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Development of Guidelines for the Evaluation of Proposed TELIDON Applications

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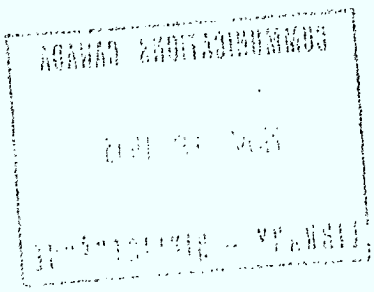

OUTLINE

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ABSTRACT

This report is concerned with the introduction of videotex services by the Government Telecommunications Agency. A set of guidelines, in the form of questions about the issues that must be addressed in the evaluation of proposed TELIDON applications, is presented. The guidelines are developed in the general context of the introduction of new information technology and recent experience with TELIDON. The guidelines are categorized as Planning, Organizational, Economic and Technical. A procedure for using the guidelines is suggested.

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EXECUTIVE SUMMARY

This report is concerned with the possible introduction of videotex (TELIDON) services by the Government Telecommunications Service. A set of guidelines, in the form of questions about the issues that must be addressed in the evaluation of proposed TELIDON applications, is presented.

The approach taken has been to provide GTA with as comprehensive a list of issues as possible, and to suggest that both the proposer of the application and GTA consider all issues, discarding those that are irrelevant and exploring those that are not. The major concern is with assessing how well thought out the proposed use of TELIDON is.

An overview of TELIDON, describing what it is and what's being done with it is presented. The overview includes the CVCC definition of videotex, a brief look at broadcast TELIDON, a history of the origins of TELIDON, and descriptions of what the data bases have looked like, and who supplies TELIDON equipment and systems. Applications by DSS, Informart, and Radio Shack are described. The wide range of potential applications in defined by reference to the projected activities of the participants in the Department of Communication's Industry Investment Stimulation Program. The application of TELIDON in education by the Ontario Educational Communications Authority is described, and some of their experiences recounted in an Appendix. Potential uses in Office Automation and by the military are mentioned.

The general factors affecting applications of TELIDON are reviewed, in the context of what is known about issues

that affect probabilities of acceptance or rejection of computer-based technologies. The elements of technology assessment are examined. Those aspects of innovation that lead to resistance to its introduction are considered in terms of what has caused resistance to computerization in the past. The effect of different types of technology on the general guidelines for conducting assessments of information technology are reviewed. The role of "evaluation research" in the evaluation of TELIDON applications is discussed briefly, and the conclusion is reached that, while it would be useful to include an evaluation researcher in every application team, it is possible to consider most positive and negative outcomes beforehand.

The assessment procedure that is proposed is that applications, that is 'uses', be doubly evaluated, once by the applicant and once by a referee. The major requirement of the evaluation is that every conceivable factor be considered by both and that if there are significant areas of disagreement about what is important that the application would have to be re-examined from a basic point of view.

The evaluation guidelines, that is the questions about issues of concern that must be considered, are organized in four categories: Planning Process, Organizational Context and Social Aspects, Economic Aspects and Technical Aspects.

The report is accompanied by a number of Appendices and an extensive bibliography.

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1.0 INTRODUCTION

1.1 The Problem

This study is concerned with the introduction of videotex services by the Government Telecommunications Agency (GTA). It is intended to develop a set of guidelines that may be used to evaluate proposed applications of videotex technology, particularly of TELIDON systems.

The study was carried out with the aim of providing GTA with guidelines that might be applied to the evaluation of prospective TELIDON uses. The assumption has been made that GTA might be interested in supplying or operating TELIDON-based information/communication systems, within its mandate to provide for the general communications requirements of the departments of the government of Canada. The results of the study are more widely applicable, in fact to general evaluation of the introduction of new information technologies.

GTA has traditionally supplied local and long distance telephone circuits and service for government departments, and they have not been active in areas related to the rapid change in government telecommunications requirements accompanying advances in data processing and computer communications. There are two areas in which GTA might be able to provide new basic services to government departments. The first is in satellite communications, in which GTA could manage the sharing of complete satellite transponders by different departments, something the carriers are loath to do. The second possibility would be the provision of basic videotex services, based on TELIDON technology.

TELIDON systems involve many distinct components and activities; any one or more of which GTA might become involved in the operation and management of. The components are: information sources; page creation and production systems; data base systems; distribution facilities; and user groups.

1.2 The Approach

The approach taken will be to provide GTA with as comprehensive a list as possible of factors that can affect

the introduction of new information technology, with particular reference to TELIDON. The purpose being two-fold: to enable GTA to specify the factors that application proposers should consider in the preparation of their proposals, and to provide GTA with the criteria required to assess the relevance and importance of the factors in explicit uses.

As discussed later in this report, videotex is a new information/ communications medium, and as such not a great deal is known about how it really will be used, nor about how it will affect the organizations into which it will be introduced. It would be dangerous to restrict assessment criteria to factors related too narrowly to immediately apparent uses or to those forecast as the only uses. There are many examples of systems that have succeeded or failed for reasons that were not considered at all during the assessment that led to their introduction. This has often arisen through the consideration of short-term effects when in fact it is long term effects that have determined the acceptability of new technologies. Many new information systems such as video teleconferencing have been introduced and failed to achieve widespread acceptance even though it appears obvious that the service would be of great value. Subsequent explanations have often failed to identify the reasons because of a lack of understanding of the system of inter-related factors involved. It should be recognized, in addition, that the utility of standard methods of evaluating the social, technical and economic effects of new service offerings may not be operative in the TELIDON environment.

It is our intention to avoid the repetition of such mistakes by suggesting that GTA not narrow the scope of the criteria they consider, too soon. In our model, as broad a range of factors as possible will be used to evaluate proposed applications; and, to ensure that a very wide range of possibilities are considered, it will be incumbent upon the application designers to determine which factors are relevant to their applications.

Our major concern will be in assessing 'how well thought through is the application?'. No set of criteria imposed a priori can say that the proposal should be approved or not, i.e., that TELIDON will 'work' well in this or that situation if the applicant says 'this and so...'; but, we propose to present criteria that must be addressed.

1.3 The Report

The report is composed of two parts. The first part covers these introductory remarks, an overview of TELIDON, and a summary of some of its current and projected applications. The second part, chapters 4 and 5, covers general issues affecting the introduction of new information technologies, and provides guidelines for assessment of proposed applications.

The report has a number of appendices which contain supporting material; and an extensive bibliography.

2.0 TELIDON OVERVIEW

2.1 Definition of Videotex

Videotex is the name given to computer-based information services that provide users with access to stored information and transactional services from information providers. Videotex systems consist of terminals, communications facilities and data bases. Most of them involve very large data bases with many users. These systems make use of raster-scan television receivers and monitors as the essential display device where the consumer may select the information that is displayed. An electronic module is added to the television set to allow the reception and decoding of communications signals that control the assembly and display of images consisting of alphanumeric characters, graphics and facsimile.

2.2 Definition of TELIDON

The Canadian Videotex Consultative Committee has adopted the following definition of videotex.

"The term 'Videotex' is used in the generic sense which denotes a class of electronic systems comprising the following elements:

1) a source of information remote from the user;
2) a connection to the source via a telecommunications link, which may be provided via copper wire, radio wave, co-axial cable, optical fibre, or other means;
3) an information display which will normally be a standard black and white or colour television set, or similar device. The information will normally be shown as a still frame, although some animation is possible, as is the addition of hard copy devices for some applications.

The Videotex service is intended for the general public as well as specialist users, and may provide, in addition to the basic facility of information retrieval upon request, the following additional facilities:

1) input of information by the users (e.g. opinion polling, or other commands initiated by a user in response to information in the data base);
2) terminal-to-terminal communication between users (direct or store and forward);
3) transactional services (e.g. electronic funds

transfer, direct ordering of consumer goods, booking systems, calculations, etc.);
4) loading of computer programs from a data base to a terminal;
5) interconnection with other related services;
6) the management of closed user groups.

The CVCC notes that the above list is not intended to be exhaustive.

TELIDON is the Canadian videotex system. It is based on the transmission of instructions, called Picture Description Instructions (PDI), which are executed by the graphics processor module at the receiver. This technique, called alphageometric, allows the efficient construction of images of very high resolution and of considerable complexity. Many other videotex systems are being developmed in other countries. The concept first arose in the United Kingdom, where it was introduced as a means of increasing telephone usage. In most other videotex systems, the image is composed of an array of characters, each consisting of an array of 5 by 7, or 9 by 9, dots. Each character, its colour and some other attributes can by specified by a code word which is transmitted to cause the display of that character on the receiver. These sytems are called alpha-mosaic.

The way in which TELIDON is used in the trials held to date is through a menu-directed tree search procedure in which the user operates a small key pad to enter the number of the branch he wishes to follow. This technique allows many users to simultaneously access a single data base, but it is frustrating in the limit for sophisticated users who would prefer to rove freely through the data base. Such systems will be extremely difficult to build for mass consumption data bases, but are entirely feasible for systems with twenty to two hundred users.

