new additional cost).

- Business users will probably be accessing the service during peak times during the day, at charges of about one pence per minute. The British Post Office charges different prices during the day: As well as having a special price discount after 6 o'clock, there are different time zones during the day when prices augment or diminish.

The British Post Office was charging about 400 pounds a year for the rental of an input terminal plus an installation charge of 30 pounds. The terminal costs about one-pence (2 cents) per minute to run at local telephone call rates.

It is possible to describe each page on a special form supplied by the British Post Office and have the Post Office insert it into an information provider's data base at a charge of 45 pence per page. The Post Office also rents direct inputing facilities at the Prestel headquarters in Finsbury Circus.

The B.P.O. planned to ask one pound per annum for every frame stored in the data base to cover the actual cost of maintaining and operating the disk store and the additional cost of expanding storage capacity from the current 250,000 frames as demand builds up. It also was planning a service charge of 250 pounds per annum for time spent by technical staff in establishing the information providers' data base. No charge was planned for servicing the equipment itself.

As the main data base builds up to a mass market level of, say, a million frames, the information providers feel that the frame storage charge probably will come down. As well the introduction of cheap cassette recorders as peripherals to the input terminal should enable material to be input either at night during cheap rate periods or at high speed and thus substantially reduce operating costs.

National Service Introduction Plans

The National public service was planned to begin in the fall of 1979 and run for at least 5 years. The British Post Office estimated that by the end of 1979 they would have 50 computers capable of servicing up to 100,000 sets (i.e. 5000 ports on the computer system). They also estimated that by 1983 they would be able to service 3,000,000 sets (out of 18,000,000 households overall in the U.K.). The cost of this investment would be in the region of 100 million pounds. However, this schedule seems overly optimistic and it seems unlikely at this time (Oct. '79) that the service will have progressed to this level of penetration within the time indicated. One of the main problems lies with the set manufacturers. They are unable or unwilling to produce large quantities of sets. This not only has kept the price of the sets up, but has impacted seriously the deadlines set by the Post Office for offering Prestel service to their market trial participants and public service users.

For the introduction of the National Prestel public service the British Post Office planned to add computers in the following locations:

- London would have a total of 11 computers with 2,100 ports
- Birmingham, Manchester and Edinburgh would have 2 computers with 350 ports
- Leeds, Cardiff and Chelmsford would also have 2 computers, 350 ports
- Newcastle, Bristol, Norwich, Redding, Nottingham, Liverpool, Glasgow and Hemel/Hempstead will all have 50 access ports each to computers in the other cities mentioned above.

The actual figures in August 1979 were:

- 1362 users (most are participants in the market trial)
- 164 information providers
- 88 access ports available
- 136,000 frames frames of information created

At this time, the British Post Office felt that they would not be able to introduce a messaging facility on Prestel before several years due to the configuration of their data network.

## Comments from Information Providers (I.P.'s)

### The Prestel Medium

Most information providers considered that the Prestel service is essentially a new medium with its own particular requirements and limitations. They feel that the test market will enable them to better design information items and to gauge more seriously the public demand for different types of information. Most of the information providers that we talked with felt, in fact, that Prestel was not necessarily an information medium but could be expanded to include many other types of

services. A number of information providers felt that essentially the viewdata medium was an entertainment medium and that different types of entertainment packages such as games or interactive/educational type of offerings should be considered.

Another point made was that essentially Prestel is an information system on information, that is, it has a strong referral element. You find information in Prestel that will tell you to go somewhere else to seek a more detailed piece of information (i.e. Prestel is a first port of call to find information and information items). One can use Prestel in conjunction with other types of information or entertainment media.

Most information providers thought that Prestel could compete with existing ways of obtaining specialized information items. They also felt that the simplicity of use was an important factor in introducing the service to a mass market.

Prestel is selective, quickly undateable, with a limited page display. Because of the limited number of words displayed on the screen, a different style from that ordinarily adopted in publishing is required.

Pages written for Prestel must be very concise, I.P.s must devise information collection and dissemination techniques to up-date information very quickly if necessary. Most information providers would like to have a wider range of graphic capabilities to be able to design and to provide particular symbols to replace words on the screen.

Most information providers feel that the motivation of the user and the perceived value of the information are the crucial variables which will determine whether or not certain pages of information will be accessed. They feel that these two factors are more important than actual system constraints.

The economics of the service are such that initially a small number of pages accessed frequently will probably represent the maximum return on investment (i.e. not encyclopedias). When there are a number of computer centres spread over England, the concept of an information warehouse in which a number of pages are accessed only by select user groups may develop.

AVIP - "The Association of Viewdata Information Providers"

Information providers in the U.K. have formed an association called "The Association of Viewdata Information Providers" (AVIP). AVIP had 65 members in September '78, accounting for more than 50 percent of all the frames booked on Prestel. This association was instrumental in persuading the Post Office to provide sufficient funds for more detailed behavioural research for the market trial and AVIP members are now drawing up a code of practice for information providers. The Prestel service is developing so fast that it seems unlikely that any legislation would be able to come to terms with the problems that might be raised by the service for some considerable time. Under these circumstances the Post Office, information providers and the advertising standards association have agreed that a code of practice should be produced as quickly as possible, and certainly before the beginning of the public service, in order to reassure the public and those in government that the medium is under responsible control and that a proper complaints procedure exists. AVIP is also currently dealing with the system of Prestel charges that the British Post Office proposes using. The Post Office feels that the charges should be related to the size of the investment that they are making to set up Prestel. The information providers feel that this is a matter of little concern to them, in fact, they feel that they are doing the Post Office a favour by making use of their system since no return on investment can be expected until a mass market is created. The question of whether noncommercial frames (routing frames) should be charged at different rates from commercial frames, i.e. those from which information providers can expect some direct or indirect financial return, has not been settled and the introduction of different categories of charges relating to frames in which there was a high editing turnover as opposed to those which remain virtually

unchanged for a long time is also being discussed. A particularly pressing problem was whether or not users should be charged for menu pages. Information providers felt very strongly that the pages which the user accesses to get to an information page should be provided free. The Post Office may drop that proposed charge.