2.3 Teletext: Broadcast TELIDON

The interactive version of TELIDON and its operation in the interactive mode via data communications over the switched telephone network, or over two-way cable television systems, is well known. TELIDON data may also be carried as ancillary signals on broadcast television channels, either off-air or on cable TV systems. In the broadcast mode, also known as teletext, packets of TELIDON data are inserted into otherwise unused lines of standard video signals at the TV

transmitter in such a way that they can be recognized at the receiver and interpreted as TELIDON PDI's.

The broadcast mode is basically a one-way, one-to-many service although frames may be addressed to specific receivers. Normally, a fixed cycle of frames is transmitted, with the receiver selecting the desired frame and acquiring and storing the PDI's associated with it as the TV frames are received. The time it takes to acquire a new frame depends on the data rate used, the number of lines used for TELIDON data, and the complexity of the image.

The teletext mode of TELIDON is particularly well suited for use where viewers do not have two-way commmunications with the data base, and where the information on a limited number of pages, say 500 to 1000, may be changing, but has a fixed format. Typical applications might be weather maps, news services, schedules, directories, stock and commodity prices, and advertising.

One of the major Canadian users of broadcast TELIDON is the Ontario Educational Communications Authority which broadcasts TELIDON signals on its TV Ontario network. A discussion of some of their experiences is contained in Appendix 4.

When an entire television channel is allocated to broadcast TELIDON, the number of frames can be increased dramatically and the possibility of the teletext mode of two-way interactive service becomes feasible, with each subscriber being assigned his own frame slot. The advantage of this mode over one that uses the switched public telephone network is that it can make use of cable television network facilities. Such companies as NABU Manufacturing are proposing to make their service a feature of the cable TV computer facilities they plan to market to cable TV operators. Broadcast TELIDON is also one of the service offerings being installed in Portland, Oregon by a subsiduary of Canadian Cablesystems.

2.4 Brief History of TELIDON Development

TELIDON sprang more or less full grown from a research program at the Communications Research Centre of the Canadian Department of Communications in 1978. At that time, the display of alphanumeric and crude graphical information on raster scan display terminals (television

monitors) was extensively used in many computer environments. Cathode ray tubes had been used as output devices devices on computers since the fifties, and graphics processor driven vector displacement generators were in widespread use. The CRC research program was involved with the simultaneous operation upon images by two or more operators who might be working on the same visual space from remote locations. The research had involved the development of sophisticated image description software and codes for the communication of images. The distinct difference between the CRC approach and others was that, in it, the instructions necessary to create the image were transmitted, rather than a facsimile of the image itself. This was a natural approach for the CRC team, being as they were computer graphics oriented. The result of the approach, as far as TELIDON is concerned was that the TELIDON terminal included instruction decoder, and was essentially a graphics processor.

The activity in the UK on videotex systems such as Prestel attracted the attention of officials in the Department of Communications who recognized that the CRC developments might be used to implement a Canadian version. Researchers at CRC, notably Herb Bown, John Smirle, John Storey and Doug O'Brien among others, saw the opportunity to provide vastly superior grraphics in a way in which the image description would be independent of the peculiarities of any particular display by using their experience with picture description languages and image communications. They were able to adapt their research very rapidly into a definition of what is now known as TELIDON, and to have prototype terminals implemented by the contractor, Norpak, who had been involved with the construction of their image communications and display equipment.

While many players have become involved with the development of TELIDON equipment and systems, as noted above, the original development group was largely occupied with the promotion of the idea of TELIDON. This promotion took a number of paths: the acquisition of major government funding and the support of equipment development and field trials, for example; but major efforts were expended on the establishment of the TELIDON PDI alphageometric approach to videtex as a recognized international standard. The original intention was to preclude the European videotex approaches such as Prestel and Antiope from becoming de facto standards, and eliminating TELIDON as a contender. The success of their efforts was underscored when AT and T decided to adopt an alphageometric videotex standard that is compatible with TELIDON.

TELIDON has now entered a new phase in its development with the awarding of fifty-two grants under the Industry Investment Stimulation Program, which will have the effect of placing thousands of terminals in the field; creating a large number of data bases; and leading to the production of trained personnel.

2.5 The TELDON Data Base and User Environment

Most TELIDON data bases were designed with two assumptions in mind. The first being that a single data base would have to handle a very large number of simulataneous users; the second, that the users would be very naive. Most data bases have been set up to demonstrate the graphic capabilities of TELIDON, and not its use in an interactive information system.

The normal user interface is a combination of aa colour television set (which will accept RGB inputs; TELIDON does not feed either NTSC-compatible baseband video or RF signals to the display) and a hand-held keypad. With the keypad the user can move about through the data base by requesting items displayed on menu-type directories. The user can also move up or down the tree structured data base, or return to the top.

The limitations of the data base structure and the user interface should not be allowed to obscure the potential of TELIDON for use in new applications.

2.6 Equipment Suppliers and Information Providers

TELIDON equipment is manufactureed in Canada by a number of firms. Foremost among them is Norpak Limited of Kanata and Pakenham, Ontario. Norpak has been apart oof the TELIDON development scene since its inception as a contractor for developmental, prototype and field trial equipment, and now markets a complete line of TELIDON equipment. Norpak's equipment includes the TELIDON-based visual aids made by Hemton Corporation, which is now the marketing arm of Norpak. With their experience, and the acquisition of many of the original TELIDON development group, including Bown and O'Brien, Norpak is in an excellent position to assess the potential of TELIDON.

Other manufacturers include Bell Northern Research, Electrohome, and AEL Microtel. TELIDON systems and related communications equipment are also provided by The Genesys Group, Gandalf, and NABU Manufacturing.

The primary information providers have been institutions such as the Department of Communications, OECA and Bell Canada, although Infomart is the major commercial information provider. Growth and acceptance of TELIDON will depend on some measure on the ability of the information providers to provide access to a variety of data bases, that is to develop gateways. The generation of data bases is an important feature of many of the IISP projects (see Appendix 1).

3.0 APPLICATIONS

Videotex systems, and TELIDON, are being used in a multitude of applications throughout the world; and there are more proposed uses than can be enumerated. TELIDON is touted as being applicable in virtually all of the communications and computer applications that have ever been suggested or thought of; whether they involve two-way or one-way access to information, graphics or not.

3.1 General

Applications are contemplated in information retrieval, e.g. Infoglobe, Grassroots, the Source, and the DSS Service to the Public carrels; teleshopping, e.g. Comp-u-star; electronic messaging; tele-education; games; reservation services; and many other of the new services of the "wired city". The major application of videotex systems to date has been in information retrieval, from fairly static data bases. Most of the TELIDON applications have taken place in field trials, although some commercial ventures are now active.

Applications in Canada, and in fact in most countries in which videotex has been promoted, are the result of government initiatives that led to the establishment of field trials. Very few applications have arisen from commercial entrepreneurial activity, one exception being the Marketfax system provided by Faxtel Information Systems of Toronto; another being the Grassroots service in Manitoba.

Major operational sytems and videotex trials have been instituted in the United Kingdom (the PRESTEL system), in France (the Telematique program, using ANTIOPE), and in Canada (with the TELIDON system). Other trials have, and are taking place in the United States, Germany, and Japan (with CAPTAIN).

Uses have ranged from advertising, government information, stock reports, race results, weather, to education. Most applications have been characterized by user-initiated tree searches, using hand-held keypads to access stored information through menu directories, although cable TV systems are using the frame preparation capabilities of TELIDON to enhance the quality of their graphics offerings on 'news' channels. TELIDON has also finding significant application among the equipped

cognoscenti as an audio/visual aid for the preparation of slides.

Videotex is used for the following purposes:

Information retrieval
Electronic publishing
Electronic messaging
Advertising
Tele-shopping
Education
Office Automation
Military Display Systems
Public Information Systems
Travel and Tourist Information
On-line Banking
TV news channels

and so on...

3.2 Some Specific Uses

Some of the specific current applications of TELIDON are:

i) DSS Service to the Public

The Canadian Department of Supply and Services has initiated a number of projects to provide Canadians with better access to government information, or to designated persons or offices throughout the government who can provide information to the public. One of their major accomplishments has been the incorporation of short directories, called the 'blue pages' (for obvious reasons), in telephone books in most major Canadian cities that list the telephone numbers of government departments and agencies.

As part of a promise by the Minister to provide information centres across the country where citizens could meet with information brokers on a face-to-face basis, TELIDON terminals have been installed in carrels in shopping malls and other such places. Self-explanatory instructions allow untrained users who walk up to the carrels to obtain information about sources of information on government programs in employment and other areas, in either official language.

Informal observations of the operation of these

terminals have indicated a number of common problems that occur with a venture of this kind. Some of these are: a) reliability and accessibility - the frustration evidenced by users who find

the terminals not working or hopelessly busy is very apparent. The terminals must be operative and functioning; the pictures must be of good quality (independently of their design); and there must be enough of them to satisfy the demand.

b) data base design - the attention span of the users is related to the

difficulty they have in moving easily through the stored pages. The menu must be designed to be flexible, and allow the user to move about in the data without having to start all over again whenever an error is made; 'dumb' systems are quickly discarded by users.

c) data base content - users are quickly frustrated by a system that does not

contain the information that they are seeking; while this is unavoidable in an open system, every effort should be made to anticipate it. Assumptions about what the user wants can be dangerous; open systems can only contain what the information provider wants to give and expectations to the contrary should be avoided.

Experiences with reliability and utility of the DSS carrels should be carefully monitored.

ii) Grassroots

Grassroots is a commercial information service offered to farmers in Manitoba. It is a joint effort of Manitoba Telephone System (MTS) and Infomart. Grassroots provides its rural subscribers with the output from a number of information providers, including 'World Weatherwatch', a direct computer to-videotex link between MTS and the Atmospheric Environment Service that provides up-to-date visual data on weather patterns within very small areas. Grassroots is a small, market-specific project that some observers consider to be an example of the place where videotex's future lies. It provides information that is not normally available otherwise and for which graphical presentation is particularly appropriate.

iii) TRS Videotex

Radio Shack, the widespread chain of electronics stores, manufactures and sells a series of personal and small business computers called the TRS 80. They now provide the software to create videotex pages on an alphanumeric raster scan display. When coupled with telecommunications software, the videotex software allows an owner to provide access to his pages by other similarly equipped TRS owners.

iv) Marketfax

Marketfax is a TELIDON-based stock market analytical tool provided as a service by Faxtel of Toronto. The service, using the graphics capability of TELIDON, provides colour technical charts for all stocks trading on the Toronto, Vancouver, New York and American exchanges. Marketfax provides price and volume charts, point and figure charts, and high, low, close and volume listings. The data is updated daily.

The price chart can be overlayed with six technical indicators: trend line, on-balance volume (the 'Granville line', which shows the distribution of the stock period-by-period), moving average, oscillator (the difference between a ten day and a twenty day moving average), relative strength line, and a momentum indicator.

Faxtel will provide TELIDON terminals and an optional printer. Connection to Marketfax is via 1200 baud telephone modem access to Datapac.

3.3 The IISP Applications

Typical applications may be defined by reference to the fifty-two TELIDON projects that qualified for matching grants under the TELIDON Industry Investment Stimulation Program (IISP). Most of the applications are not yet implemented, but some are in advanced planning stages, while a few are actually underway.

The successful projects propose TELIDON services ranging from business systems to computer-assisted learning and health programs. In reviewing the list of qualified projects it is important to keep in mind that the primary objective of the program was to stimulate the purchase of

TELIDON terminals and to stimulate the growth of TELIDON data bases, together with the creation of pages of information of sufficient quality and quantity to make the purchase of TELIDON terminals attractive to both home and office users. Among the approved projects were:

i) For agriculture and fisheries users:

A service to provide farmers with information about market prices and the availability of space in grain elevators, to be developed by the Saskatchewan Wheat Pool.

A service to provide Atlantic fishermen with information about fish stocks, prices, regulations and related services, to be developed by the New Brunswick Telephone Company.

ii) For business users:

A real estate listings service to be developed by A. E. LePage Ltd. of Toronto.

An inventory control system to be developed by Radio Payette of Montreal.

An inventory service for suppliers and users of heavy equipment in resource industries, to be developed by Time Shifts Video Systems of Edmonton.

An advertising system for shopping malls and public areas, to be developed by the London Free Press of London, Ontario.

A page creation and software service, to be developed by Marlimage of Montreal.

An integrated unit combining the Mitel SX-2000 Superswitch telephone exchange system with TELIDON terminals to provide computer-assisted instruction on how to use the Superswitch system, to be developed by Mitel, of Kanata.

iii) For education and health services users:

A career guidance service to be developed by TV Ontario.

Computer-aided teaching aids to be developed by the Universite du Quebec in Hull.

A 1,000 terminal public TELIDON service and tele-education service for Quebec, to be developed by Edimedia Inc. of

Quebec.

Courses to train students in page creation, system design and maintainance, and videotex marketing, to be developed by a number of universities and community colleges.

Computer-aided consulting and diagnostic services, to be developed by Toronto General Hospital.

An "electronic journal" for the handicapped, to be developed by Agora-laboratories de Telematique of Montreal.

iv) For tourist and entertainment users:

A tourism data base and installation of terminals in parks, historic sites and other locations by the Newfoundland Telephone Company.

The installation of 2,000 terminals in public places in Toronto to provide information about tourism, entertainment, accomodation and other services in Toronto and Ontario; sponsored by Infomart and the Ontario Ministry of Industry and Tourism.

3.4 Education

The major educational user of TELIDON is the Ontario Educational Communications Authority, who broadcast TELIDON signals along with their standard television programs on TV Ontario. Some of their experiences relating to the introduction of teletext in the educational system are described in Appendix 4.

The CVCC has formed an Educational Sub-committee which represents the interests of teachers, administrators, trustees and librarians in the educational applications of TELIDON.

A number of educational applications were successful in the IISP competition. For example, Laurentian University intends to extend TELIDON service into their large region to provide information about their offerings and support their courses. Other universities, such as Athabaska, Guelph, York, Waterloo and the University of Victoria have used developed data bases or created their own TELIDON systems. It is very interesting, and probably very significant, that most of these applications are not involved with the use of TELIDON in teaching, that is for courseware, but present information about the university program, most often about their extention and part-time programs.

The development of educational applications of TELIDON appears to depend on one crucial factor: the existence of a concerned, dedicated individual who proceeds on his or her own to create a working TELIDON system. This individual is, as often as not, not connected directly with the academic side of the institution, but is often in the library, liasion, registrar's office or extension department. Many of the institutions with operating TELIDON facilities have not waited for the provision of central data bases but have proceeded to create their own software. Likewise, they have also developed their own Information Provider Systems, either from mainframe computers, minicomputers, or personal computers such as the Apple. This situation is very analogous to that which exists in Computer Aided Instruction where most successful applications have depended on the efforts of one or two individuals, and have not always survived the departure of that individual for other pursuits.

3.5 Office Automation

TELIDON is a possible information and display technology for applications in the automated office. Its touted application to information retrieval, electronic messaging, facsimile distribution and other communication functions is directly useful in a number of office of the future scenarios. Organizations such as the Office Communications Research Associates, a cooperative venture of the Cable Telecommunications Research Institute, CNCP Telecommunicastions, Gandalf, NABU, Ottawa Cablevision, Skyline Cablevision, and Laurentian cablevision, are proposing the use of TELIDON as part of their development of office communication systems.

3.6 Possible Government Closed User Group Applications

There are two types of information that government departments prepare that are particularly well suited to dissemination via TELIDON. The first type is regulations, which must be available in many different locations in an up to date form. Typical might be postal regulations, rates, routings, schedules; or DOC radio licensing regulations; or customs and excise regulations; or immigration data (on call at US border-crossing points); or income tax regulations; or a thousand other data sets. The second type of information includes that prepared for general distribution, but with which there is difficulty in establishing a mailing list. Typical of the second type are brochures on health, agriculture, national parks, and other subjects; program guides, directories, and so on. TELIDON could be used as the medium for the dissemination of, or access to these types of information. The use could be almost immediate, as the demand is there.

One of the problems facing the Atmospheric Environment Service is the distribution of weather maps, weather radar displays, and satellite imagery to the public; in particular to television distributors. TELIDON is an obvious candidate for the provision of this service.

TELIDON is already in use by the military as a display system in the Regional Operational Control Centres (ROCC), which are replacing the old Sage Centres in the North American Air Defence System. High resolution TELIDON terminals can be used in military, and paramilitary applications such as surveillance, remote sensing, radar remoting, and simulation.

4.0 GENERAL ISSUES AND FACTORS AFFECTING APPLICATION OF INFORMATION TECHNOLOGY

4.1 Introduction

The fact that the technology and services involved in videotex dissemination and, in particular, the distribution of TELIDON are so new, if only in terms of their wide-spread application, is the most limiting factor in the attempt to derive demonstrably appropriate guidelines to aid the reader of a specific application who finds him/herself in the role of assessor. There is essentially no history, other than that consisting largely of (positively or negatively) biased anecdotes. We cannot glean from past specifics even the amount and kind of advice we would give to a valued colleague who was, say, about to buy his first car -- let alone to a government or other organization that was going to buy and deploy a fleet of cars. This implies that it is not possible to record criteria for success, which might be helpful used as guidelines, in advance of the receipt of proposals. We must, then, try to anticipate factors which prospective users must consider.

But how many factors do we propose? Should we try to list discrete, perhaps even fairly small guideline subsets for different fields of proposed application? We reject this strategy, although it offers the appeal of apparent manageability, for two reasons; first, TELIDON services are alleged to have so many different applications that it would be impossible to list in advance the specific subsets of criteria appropriate for each application context; second, unless the total set of criteria are, at the outset, presented to applicants and judges, it is possible that those important generalities, i.e. criteria, that are important across applications might never emerge.