Many information providers have said that Videotex is a new medium and that different types of rules, regulations and standards must apply to it. One problem which is faced by everyone is the limitations of the current copyright law. How do you copyright a computer program? (How do you assign royalty payments?). These questions are also being discussed now in the States and in Canada.

A number of questions have been raised by information providers about advertising on Prestel. When is an advertisement an advertisement? Also questions about the record keeping system needed to monitor each information item were being asked because of existing libel and copyright regulations. (This is the first mass-media which is essentially eraseable.) AVIP was interested in addressing all these questions.

There was also a feeling among the information providers that there is no reason why other viewdata systems should not be set up using different computers and the existing telephone network. Thus, they describe the medium as viewdata while the current post office system is referred to as Prestel. The Post Office itself is not in disagreement with this view.

Many information providers were also very aware and enthusiastic about the need for an international service.

## Critiques of the Prestel System

The British Post Office is encouraging Information Provider umbrella organizations (i.e. very small information providers would go to larger information providers to access or to reserve a block of frames, and to receive training on designing and inputting frames).

The British Post Office does not have the personnel and the time to train and to demonstrate the correct way of inputting and editing Prestel pages and is therefore encouraging smaller information providers to go to large information providers for these services. The proposed encouragement is in the form of a very large standing charge for access to a three digit number in the data base. Every information provider must have a three digit number, to place information in the tree structure. Therefore, smaller information providers who would wish to have only a limited number of pages must go to a larger information supplier for a subset of those three digit number pages. Many information suppliers however, seriously feel that the fundamental principles of Prestel would be changed because of this standing charge, and that this would severely distort the data base. One effect would be to prevent the starting up of a cottage industry dealing in information pages. Some information providers think that the British Post Office is using this as an initial deterrent for small information providers until it can reorganize to receive them adequately or until large information suppliers start taking over the British Post Office educational role in the Prestel service. One pressing problem is that umbrella IPs receive only one billing charge per three digit number. Therefore they must keep an exact page count on each application created by other IPs attached to that three digit number in order to renumerate them equitably. IPs would like the Post Office to bill on four digit number codes for this reason.

Another problem that most information suppliers agreed was serious was the structuring of the initial Prestel page. The initial page should have some type of classification so that the user has the maximum opportunity to be aware of the variety of information which is in the system. This presents a considerable problem and no one has yet solved it. The Prestel service has an alphabetical and a subject index at the beginning of the Prestel service that can be accessed. However, because this is relatively new service most people feel more comfortable still with a printed directory and several were published (supported by advertising).

Information providers felt that the tree structure used for accessing information should be designed so that the user can go back

as well as forwards without incurring any pricing penalities. Information items should be placed in such a way that contiguous items of information can be easily accessible. Cross-references are extremely important and many information providers have put in cross-references after having initially designed an information package. Because of master index problems, a number of routes through the data base have had to be changed or updated. This change was confusing for both the information providers and the potential users.

Other problems which concerned the information providers were the difficulty of getting material into the data base, due to the length of time needed to input a page, the very small number of access ports on the computer, and the lack of Mark 1 editing terminals. The Post Office felt that with the opening of their first public service computer centre at Gresham Street an adequate number of ports on the computer would be provided.

The estimated length of time to input a page into the data base using a Mark 1 terminal varied from 10 to 15 minutes for a page which was primarily text to 45 minutes to two hours for particularly complicated graphics. The learning time needed to be able to input a page was fairly long. This design and apprentice stage could continue for a while because Prestel was such a new medium.

Most information providers felt that 70 to 80 words per frame was the maximum number for legibility. Because of this limitation I.P.s felt that there should be many more types of creative editing packages on the input terminal which would help reduce the length of time to create and input a page. They also felt the graphic capabilities of the system should be improved.

One of the fundamental constraints in providing the Prestel service was time: It took time to be able to analyze how best to structure the data base and to provide a good tree structure, routing structure and cross-reference system.

Another problem was the incompatibility between videotex and most conventional computer systems. Many information providers already had their data stored on a computer and would have prefered to dump information from their own computer to the Prestel computer at certain times of the day. The British Post Office did not supply the software to do this, but several private companies have created the interface to be able to automatically update their information in the Prestel computer.

Some disadvantages of this service for business users were that interaction was not in real time, no terminal to terminal connectivity existed and the retrieval of information was lengthy and complex because of the tree search mechanism.

Although Prestel seemed geared to smaller businesses, a number of large business concerns are also trying Prestel out. i.e. Fintel, New York Times, Reuters, etc.

The following Information Providers were contacted:

1) Richard Hooper from Mills and Allen Communications Limited, a wholly owned subsidiary of Mills and Allen, who are an advertising and media production house. Mills and Allen Communications Limited are a news and electronic publishing company for other information providers. They are an example of an unbrella organization as defined by the Post Office. This company was founded 21 years ago.