There is a second reason why an evaluation of information technology is so scanty as to be effectively non-existent. In addition to the brief time span over which evaluations have even been possible, the basic aim of most trials is to make a profit for both the user and the manufacturer/promoter. It needs little documentation (see Appendix 3) to conclude that this is a highly competitive area of technology development and application -- if a competitor has a better product and successful marketing strategy, the reasons for these strengths are not likely to be communicated directly to competitors through professional journals or governmental reports -- the sources of information on which academic investigators must generally rely.

Our strategy in this section is to review what is known about general issues that affect probabilities of acceptance/rejection of computer-based technology; we should glean what hints/suggestions these general considerations have for information systems, especially TELIDON.

4.2 General Considerations for Assessment of New Technology

It has been suggested (i.e. Hetman, 1973; Raffaek, 1978; Bjorn-Andersen, 1980, etc.) that in the process of implementing new technology two levels can be distinguished. At the first one, the emphasis is placed on what is called operator problems, that is, in how to make the technology faster, more reliable, efficient, economical, etc. At the second level, defined as the point where the relative benefits of technological advancements become smaller, the focus shifts to what is denominated ergonomic and societal problems of the operator: safety, comfort, improving esthetics, effects of the technology on different levels of society and individuals.

It is in relation to the last issue where the need to assess the impact of the technology and to control it becomes specially relevant. The area concerned with these problems is designated Control and Management of Technology (CMT). Hetman (1973) notes that "the main task of the control and management of technology is to forecast the range of possible effects of technology on society and its ecological environment so as to clarify society's choices before options are foreclosed by default. In the second place, it is called upon to explore new possibilities of satisfying social and economic needs afforded by scientific progress. Finally, it has to analyse the evolution of these needs with a view to redefining its aims and modifying the goals and objectives of society in the light of new knowledge." (p.69)

The techniques related to Control and Management of Technology are generally named technological forecasting which involves at least the following facets: technological projections, technological assessment, technological planning, technological parameters in social and economic planning, and control and management of technology.

Technological assessment is commonly considered to be a method of analysis that allows systematic evaluations concerning the nature, significance, merits, and possible impacts of a technological innovation. Hetman (1973) sees

technology assessment as a "systematic planning and forecasting process which encompasses an analysis of a given production method or a line of products taking into account both internal and external factors." Conceptually, he defines the term of technological assessment "as a process for mapping out technological options. It is a way of charting out the range of possible or alternative futures,..." (pp.54, 61).

Perhaps one of the most systematic and comprehensive presentations of technology assessment is represented by the works of Armstrong and Harman (1980). Their report is the result of a combined effort between the University of Michigan, the Georgia Institute of Technology and Stanford University under the coordination of the National Science Foundation (NSF). The last agency implemented a revision and evaluation of the art and practice of technology assessment. The specific task of Stanford University consisted of an overall evaluation of the strategies and methodologies of technology assessment.

The Stanford University Project, after a review of theoretical and methodological developments in the area of technology assessment and an examination of empirical application, came to the conclusion that any technology assessment attempt comprises the following three functional elements:

- Technology description and alternative projections
- Impact assessment
- Policy analysis

These elements are generally accepted as being essential of any technology assessment. Furthermore, six cross-cutting dimensions emerge as relevant. They refer to:

- team interaction
- iteration
- societal futures
- societal values
- uncertainty
- validation and public participation

4.2.1 The first functional element - Technology Description and Alternative Projections - constitutes the attempt to present a "description of the technology (or problem area) to be assessed and projecting it (or problem solutions) along alternative paths to a specified future time. The description of the technological alternatives must necessarily take a form that allows for a comprehensive

comparison of impacts and consequences." (p.17)

The sub-elements of the above dimension are:

i) Data acquisition, which in a strict sense refers to the necessary information to describe the technology. The suggested means to collect information are: a) personal contacts with experts in the technology to be assessed; and b) literature review concerning the technology.

ii) Bounding the assessment domain. There is agreement among TA practitioners that the scope of any assessment must be deliberately limited. The three major categories of constraints distinguished emerge from:

a) the sponsor of the technology assessment. "The client usually identifies the major thrust and intended users of the assessment (which in turn reflect how the need for the assessment complements or supplements other ongoing efforts) and ... provides budgetary and political limitations for the study" (p.20);

b) the background and projected span of the technology itself;

c) the choice of projected societal value structures.

It is suggested "that the bounding elements should be considered as a specific agenda item at a project review session to be held six to eight weeks after the project starts. The object of that session is to conduct a complete mini-assessment, thus familiarizing the team with all of the functional elements and cross-cutting concerns of the TA process" (p.22).

The four following dimensions are suggested as providing meaningful bounding constraints: a) time (this should be set as narrowly as possible and should accommodate expected changes in the technology and be compatible with data resources); b) geographical scope; c) institutional considerations and c) political jurisdiction.

In relation to the projection of technological alternatives it is suggested "to formulate two or more mutually exclusively technological alternatives for the future around which impact and policy comparisons can be made. The objective is to specify future alternatives in sufficient detail to permit impact evaluations over

broad-ranging criteria and to present those alternatives so as to aid the determination of secondary and higher-order social impacts. The array of alternatives is not intended to reflect the most likely choice but rather to present a spectrum of choices that includes the most likely future developments (based on past experience) as well as feasible but less likely ones" (p.24). The following five areas are considered useful aids in formulating technological alternatives for a given subject area:

- Deciding what relative emphasis to put on projecting past trends as compared to defining desirable future objectives toward which to develop a technology.

- Determining outside limits for high- and low-level technologicl alternatives (maximum and minimum feasible rates of development or of implementation as the bases for technological alternatives).

- Choosing time intervals by which alternatives are grown from the present to the projected future period.

- Choosing how to describe the technological alternatives (i.e. vivid scenario description, specified levels of implementation, site locations, project social context).

- Including models or simulations to and in the generation of technology alternatives (pp.25-26).

4.2.2 The second functional element - Impact Assessment - is conducting a comparative assessment of the alternative technological options using broadly based criteria that include primary (direct impacts) and high order social and environmental concerns (indirect impacts) along with the more conventional elements of economics, technical performance, and legal and institutional considerations (pp.12, 29). The sub-elements of the impact assessment dimension are:

i) Impact criteria selection, which consists of a list of items to be used to judge, measure, and compare technological alternatives. Three tasks are involved in this step. They are: a) to list all possible impacts; b) to structure them in a coherent manner; c) to select as criteria those relevant to assess the technology. Potential aids suggested to accomplish the above tasks are: interactions with the informed public, meetings with representatives of the concerned stockholder groups, meetings with experts, etc.

Different approaches to define and structure the impact criteria can be taken. The three recommended are:

a) Arrangement by scientific discipline. It is suggested to use a multi-avenued approach incorporating positions from diverse disciplines.

b) Arrangement by stockholder groups. Criteria organization in terms of the groups affected by the technology.

c) Arrangement by functional areas of the technology considering the elements of the technology itself.

d) Arrangement by logical categorizations following a relatively a priori logical analysis of what can possibly constitute the universe of impact areas.

"Once all the impacts have been identified it may be still necessary to select only a few to be used as actual criteria in the impact assessment. In almost every case, the basics for selection is the study team's judgement of what constitutes a significant impact in the context of the bounding assumptions of the assessment" (p.33).

ii) Predicting and assessing impacts. This basically implies the devising of a prediction mechanism for estimating the intensity of the identified impacts for each of the technological alternatives. Some guidelines suggested are:

a) Scientific disciplines. This means consulting specialists in the particular scientific disciplines involved and, if this is done, use the predictive strategies or techniques of those disciplines.

b) Interdisciplinary and futuristic aspects. Here the techniques recommended are:

- Expert opinion. If, a consensual body of information on a subject already exists, then compute, analyze and report this information. If, disagreement is found, then, describe the controversial points or take a poll of the different schools of thought or present a range of estimates from the literature. If, disagreement exists and consensus is needed, it is recommended to utilize the Delphi technique to reach agreement among experts.

- Analogy. This means applying findings from different disciplines or other technology assessment attempts in order to predict eventual situational outcomes.

- Use of quantitative models to derive the economic and physical elements of technological alternatives.

- Use of conceptual models to represent all impacts, including the non-quantitative ones (e.g., block diagrams showing interfaces and interactions).

- Use trend analysis, either trend impact analysis to obtain probabilistic estimates or trend correlation analysis to achieve predictive estimates.

- Use cross impact analysis to determine how the occurence of one event can affect the likelihoods of others.

- Construct scenarios.

c) Projection of the social impacts. It is said that "even though the identification and assessment of social impacts is a central feature of technology assessments, their application constitutes one of the weakest aspects of the process". To achieve a better prospective of the social impacts it is suggested to:

- Employ some quantitative measures such as demographic profiles, population growth, employment, etc., to define the formal context of the social setting.

- Implement some kind of morphological analysis (e.g., relevance trees, taxonomics, etc.) to structure the social impact analysis.