2) St.John Sandringham from the Consumer Association. It publishes a magazine called Which?. This magazine has a circulation of 600,000. It is also a centre for public information and they publish consumer-oriented books and magazines.

3) John Barnes from the Central Office of Information, a government organization responsible for the dissemination of governmental information to the public. It interacts with 350 government departments, 16 of which have signed up for the Prestel service. The Central Office of Information also has an international data base, present in every British embassy, which provides relevant information on England.

4) Roger Barrett from the National Magazine Company, a subsidiary of Hearst Publishing which publishes such magazines as Cosmopolitan and Good Housekeeping.

5) Martin Lane from Fintel, the subsidiary of the Financial Times responsible for business data bases. It has the largest business data base in England.

LIST OF ALL PROJECTS

## TELECONFERENCING

### 1. VIDEO TELECONFERENCING

- AUSTRALIA POST OFFICE .....
  Melbourne, Australia.

  Two-site video teleconferencing configuration between Melbourne and Sidney used for routine business meetings.

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- BRITISH COLUMBIA TELEPHONE CO.....
  Victoria B.C., Canada.

  Two-site experimental video teleconferencing between Victoria and Vancouver, intended for use by the business community.

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- VIDEO CONFERENCING .....
  Bell Canada, Ottawa, Ontario, Canada

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  Two-site video teleconferencing between any two cities out of five which have studios.

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- SASKEBEC .....
  University of Regina, Saskatchewan, Canada.

  Two-way TV transmission using the HERMES satellite, for educational and cultural exchange activity between two widely separated French-speaking communities.

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- CONFRAVISION .....
  British Post Office, London, England.

  Multi-site video teleconferencing system.

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- DEPARTMENT OF THE ENVIRONMENT .....
  London, England.

  Two-site video teleconferencing system.

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- NIPPON STEEL CORPORATION .....
  Kitakyushy, Japan.

  Three-site black and white video teleconferencing system for Yawata Works.

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- ELECTRICAL COMMUNICATIONS LAB .....
  Nippon Telegraph & Telephone Corp., Tokyo, Japan.

  Two-site experimental black and white video teleconferencing system between any two of five conference studios of the Electrical Communications Lab., used for regular internal meetings.

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- NIPPON TELEGRAPH & TELEPHONE CORP .....
  Tokyo, Japan.

  Two-site colour video teleconferencing system which is an outgrowth of the Nippon Steel Works System.

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- NEW YORK TELEPHONE CO .....
  New York, N.Y. USA.

  Two-site video teleconferencing system used for internal management studios.

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- EVCS .....
  ERDA, Washington, D.C., USA.

  ERDA Visual Conference System: Two-site video teleconferencing system used for regular internal meetings between two offices of ERDA, 20 miles apart.

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2. AUDIO TELECONFERENCING WITH VISUAL AIDS

- TELECOM-AUSTRALIA RESEARCH LABS.....
  Melbourne, Australia.

  Multi-site computer-aided audio teleconferencing used for technical and personnel management meetings.

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- PUBLIC SERVICE COMMISSION .....
  Ottawa, Ontario, Canada.

  Multi-site audio teleconferencing system for training, administration and management.

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- DEPARTMENT OF COMMUNICATIONS .....
  Ottawa, Ontario, Canada.

  Multi-site audio teleconferencing used for business meetings.

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- DOC-CRC .....
  Department of Communications, Ottawa, Ontario, Canada.

  DOC-CRC high-quality experimental audio teleconferencing using visual aids.

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- DEPT. OF INDIAN AND NORTHERN AFFAIRS .....
  Ottawa, Ontario, Canada.

  Multi-site audio teleconferencing used for business meetings between members of the department located in the far North and in Ottawa.

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- TELE-UNIVERSITE du QUEBEC .....
  Québec, Canada.

  Multi-site audio teleconferencing system used for administrative and personnel management meetings in the University of Quebec.

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- REMOTE MEETING TABLE .....
  U.K. Civil Service, London, England.

  Two-site audio teleconferencing used for administrative and business meetings.

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- INTELCENTRE .....
  France.

  Audio teleconferencing.

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- TELECENTRE .....
  Paris, France.

  Multi-site audio teleconferencing used for business meetings.

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- TRIDIC .....
  NIPPON TELEGRAPH AND TELEPHONE CORP.
  Tokyo, Japan.

  Multi-site video teleconferencing system.

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- PHOENIX CRIMINAL JUSTICE .....
* Phoenix, Arizona, USA.

  Video telephone trial linking jail, courtrooms, public defenders, parole officers and prosecutors.

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- BANK OF AMERICA .....
  San Francisco, California, USA.

  Two-site teleconferencing system used for regularly scheduled meetings by Senior Management.

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- UNION TRUST COMPANY.....
  Stanford, Connecticut, USA.

  Two-site audio teleconferencing used for administrative and business meetings.

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- WESTINGHOUSE ELECTRIC CO.....
  Baltimore, Maryland, USA.

  Two-site video teleconferencing between two of three studios using the Hermes satellite, currently used for tests of potential cost savings over travel and performance/ reliability within Westinghouse.

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- NASA .....
  Goddard Center, Greenbel, Maryland, USA.

  Multi-site video conferencing system using the Hermes satellite, used for internal meetings between NASA centers.

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- DOW CHEMICAL COMPANY .....
  Midland, Michigan, USA.

  Two-site video teleconferencing used for internal meetings between two faculties belonging to Dow Chemical.

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- PICTUREPHONE MEETING SERVICE .....
* AT&T, Basking Ridge, New Jersey, USA.

Two-site black and white video teleconferencing between any two of 17 or more studios.

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- BELL LABS .....
Murray Hill, New Jersey, USA.

Two-site video teleconferencing system.

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- BANKERS TRUST COMPANY .....
New York, N.Y., USA.

Two-site video teleconferencing system.

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- FIRST NATIONAL CITY BANK .....
New York, N.Y., USA.

Two-site video teleconferencing system.

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- PHILADELPHIA POLICE TV .....
* Philadelphia Police Department, Pa., USA.

Two-way cable system used for internal communications.

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- E.R.D.A. .....
Washington, D.C., USA.

Multi-site audio teleconferencing system.

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- GENERAL SERVICES ADMINISTRATION .....
Washington, D.C., USA.

Multi-site audio teleconferencing system used to connect the regional headquarters of this organization.

---

3. GRAPHIC CONFERENCING MECHANISMS

- VISUAL COMMUNICATION NETWORK .....
C.R.C., Shirley Bay, Ontario, Canada.

Interactive narrowband visual (graphics and text) communication system with provision of a common visual working space.

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- INTERACTIVE VISUAL COMMUNICATIONS .....
BNR, Nun's Island, Verdun, Quebec, Canada.

Simulation lab for interactive visual communications using television monitor and light pen.

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- STRATHCLYDE FIRE BRIGADE .....
Hamilton, Scotland.

Facsimile transmission to fire trucks.

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- INTEGRAPH III .....
  Northern Telecom Inc., Palo Alto, California, USA.

  Interactive graphic video system with common working space and audio using telephone lines.

---

- TELENOTE 100 .....
  San Diego School District, San Diego, California, USA.

  Tele-education using a voice/graphic electronic instrument which lets teacher and students communicate through speech and handwriting.

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- ELECTRONIC BLACKBOARD .....
  Bell Labs., Holmdel, New Jersey, USA.

  Large pressure sensitive device written on with chalk and reproduced via telecommunication link on conventional TV display.

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- TOPES .....
  Bell Labs., Whipanny, New Jersey, USA.

  Used for telephone office planning and engineering in the Bell System.

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## COMPUTER MEDIATED COMMUNICATIONS

### 1. COMPUTER CONFERENCING

- CMI .....
  Bell-Northern Research, Ottawa, Ontario, Canada.

  Computer mediated system used internally.

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- MINT .....
  Non Medical Use of Drugs Directorate
  Dept. of Health and Welfare, Ottawa, Ontario, Canada.

  * Multi-site computer conferencing used especially for messages and some informal conferences.

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- CONFER .....
  National Physical Laboratory, Teddington, England.

  Multi-site computer conferencing system.

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- PLANET, TOPICS, NOTEPAD, CASELOG .....
  Informedia, Palo Alto, California, USA.

  Infomedia offers various computer conferencing systems: "TOPICS" used as a general electronic message system and as a conferencing system; "NOTEPAD" used to integrate file management and information retrieval; "PLANET", used as a comprehensive conferencing system.

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- CONFER .....
  University of Illinois, Urbana, Illinois, USA.

  Multi-site computer conferencing system used for extending CAI to communities and for group discussions as part of the PLATO system of the University of Illinois.

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- CONFER 11 .....
  Ann Arbor, Michigan, USA.

  Multi-site computer teleconferencing system used for university committee meetings, group discussions, classes, etc.

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- EIES .....
  New Jersey Institute of Technology, Newark
  New Jersey, USA.

  * "EIES" - Electronic Information Exchange System: Multi-site computer conferencing system used for information exchange between research groups.

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- DEP CONFERENCING SYSTEM .....
  NTIS, Springfield, Virginia, USA.

  Multi-site computer conferencing designed for real-time and/or delayed communication.

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## 2. COMPUTER AUGMENTATION

- N.L.S. / AUGMENT .....
  SRI, Menlo Park, California, USA.

  Computer augmented communication and interactive office automation system.

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## 3. COMPUTER MESSAGING

- QUICLAW .....
  QL Systems Ltd., Kingston, Ontario, Canada.

  On-line searching information service.

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- CAN/OLE .....
  National Science Library, Ottawa, Ontario, Canada.

  On-line interactive retrieval system dedicated to the retrospective searching of bibliographical data bases containing over 4,000,000 references and abstracts to all major fields of science and technology.

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- INFOMART .....
  INFOMART, Toronto, Ontario, Canada.

  On-line searching information service. Provides access to over 16 data bases.

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- MAILBOX .....
  I.P. Sharp Ass., Toronto, Ontario, Canada.

  * Computer based store and forward system for sending messages between people.

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- MRDS .....
  Vancouver Police Department, B.C., Canada.

  Interactive data communications system with full keyboard and plasma display terminals in police cars.

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- ONTYME .....
  Tymenet, Cupertino, California, USA.

  * Computer based store and forward system for sending messages between people.

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- HERMES .....
  BBN, Boston, Massachusetts, USA.

  Computer Message System.

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- TELEMAIL .....
  Telenet C.C., Washington, D.C., USA.

  * Computer based terminal-to-terminal and store and forward system for sending messages between people.

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# TELE-EDUCATION

## 1. UNIVERSITIES

- CAI SYSTEM .....
  University of Alberta, Edmonton, Alberta, Canada.

  * Computer-aided instruction system.