- Consult expert opinion.

- Consult public polls.

iii) Impact comparisons and presentation. "Having predicted impact magnitudes for the selected criteria, the project team must decide not only how to summarize, evaluate and compare them"... (p.42). Here, the most important issues are:

- how should the subjective attitudes of various public and stakeholder groups toward the technology and its related developments be presented,

- should the impacts be numerically quantified,

- when and how should all the impacts be evaluated on a common scale in commensurable terms,

- along what lines should the impact presentation be organized.

In relation to the first issue, it is suggested to describe physical and economic impacts in non subjective factual terms. Social and political impacts should be described using data (if available) from: public polls, meeting with stakeholder representatives, public review synthesis, project teams opinions, etc. This information can be rated or weighted in order to obtain a scale reflecting its importance.

Concerning the issue of quantification, it is recommended to present the information in a numerical way as much as is possible, in order to avoid ambiguous expressions such as likely, probably, slight increase, etc.

In relation to the evaluation and summary comparisons it is suggested to express all the impacts on a common quantitative or semi-quantitative scale so they can be easily compared and/or aggregated. The most common types of summary approaches are summary by a common physical measure and summary by unitless scales. The first type can be used only if all of the impacts have been assessed using a single theoretical model or viewpoint which allows the use of commensurable units. In the second type of summary, the impact assessment is concluded with a list and estimates of all significant impacts on a fixed scale. The results can be arranged in tabular form to allow comparisons and summed and weighted to arrive at a total value for a given scenario.

iv) Organization of the impact assessment. This step can be done either by interest group (or other impact area), by the technological choices and their subelements or by other methodological scheme (like relevance trees). As a rule, it is suggested to

APPENDIX 2 NORPAK (HEMTON) MARKETING EXPERIENCE

Hemton Corporation, now the marketing arm of Norpak Limited, was involved for some time in the manufacture and sales of TELIDON systems, both page creation and display units. Hemton, like OECA (as discussed in Appendix 4), were in a sense very successful. They marketed TELIDON equipment to a group of users who recognized what it was, what an improvement it could be over their present equipment, and who could foresee a multitude of uses for it. This market was made up of audio-visual display creators, trade-show exhibitors, cable television operators and others who recognized the graphical quality of TELIDON images, the utility of the PDI's for creating them, and advantages of television display.

Hemton has found that most of their customers have been young, in the graphics business (often computer graphics), and have a need for the product. Hemton is also beginning to provide training to customers in the design of TELIDON pages, passing on what they have learned about making successful pages. They have also begun to market some of the fruits of their labours: the electronic image library they call electronic letraset.

Most TELIDON systems are sold for future applications, that is for applications that are yet to be developed, the 'wired city' and promisory potentials. The market has been mainly reactive, rather than proactive. The Hemton EPS-1 had a market for today, videotex has a market for tomorrow. Its introduction requires an immense support infrastructure, e.g., communications, and a potential user can only theorize about its impact.

There is a moral in Hemton's experience that is worth considering: sell to a market that understands what you are selling, and you will succeed; sell to promises, and live on dreams.

APPENDIX 3 APPROACHES TO INFORMATION TECHNOLOGY MARKETEERING

Included in this Appendix are a number of advertisements selected more or less at random from current issues of some of the popular computer magazines. They are presented here because they represent the claims being made for information technology.

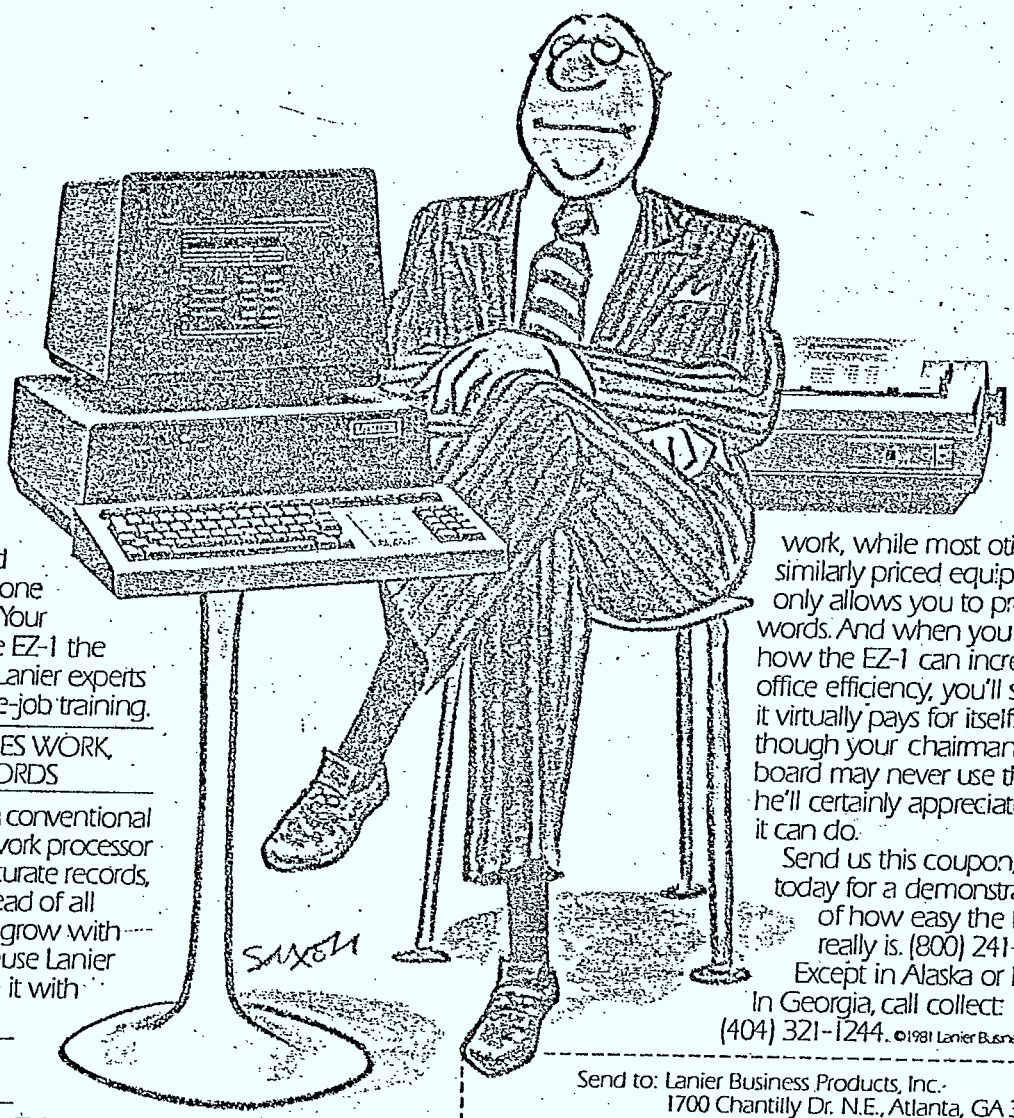
The devices or systems offered in the following advertisements appear as:

- being fast and reliable
- simple in their use: easy and fast to learn, with assured support
- having technical support and service guaranteed
- being suitable for multiple uses, or at least more than one
- having some features interchangeable with other systems
- possibilities of expansion according to future needs
- cheap: their use always pays off, and the investment is assured
- offering a 'new extra feature': in comparison with other systems
- already on the market, which makes them distinctive and better options.

The technology offered will:

- reduce costs: increased speed of operations and increased number jobs completed per unit time will increase productivity
- increase control
- increase accuracy
- provide relief from mechanical and boring tasks

Introducing a work processor so easy even the chairman of the board can operate it.



With Lanier's new EZ-1,™ suddenly it's easy to type reports, letters, memos, lists, and more. And get them done accurately right away. Your staff can start using the EZ-1 the day it arrives, because Lanier experts offer immediate on-the-job training.

THE EZ-1 PROCESSES WORK, NOT JUST WORDS

The EZ-1 is more than a conventional word processor. It's a work processor that also files, keeps accurate records, and helps you stay ahead of all your paperwork. It can grow with your business too, because Lanier will continually update it with new capabilities.

HARD WORK WAS NEVER THIS EASY

Your secretary types on a TV-like screen instead of on paper, so changes are made before printing. That saves time and helps avoid typos. All your work is produced in letter-quality printing at less than 30 seconds per page. 50-200 pages can be stored on a single memory disc. In addition, the EZ-1 does more than one job at a time, which can free your secretary to work on other administrative tasks.

EASY TO AFFORD

The new EZ-1 gives you the ability to process all kinds of work, while most other similarly priced equipment only allows you to process words. And when you consider how the EZ-1 can increase office efficiency, you'll see how it virtually pays for itself. Even though your chairman of the board may never use the EZ-1, he'll certainly appreciate all it can do.

Send us this coupon, or call today for a demonstration of how easy the EZ-1, really is. (800) 241-1706. Except in Alaska or Hawaii. In Georgia, call collect: (404) 321-1244. ©1981 Lanier Business Products, Inc.

LANIER'S EZ-1

Send to: Lanier Business Products, Inc.
1700 Chantilly Dr. N.E., Atlanta, GA 30324

Show me how easy the EZ-1 is.

Name

Title

Phone Best Time to Call

Firm Address

City County State Zip

LANIER

We make your good people even better.

Oct. 81 Byte 4 81 B J1

Circle 221 on Inquiry card.

Makers of the TypeMaster™ No Problem® Typewriter, No Problem Shared System™ and EZ-1™ Work Processor.

BYTE, November 1981, vol. 6, No. 11

WHAT'S THE KEY TO BUYING A COMPUTER?

Look beyond the computer. Look at how the total system– hardware, software, support, service– meets your needs, today and tomorrow. That's the key. When you choose a computer source, you choose a long term partner who must stand by you with total support. And no one stands by you like Heath/Zenith.

Software

Including word processing, business applications, versatile utility programs, and the Heath Users' Group library of over 500 low-cost programs for home, work or play.

And a choice of three operating systems, including CP/M by Digital Research for compatibility with thousands of popular CP/M programs.

Languages

For your own custom programs, Microsoft languages are available in BASIC (compiler and interpreter), FORTRAN and COBOL.

Self-Study Courses

Learn at your own pace with *Programming Courses* that teach you to write and run your own programs in Assembly, BASIC, Pascal or COBOL.

For the business person, *Computer Concepts for Small Business* helps you evaluate the ways a computer can benefit your business. And for the novice, *Personal Computing* is a complete introduction to computer fundamentals and BASIC Programming.

Support

Before and after the sale we work with you to configure the system that serves you best. We help you get your system up and running smoothly. Assistance is always just a phone call away.

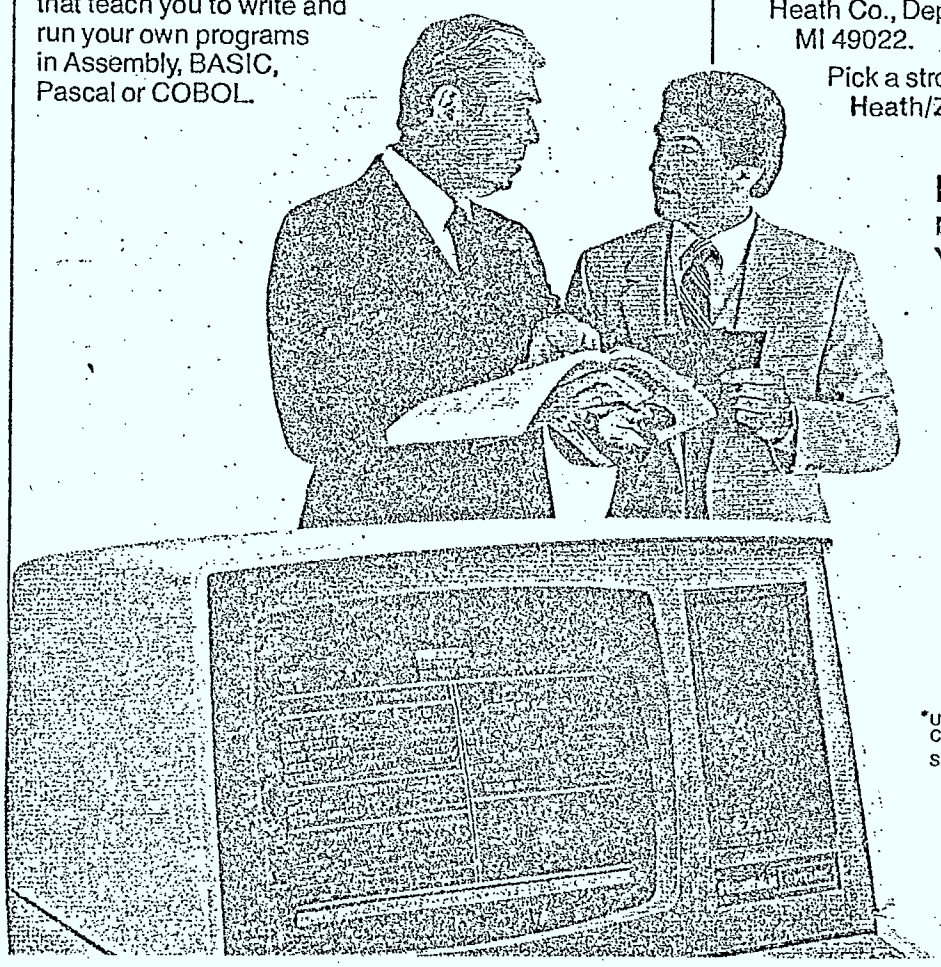
Service

Friendly, experienced technicians are available, either over the phone or at any of the 56 Heathkit Electronic Centers nationwide.

Visit your Heathkit Electronic Center*

Pick the store nearest you from the list at left. And stop in today for a demonstration of how Heath/Zenith Computer Systems can serve you. If you can't get to a store, send $1.00 for the latest Heathkit Catalog and the new Zenith Data Systems Catalog of assembled commercial computers. Write to Heath Co., Dept. 334-834, Benton Harbor, MI 49022.

Pick a strong partner.
Heath/Zenith & You.



HEATH/ZENITH

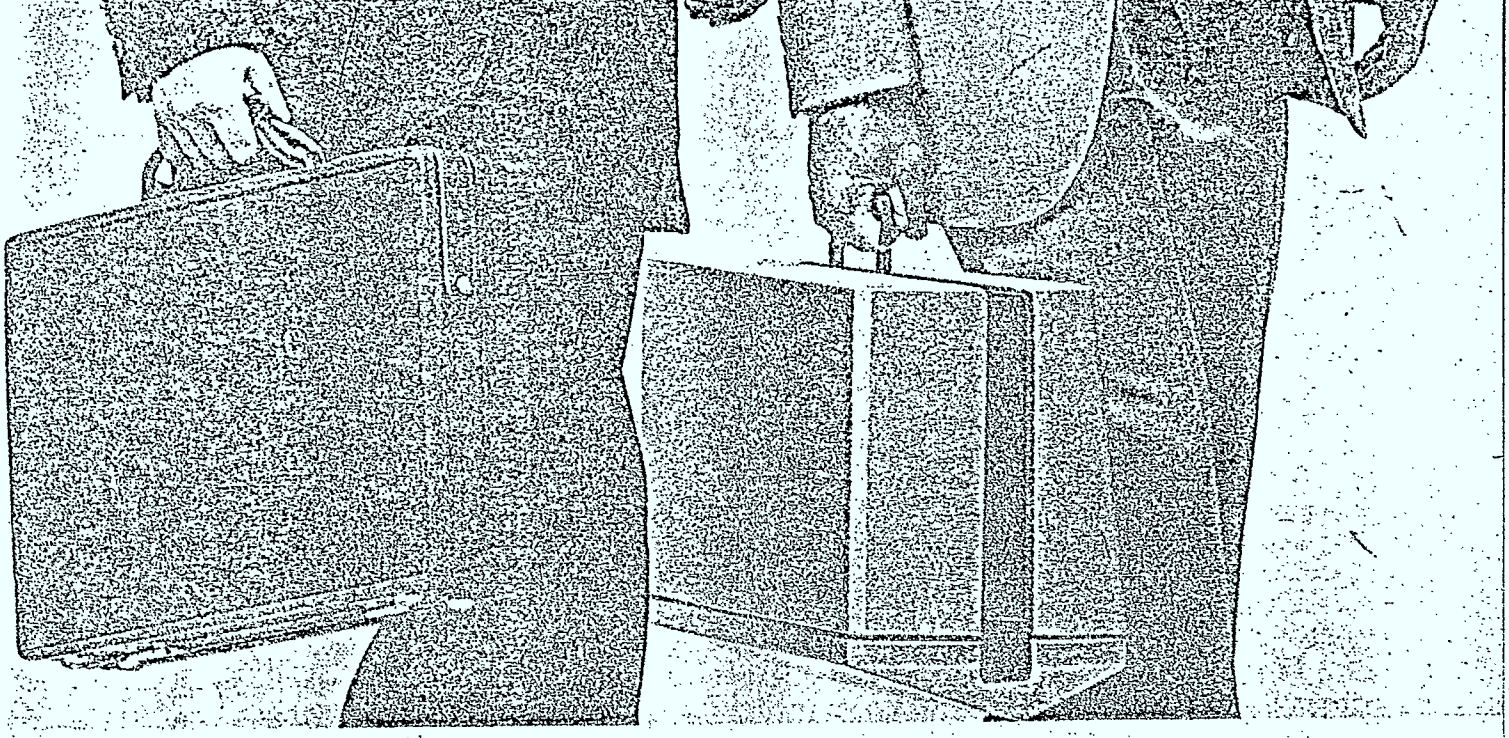
Your strong partner

*Units of Veritechnology Electronics Corporation in the U.S.

Specifications subject to change without notice.