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- TAIM .....
  Athabaska University, Edmonton, Alberta, Canada.

  Multi-site computer managed instructional system.

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- CARLETON-STANFORD .....
  Carleton University, Ottawa, Ontario, Canada.
  Stanford University, Stanford, California, USA.

  Curriculum sharing experiment via satellite (Hermes) transmitting video, audio and data both ways.

---

- U.Q. TELEVISION NETWORK .....
  Université du Québec, Ste-Foy, Québec, Canada.

  * Multi-site video teleconferencing system for teaching classes and administrative meetings.

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- UNIVERSITY OF CALIFORNIA ITV NETWORK .....
  University of California, Davis, California, USA.

  Microwave system for graduate education between Davis and Livermore.

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- STANFORD ITV NETWORK (SITN) .....
  Stanford University, California, USA.

  * Instructional TV network with audio feeback.

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- SURGE, CO-TIE, AND BIO CO-TIE .....
  Colorado State University, Fort Collins, Colorado, USA.

  Video Tape system for research in graduate education.

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- GENESYS .....
  Florida, USA.

  Point-to-point common carrier microwave system for the continuing education of engineers in industry.

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- PLATO IV .....
  University of Illinois, Illinois, USA.

  Computer-aided instruction system marketed by Control Data.

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- COLLEGE OF NURSING NETWORK .....
  University of Nebraska, Omaha and Lincoln, Nebraska, USA.

  Two-way colour video via microwave and audio via telephone lines for joint training of nurses, administrative staff, etc.

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- OKLAHOMA SYSTEM .....
  University of Oklahoma Medical Centre, Oklahoma City, USA.

  Private point-to-point microwave system servicing several ITFS area systems in four campuses and eight cities.

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- .....
  University of Pennsylvania, Philadelphia, Pa., USA.

  ITFS transmission to 4 centres with audio feedback.

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- TAGER SYSTEM .....
  Southern Methodist University, Dallas, Texas, USA.

  Microwave tele-education network: Audio & black and white video downstream and audio upstream.

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- SEEN .....
  University of Wisconsin-Extension, Madison, Wisconsin, USA.

  Multi-site educational audio telephone network.

---

2. SCHOOLS

- IRTV .....
  Ottawa Board of Education, Ottawa, Ontario, Canada.

  Television programs on demand (by telephone) for schools.

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- SITE .....
  India Posts & Telegraphs, India.

  Satellite telecasts (ATS-6) for education at several levels.

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- .....
  Tateyama City, Japan

  Two-way CATV among the city's 33 school system and the CATV centre.

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- ATS-1, ATS-6 .....
  Alaska, USA.

  Education and health in remote communities using satellites.

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- VIDEO COMMUNICATION PROJECT .....
  Irvine Unified School District, Irvine, California, USA.

  Two-way black and white video system between 14 schools.

---

- ATS-3, ATS-6 .....
  Federation of Rocky Mountain States, Denver, Colo., USA.

  Educational programs for rural communities via satellite.

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- AESP .....
  Appalachian Region, Kentucky, USA.

  Educational project using satellite transmission for the continuing education of rural teachers.

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- .....
  Data Systems Centre, Archdiocese of New York, N.Y., USA.

  ITV network with a Computer aided instruction system: Slides and voice computer controlled downstream and data (touch tone telephone) upstream.

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- CABLE TELEVISION PROJECT .....
  Tulsa School System, Tulsa, Oklahoma, USA.

  Colour one-way video and two-way audio capability for schools.

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- KSC-TV .....
  Kutztown State College, Kutztown, Pa., USA.

  Two-way microwave link between Kutztown State College and cable companies.

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- TICCIT .....
  Mitre Corp., Reston, Virginia, USA.

  TICCIT system used for educational applications.

---

3\ SPECIALIZED TRAINING

- AUDIO TELECONFERENCING NETWORK FOR STAFF TRAINING .....
  Public Service Commission, Ottawa, Ontario, Canada.

  Eleven-node audio teleconferencing system.

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- CAL .....
  National Research Council, Ottawa, Ontario, Canada.

  Computer Aided Learning System.

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- SUMMER ACADEMY BRUSH UP YOUR FRENCH .....
  OECA, Toronto, Ontario, Canada.

  French course: one-half hour, 5 days per week, broadcast television with 15 minutes per week interaction by telephone.

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- STEP .....
  Ministry of Education, Vancouver, B.C., Canada.

  Satellite Tele-Education Program on the HERMES satellite.

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- USC I-ITV .....
  University of Southern California, Los Angeles, California, USA.

  Interactive Instructional Television System.

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- MSU - ROCKFORD TWO-WAY CABLE PROJECT .....
  Rockford Cablevision, Rockford, Illinois, USA.

  In-service training via CATV with data return.

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- SPARTENBURG .....
  Telecable Corp., Spartenburg, South Carolina, USA.

  Two-way CATV system for education and community applications.

---

4. HANDICAPPED

- .....
  Memorial University, St-John's, Newfoundland, Canada.

  Home-centered videotape and counselling service to parents of pre-school, hearing impaired children, in rural area.

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- STIFTUNG REHABILITATION .....
  Heidelberg, Germany.
  Computer Aided Instruction system and CCTV system for training of disabled people.

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- .....
  G.E. Cablevision System, PEORIA, Illinois, USA.

  Education of the handicapped via two-way cable television.

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- FEATT .....
  Purdue University, West Lafayette, Indiana, USA.

  Project to instruct parents of severely handicapped children how to teach development skills to their children.