CP-203A

BYTE, November 1981, No. 11



The guy on the left doesn't stand a chance.

The guy on the left has two file folders, a news magazine, and a sandwich.

The guy on the right has the OSBORNE 1®, a fully functional computer system in a portable package the size of a briefcase. Also in the case are the equivalent of over 1600 typed pages, stored on floppy diskettes.

The owner of the OSBORNE 1 is going to get more work done—and *better* work done—in less time, and with less effort.

Unfold it, plug it in, and go to work like you've never worked before. . . .

Go to work with WORDSTAR® word processing, so your correspondence, reports, and memos take less time to produce, and say more of what you wanted to say. And with MAILMERGE®—the mailing system that turns out personalized mass mailings in the time you'd spend on a rough draft.

Go to work with SUPERCALC®, the electronic spreadsheet package that handles complex projections, financial planning, statistics, and "what if" questions instantly. For the more technically minded, SUPERCALC will process scientific data and calculate results.

Go to work with powerful BASIC language tools—the CBASIC-2® business BASIC, or the Microsoft BASIC® interpreter.

That's standard equipment.

Options include about a thousand different software packages from a host of vendors designed to run on the CP/M® computer system.

Go to work at the office, at home, or in the field.

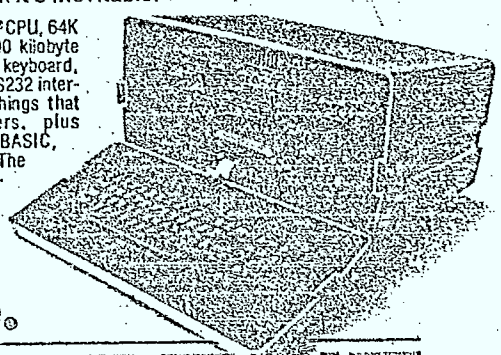
Or anywhere. Optional battery packs and telephone transmission couplers mean you need never work without the capabilities of the OSBORNE 1. That's good, because you won't want to work again without it.

All for $1795. It's inevitable.

The OSBORNE 1 is the productivity machine that's changing the way people work. Put simply, the machine delivers a significant productivity edge—day in and day out—to virtually anyone who deals with words or numbers. Or both.

Since the entire system is only $1795, it won't be too long before the guy on the left has an OSBORNE 1 of his own. The same probably goes for the person reading this ad. In fact, we think it's inevitable.

The OSBORNE 1 includes a Z80A® CPU, 64K bytes of RAM memory, two 100 kilobyte floppy disk drives, a business keyboard, built-in monitor, IEEE 488 and RS232 interfaces for printers and other things that get connected to computers, plus CP/M, CBASIC-2, Microsoft BASIC, WORDSTAR, and SUPERCALC. The system is available from computer retailers nationally.



$1795. It's inevitable.

OSBORNE

COMPUTER CORPORATION

26500 Corporate Avenue Hayward, California 94545
Phone (415) 887-8080 TWX (910) 383-2021

Circle 289 on Inquiry card.

BYTE, January 1982, vol. 7, No. 1

The ultimate single user machine

The PDS-80™ with Cache BIOS™ is a professional system designed for the most rigorous single user CP/M* environments... in business, software development, scientific, educational and industrial research... where speed and program space are critical factors.

SymBIOSis quadruples speed

No matter what high-level language you use... Cobol, Basic, Fortran, PL/1, or Pascal... PDS-80 offers more speed, power and reliability than any other floppy based CP/M system currently on the market. The InterSystems Cache BIOS fully exploits the advanced DMA and interrupt features of our reliable Series II hardware to buffer whole tracks in extended memory so most operations run two to four times faster than on other floppy based systems... actually equals the speed of many small hard disk systems. And Cache BIOS also provides many sophisticated system test and protection features to assure reliable operation.

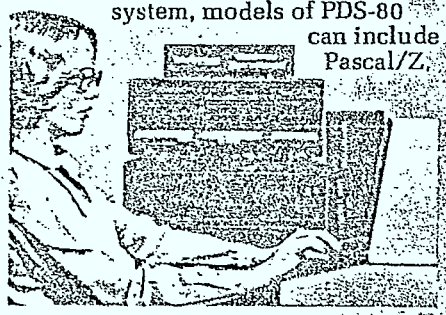
An advanced CP/M application system

PDS-80 has all you need for commercial systems integration and applications software development... including a choice of the industry's only integral 8 bit front panel. Best of all, PDS-80 allows the systems integrator or applications developer addressing a vertical market to develop on the same components he configures for resale. The highly expandable modular design with 20 slot S-100 mainframe allows almost unlimited options to suit any end use environment... including a choice of tabletop or rackmount design.

InterSystems will work with you at whatever level is appropriate to configure the target system you need ...right up to fully assembled and tested systems with floppy and Winchester disk drives.

Full software support

In addition to InterSystems' Cache BIOS and the CP/M operating system, models of PDS-80 can include Pascal/Z,



our highly acclaimed Z-80® native code Pascal compiler, and InterPak 80™, a special set of utilities including a powerful screen editor and versatile spelling editor to assist in the rapid editing, proofing and documentation of your code. These powerful programming aids are also available as standalone products.

It's upgradeable!

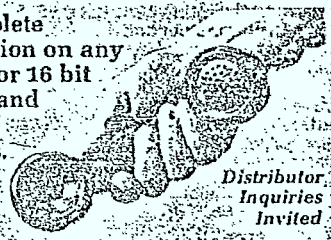
Both hardware and software are designed to provide for upgrade to 16 bit operation. Programs written for Pascal/Z are fully compatible with I•Pas 8000™, our Z-8000® native code compiler, and all PDS-80 systems are upgradeable to our 16 bit multi-user DPS-8000.

We build micros for bigger ideas.

Your big ideas. We're dedicated to providing the computer professional ... Systems Integrators, commercial program developers, scientific and industrial programmers ... with professional hardware and software tools. And we support our customers to the fullest, with complete, professional documentation, application engineering consultation, and prompt, responsive service both from the factory and through factory-authorized service centers.

Call us toll free: 800-847-2088

for complete information on any of our 8 or 16 bit systems and software products.



Distributor Inquiries Invited

InterSystems™

Ithaca Intersystems Inc.

Circle 193 on Inquiry card.

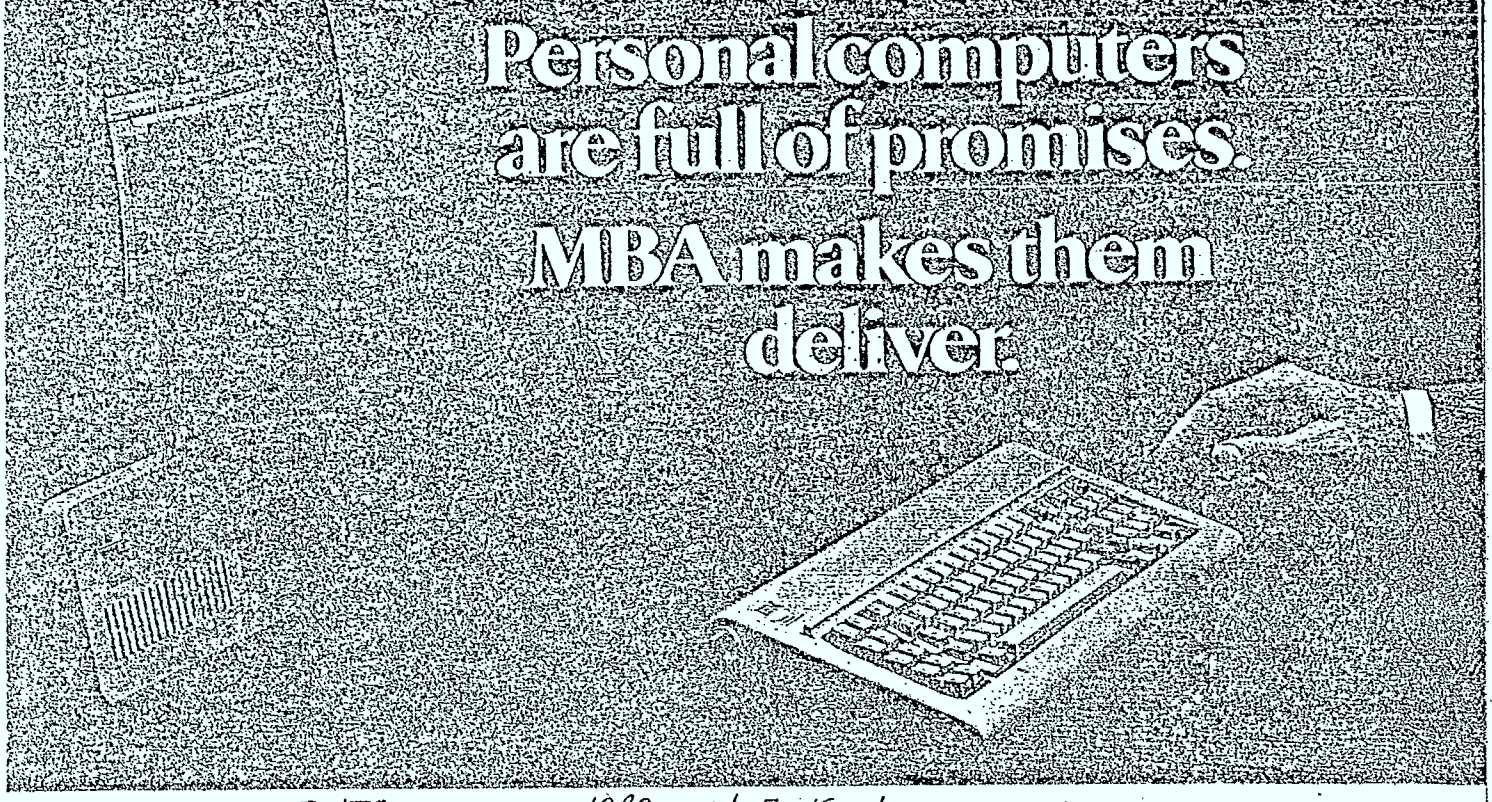
Micros for bigger ideas.