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- .....
  Special Education Department, Univ. of Kentucky, Lexington, Kentucky, USA.

  Study and demonstration on the applications of communications satellites in the education of the handicapped.

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- HANDICAPPED PROJECT .....
  Univ. of Kentucky, Lexington, Kentucky, USA.

  Tactile response units are used to provide specialized individual education to homebound urban children.

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- TEL-CATCH .....
  United Cerebral Palsy of Western New York, Amherst, N.Y., USA.

  * A modified TICCIT system for the education of homebound handicapped children.

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- HANDICAPPED PROJECT .....
  Teaching Resources Centre, City University of New York, N.Y., USA.

  Instructional programmes are transmitted via cable TV with feedback from digital response units.

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- TELEPAC .....
  Utah State University, Utah, USA.

  Interactive telephone speaker system to serve children in rural areas who are considered severely and profoundly retarded, multi-handicapped, or emotionally disturbed.

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- TICCIT+10 .....
  Hazeltine Corp., McLean, Virginia, USA.

  Multi-terminal TICCIT system with video downstream and audio upstream providing computer-assisted instruction to the deaf.

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# TELEMEDICINE

## 1. URBAN

- .....
  Univ. of Alberta Hospital, Edmonton, Alberta, Canada.

  Remote measurements in ECG for diagnisis.

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- MEMORIAL UNIVERSITY TELEMEDICINE PROJECT .....
  Memorial University, Newfoundland, Canada.

  Full duplex teleconferencing system using microwave link and telephone medical consultation and teaching.

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- T.V. CABLE DISTRIBUTION SERVICES OF THE FACULTY OF MEDICINE.....
  Univ. of Dalhousie, Halifax, Nova Scotia, Canada.

  Two-way broadband system used for primary health care patient consultation, and diagnosis, educational instruction for the medical school, etc.

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- .....
  Institute of Cardiology, Montreal, Quebec, Canada

  ECG computer processing and on-line storage system.

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- DIALEX INFORMATION SERVICE .....
  Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada.

  Medical consultation service by telephone.

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- POLAR - ECG SERVICE .....
  Vancouver General Hospital, B.C., Canada

  Telediagnosis and computer processing of ECG.

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- .....
  Bethamy-Brethren Corp., Chicago, Illinois, USA.

  Bethamy-Garfield Community Health Care Network.

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- .....
  Illinois State Psychiatric Institute, Illinois, USA.

  Illinois Dept. of Medical Health Centre Complex community mental health program.

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- NURSING HOME TELEMEDICINE PROJECT .....
  Boston City Hospital, Mass., USA.

  Two-way audio and facsimile transceivers, via telephone lines for cronic disease follow-up in nursing homes.

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- .....
  Mass. General Hospital, Boston, Mass., USA.

  * Massachusetts General Hospital/Bedford Veterans Hospital/Logan Airport telemedicine.

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- .....
  Cambridge Hospital, Cambridge, Mass., USA.

  Broadband microwave used for consultation with patients and nurse-practitioners in the clinic.

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- .....
  Nebraska Psychiatric Institute, Nebraska, USA.

  University of Nebraska, College of Medicine, Telemedicine Project.

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- .....
  Mount Sinai Hospital, New York, N.Y., USA.

  Mount Sinai-Wagner bidirectional cable link.

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- .....
  Case Western Reserve Univ., Cleveland, Ohio, USA.

  School of Medicine Anesthesiology Project using a laser link.

---

2. RURAL

- .....
  Hôpital Sacré-Coeur, Montréal, Québec, Canada.

  Telephone network for ECG transmission and cardiologic consultations.

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- STARPAHC .....
  HEW, Arizona, USA.

  * Space technology applied to rural Papago (Indian reservation) advanced health care.

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- .....
  Jacksonville, Florida, USA.

  Telemedicine network using microwave links.

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- .....
  Cook County Hospital, Chicago, Illinois, USA.

  Cook County Hospital Department of Urology picturephone network.

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- .....
  Blue Hill Memorial Hospital, Maine, USA.

  Blue Hill-Deer Isle Telemedicine system using two-way broadband microwave with applications to teaching, consultation, care of ambulatory patients, etc.

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- .....
  Maine Rural Health Associates, Maine, USA.

  Telemedicine project using interactive television via microwave.

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- .....
  Lakeview Clinic, Minnesota, USA.

  Bi-directional cable television system used for patient monitoring and consultation, emergency care and temporary patient disposition decisions.

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- .....
  University of Nebraska, Omaha, Nebraska, USA.

  University of Nebraska Medical Centre Slow-Scan Radiology Project.

---

3. REMOTE

- .....
  Memorial University, Newfoundland, Canada.

  Telemedicine project using the HERMES satellite.

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- .....
  University of Western Ontario, London, Ontario, Canada.

  Telemedicine experiment using the Hermes satellite to communicate with Moose Factory, in Northern Canada.

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- .....
  Dept. of Psychology, Carleton University, Ottawa, Ontario, Canada.

  A feasibility study of a remote computer-assisted developmental assessment of children via satellite.

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- TELEMEDICINE PROJECT .....
  Sunnybrook Medical Centre, Toronto, Ontario, Canada.

  A series of telemedicine projects in urban and remote settings using broadband and narrowband communications.

---

- LA GRANDE-MONTREAL .....
  Université de Montréal, Montréal, Québec, Canada.

  Medical data and consultation via satellite (ANIK-B) to a remote community.

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- TELECLINIQUE .....
  Montreal-Lyons, Quebec, Canada.

  Medical télé-consultation between Canada and France using the Intelsat IV satellite.

---

- ATS-1, ATS-6 .....
  Alaska, USA.

  Use of satellite in remote area for primary health care delivery, tele-diagnosis and consultation, and transmission of medical data.

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- WAMI .....
  Seattle, Washington, USA.

  Communication support of regionalized medical education via the ATS-6 and CTS (HERMES) satellites.

---

4. DISTRIBUTED

- IEPC .....
  Dalhousie Medical School, Halifax, Nova Scotia, Canada.

  Telediagnosis and computer processing of ECG.

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- .....
  Institute of Cardiology, Laval University,
  Quebec City, Quebec, Canada.

  Telediagnosis and computer processing of ECG.

---

- Puerto Rico Telemedicine Project .....
  Ponce Regional Hospital, Ponce, Puerto Rico.

  Microwave link for regional health care, emergencies consultations, education, in-service training, etc.

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- VIDEO-LINK .....
  Memorial Rehabilitation Centre, Santa Barbara,
  California, USA.

  Video link for the examination of severely physically disabled people by specialists.

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- MIAMI-DADE .....
  Dade County, Florida, USA.

  Miami-Dade County Correctional Institutions Telemedicine Project.

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- ATS-6 .....
  V.A. Hospitals, Atlanta, Georgia, USA.

  ATS-6 satellite advanced health care and education experiments.

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- .....
  Augusta, Maine, USA.

  Interactive telecommunications system for Central Maine used for medical care development.

---

- VETERAN .....
  Missouri, USA.

  Veterans Administration educational training extramural regional audiovisual network.

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- .....
  Univ. of Nebraska, Med Centre, Nebraska, USA.

  Nebraska Veterans Administration Network.

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- .....
  Med-Square Clinic (Phelps-Dodge Co.), Playas, New Mexico, USA.

  Black and white broadband interactive TV telemedicine system.

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- .....
  Ohio State Univ. College of Medicine, Columbus, Ohio, USA.

  Ohio Valley Medical Microwave Television Systems.

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- .....
  V.A., Texas, USA.

  Interactive closed circuit microwave television system.

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- INTERACT .....
  Vermont-New Hampshire, USA.

  Interactive medical television network.

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## SERVICES TO THE PUBLIC

### 1. BROADCAST INFORMATION RETRIEVAL

- GRAND RIVER.....
  Grand River, Kitchener, Ontario, Canada.

  Teletext system coaxial cable and the TV set.

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- PHONE-INFO .....
  Wired City, Carleton Univ., Ottawa, Ontario, Canada.

  Information retrieval using cable TV and touch tone telephones.

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- TV ONTARIO .....
  OECA, Toronto, Ontario, Canada.

  Broadcast teletext system using Telidon and the T.V. set for trials on an educational T.V. network.

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- .....
  Télécable - Vidéotron Ltée, St.Hubert, Québec, Canada.

* On-demand programs of local text information in a CATV system by telephone call-up.

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- CEEFAX, ORACLE .....
  BBC, ITV, London, England.

  Teletext information retrieval systems for broadcast TV.

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- ANTIOPE .....
  CCETT, Rennes, France.

  Teletext system.

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- CHARACTER INFORMATION BROADCASTING STATION (CIBS) .....
  Japan.

  Teletext system with sufficient revolution to show Japanese text and video pictures.

---

- CableText, INC. .....
  U.S.A.

  Teletext system offered over satellite to CATV stations equipped with Micro TV decoders.

---

- INTELTEXT .....
  U.S.A.

  Pilot test of Teletext system using Antiope decoders in hotels and apartment buildings.

---

- IDR SYSTEM .....
  Reuters, New York, N.Y., USA.

* Information retrieval system via cable.

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- INFO-TEXT .....
  Philadelphia, Pennsylvania, USA.

Pilot trial of a Teletext system similar to Ceefax.

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- TELEDATA .....
  Salt Lake City, Utah, USA.

Teletext system using TIFAX decoders.

---

- LINE 21 SYSTEM .....
  Washington, D.C., U.S.A.

Teletext system for program captionning and additional information destined for the deaf community.

---

- .....
  Natrona County Public Library, Casper, Wyoming, USA.

Video reference service via CATV.

---

2. METERING / SECURITY

- A.M.R. .....
  Edmonton Telephone, Alberta, Canada.

Automated Meter Reading, Security (fire, burglar, medical, etc.), power shedding, etc. via telephone lines.

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- NORTH YORK METERING TRIAL .....
  Bell Canada, Toronto, Ontario, Canada.

Automatic meter reading for electricity, gas and water using telephone lines.

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- ERDA / EPRI .....
  EPRI, Palo Alto, California, USA.

Four projects on remote metering.

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- .....
  Monroe W.L. & G.C., Monroe, Georgia, USA.

Remote monitoring via CATV.

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- .....
  LVO Cable, Carpentersville, Illinois, USA.

Security monitoring via CATV.

---

- TOCOM II .....
  Tocom, Inc., Dallas, Texas, USA.
* Mini-computer based security and monitoring system via CATV.

---

3. COMMUNITY SERVICES

- PROJECT IRONSTAR .....
  Alberta Native Communications Society, Canada.
  Audio and video programming for the north using the HERMES satellite and audio return.

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- .....
  Channel 40, Milton-Keynes, England.
  Local programming experiment.

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- .....
  Kablevision Kiruna, Sweden.
  Local programming experiment in a remote community in the far north.

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- MANHATTAN CABLE ACCESS .....
  Manhattan Cable TV, New York, USA.
* Public access.

---

- MRC-TV .....
  Metropolital Regional Council, New York, N.Y., USA.
* Multi-site teleconferencing system used for continuing education, personnel management, etc.

---

- .....
  Berks Cable TV, Reading, Pa., USA.
* Two-way cable system for senior citizens program and school applications.

---

4. SHOPPING

- COM-U-SHOP .....
  Simpsons-Sears, Toronto, Ontario, Canada
* Remote catalogue shopping using touch-tone telephones and computer voice response.

---

5. MULTIPURPOSE SYSTEMS TO THE HOME AND BUSINESS

- CALGARY .....
  A.G.T., Calgary, Alberta, Canada.

  Pilot trial of a videotex system for information retrieval that uses telephone lines and the TV set and integrates security and metering services.

---

- .....
  B.C.T., Vancouver, B.C., Canada.

  Pilot trial of a videotex system using copper pair wires and the home TV set.

---

- ELIE .....
  M.T.S., Elie, Manitoba, Canada.

  Field trial of information retrieval and integrated telecommunications and broadcast services using fibre optic loops in a rural area.

---

- IDA .....
  M.T.S., Winnipeg, Manitoba, Canada.

  Pilot trial of a videotex system using two-way cable and the home TV and integrating services such as security and metering.

---

- TELIDON .....
  Dept. of Communications, Ottawa, Ontario, Canada.

  Interactive videotex system with high quality display of characters and graphics.

---

- VISTA .....
  Bell Canada, Hull, Quebec, Canada.

  Field trial of a videotex system for on-demand information and transactions that uses the TV set for display and telephone lines.

---

- PRESTEL / VIEWDATA .....
  British Post Office, London, England.

  Information retrieval via telephone lines using the TV set as display unit.

---

- DIAL-A-PROGRAM .....
  Rediffusion Int., Surrey, England.

  Switched Quist system providing on-demand TV and other services to subscribers and in professional applications.

---

- TELSET .....
  Helsinki, Finland.

  Pilot test of an interactive videotex system similar to Prestel.

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- TELETEL .....
  Ille & Villaine, France.

  Pilot trials of an interactive videotex system for information retrieval, transactions, message services and telephone directory use.

---

- TIC TAC .....
  P.T.T./C.N.E.T., 92, Issy les Moulineaux, France.

  Information retrieval via telephone lines using the TV set or CRT as a display unit. Now part of Antiope/Télétel.

---

- BILDSCHIRMTEXT .....
  Germany.

  Pilot trials of an interactive videotex system similar to Prestel but including messaging capabilities.

---

- VIEWDATA .....
  Holland.

  Interactive videotex system based on Prestel.

---

- HI-OVIS .....
  V.I.S.D.A, Japan

  Two-way and interactive services on fibre optics.

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- TAMA NEW TOWN .....
  V.I.S.D.A, Japan.

  Two-way and interactive services on cable TV.

---

- CAPTAINS (character and pattern telephone access information network system) .....
  Tokyo, Japan.

  Pilot test of an interactive videotex system over telephone lines with audio capabilities.

---

- DATAVISION .....
  Stockholm, Sweden.

  Interactive videotex system compatible with Prestel.

---

- LOS GATOS .....
  TelePrompter, Los Gatos, California, USA.

  Technical test bed for the project at El Segundo.

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- EL SEGUNDO .....
  Denver Research Inst., Denver, Colorado, USA.

  Proposed experiment of interactive services on cable TV.

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- VIEWTRON .....
  Miami, Florida, USA.

  Interactive videotex system accessed via telephone lines.

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- POLY-COM .....
  Orlando, Florida, USA.
  Various interactive services on cable TV.

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- VICOM .....
  Telecable Corp., Overland Park, Kansas, USA.

  Two-way CATV with applications to education (handicapped children), merchandising (Sears) and polls.

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- MITRIX .....
  Mitre Corp., Bedford, Mass., USA.

  Multi-media and multi-mode information transfer system on coaxial cable.

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- SRU .....
  Community Information Systems, Inc., Chaska, Minnesota, USA.

  Two-way coaxial cable.

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- .....
  RCA Labs., Princetown, N.J., USA.

  Lab test bed for a two-way cable system.

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- QUBE .....
  Warner Communications, Columbus, Ohio, USA.

  30-channel CATV system with data upstream.

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- .....
  Coaxial Communications, Inc., Columbus, Ohio, USA.

  Area multiplexing system for pay-TV.

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- COMMUNICON .....
  Jerrold Electronics, Horsham, Pa., USA.

  Lab test bed for a sophisticated computer-based two-way cable TV system.

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- DOW JONES NEWS / RETRIEVAL SERVICE (DJS) .....
  Major cities in the U.S. and Canada.

  Interactive information retrieval system over telephone lines using Apple II home computers.

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- GREENTHUMB .....
  Farming communities in the USA.

  Interactive videotex system over telephone lines for farming communities.

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- PlayCable .....
  U.S.A.

  Pilot test of an interactive videotex system offered over cable and providing a wide range of information processing applications and games.

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- THE SOURCE .....
  U.S.A.

  Computer time-sharing information system accessed through telephone lines by a range of home computers.

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THE DEVELOPMENT OF TELECOMMUNICATIONS SERVICES : A REVIEW OF PROJECTS