Ithaca Intersystems Inc. • 1650 Hanshaw Road • Ithaca, NY 14850 • Phone (607) 257-0190 • TWX: 510 255 4346

U.K. Distributor Ithaca Intersystems (U.K.)Ltd. Coleridge Road London N8 8ED Phone: 01-341 2447 Telex: 299568

*Z-80 and Z-8000 are registered trademarks of Zilog, Inc. ™Trademarks of Ithaca Intersystems Inc. *Registered trademark of Digital Research

Personal computers are full of promises. MBA makes them deliver.



BYTE, January 1982, vol. 7, No. 1.

You've heard how the personal computer is going to revolutionize the way you work.

So far, the reality hasn't measured up to the promises.

But now there's a remarkable new software package that transforms the IBM Personal Computer into an incredibly powerful management tool (Apple and Xerox owners: read on).

The first totally integrated management software.

There are a lot of useful programs available for personal computers.

Unfortunately, they all seem to use different commands and different ways of storing data. This creates two major problems:

1. Every time you want to add a new function, you have to learn a whole new command language.

2. You may not be able to exchange data between different programs.

But now there's a better way. It's called the MBA, and it was created by a blue-chip management consultant, an MIT-trained systems designer, and some of the country's most experienced business programmers.

For the first time, MBA combines all the essential management functions in one easy-to-use package:

Electronic Spreadsheet. The ultimate financial modeling tool that lets you create a giant spreadsheet of figures and text. Change one number, and every affected item is instantly re-calculated.

Word Processing. Compose, edit, and print any kind of document. Make revisions yourself—faster than you can explain them to your secretary. Because MBA is an *integrated* system, it's easy to incorporate data from its other modules into a report you're writing.

Data Management. A sophisticated electronic filing system that lets you store information—ANY information—then retrieve it, analyze it, and generate reports to your specifications.

Graphic Output. For those occasions when a picture tells your story better than words, you can easily generate clear, readable graphs.

Communications. Tie into your company data center, a financial information service, or virtually any other computer system. MBA automatically retrieves the information you want, and lets you edit or rearrange it with a few keystrokes.

Easy to learn. Easy to use.

MBA's designers devoted great care to giving it a simple, consistent set of commands. So when you've learned one module, you'll immediately be comfortable with the others.

What, where, and how.

MBA is offered through selected computer retailers who have qualified people to demonstrate and answer questions.

It runs on the IBM Personal Computer, with Xerox and Apple versions available soon. But whichever machine you use, MBA will make a dramatic improvement in your personal productivity.

And that's a promise.

Context Management Systems, Inc.
Management software for personal computers.

23864 Hawthorne Blvd., Suite 101
Torrance, California 90505
(213) 378-8277

Circle 108 on inquiry card.

APPENDIX 4 EXPERIENCES OF THE ONTARIO EDUCATIONAL COMMUNICATIONS AUTHORITY WITH BROADCAST TELIDON

The Ontario Educational Communications Authority (OECA) has been a TELIDON user since its introduction some three years ago, and has been distributing TELIDON signals as part of its regular television programs on the TV Ontario network for some time. OECA has pioneered the educational applications of TELIDON, as being consistent with its mandate from the Ontario Government to research and explore the use of new technologies in education.

OECA has an established reputation in educational communications, in the production of educational material and in the use of media in its delivery; especially in the use of television. They have a number of staff members who are very interested in the use of new technologies in education, an attitude that includes their most senior management. With that background, it was natural for them to become involved in the use of TELIDON. The TELIDON program is headed by John Syrett, and liasion with users is handled by Maria Cioni.

OECA has taken a leadership role in the introduction of TELIDON. They have taken the product and demonstrated it; they have evolved the technology and applications; and they have found modes of sucessful application. The OECA team has evolved the system to be 'user friendly' and more acceptable. They have been a shaping influence on TELIDON.

One of the interesting facets of OECA's involvement with broadcast TELIDON is the nature of the users they are serving. These users are primarily in the educational field: the school systems and among adult educators. While there is often a vehement opposition to the introduction of technology in education, in this case, TELIDON has come along at a time when there is a tremendous awareness of computers and computer communications in the schools. School boards have been buying computers in way unparalleled by any other technology.

Many persons in the schools and other TV Ontario viewing sectors are very aware of media and educational technology. Many have experience with computer aided learning such as CAN8. Even more have experience with the introduction of micro computers into the schools. Most important however, from the point of view of TELIDON introduction, the senior personnel in the schools are

completely turned on to the potential that information technology has for the 'good' or the 'bad' of their positions, functions, and what have you, that they cannot afford not to know what is going on; and to be involved in it.

OECA has found that computers have been accepted in education. They do not have to 'sell' TELIDON; it is difficult for them to meet the demand. TELIDON is now recognized as being 'the same' as computer communications, with the associated costs, and many teachers are looking forward to the micro/TELIDON hook-up.

It must be remembered however that OECA has been developing their user groups for three years. initial field trials were 'busts', as the equipment was unreliable, but the client population has stayed with them, and been able to perceive the long termm advantages.

OECA has ventured a number of informal comments regarding the evaluation of potential applications. Some of these are:

It is essential that potential users do their homework, and thoroughly evaluate all of the costs, etc.

It is essential that users participate in the development of the application.

Was this done?

Systems that allow the user to contribute rather than just receive are more successful.

This is an important time to be considering TELIDON applications because it coincides with the introduction of the multi-purpose terminal.

TELIDON data rates must be at least 1200 bits per second. Data rates of 300 bits per second are used on Northern Ontario telephone lines because of poor transmission. OECA also has trouble with 'audio buzz', when broadcast TELIDON rates of 4.6 MHz are used. The current standard is to be 5.7 MHz. Experience of OECA and WETA in Washington, D. C. indicate that data transmission effects must be ascertained before service is inaugurated.

OECA worked with user groupd to develop their interest, understanding and use. The introduction of TELIDON has been a growth process. OECA warns against imposing service upon an un-knowing, non-participating group.

The OECA data base is not overly deep, but is extremely broad. It covers all areas and potential applications.

Sources of help, e.g., maintainance must be clearly identified and availaable to users.

The nature of information itself and the cost of preparing, converting, and communicating it must be fully considered in the planning.

In conclusion, it must be pointed out that OECA is 'in' the information business, committed to the exploitation of information technology, and delivering information to an educated audience, and they still must work very hard to put TELIDON into service.

APPENDIX 5 SOME ISSUES ASSOCIATED WITH USABILITY OF VIDEOTEX

Excerpts from:

Dillon, F.R. and Tombaugh, Jo.

Psychological Research on Videotex (November, 1981)

Carleton University, Ottawa, Canada, K1S 5B6

Some issues associated with usability of videotex by the end user, information provider, and data base manager.

> "The major difficulty for evaluators at the present time is that the database is so small and the service so restricted that use of the system, as well as its impact, will be very limited." ¶p.17)

END USERS

a) Approximately 40% of users who try fail to produce a correct response(*).

b) Using widely different data bases and retrieval methods, studies consistently show that users access approximately twice as many pages as optimally necessary in finding material.

Some reasons:

a) poorly prepared instruction at the display
b) unfortunate choice of symbols for the keypad
c) error messages noninformative and intimidating

Then: s/b done

- the development of instruction sets should incorporate user testing
- assess user satisfaction with the material in the laboratory and in real settings, testing clarity and acceptability.
- try other paths for search and retrieval of information. The menu approach to information

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(*) From: Jo Tombaugh and Richard Dillon. Videotex: Who Uses and How Well© Carleton University, Ottawa, Ontario, K1S 5B6 (November 1980).

retrieval may have to be abandoned or supplemented ir future generations of videotex. Research into potential alternatives to menu solution is needed and should be undertaken by cognitive psychologists with training in database management systems to appreciate the practical constraints of computer-based information retrieval and database management.

INFORMATION PROVIDERS

Because information provider is an artist, not a computer expert, issues having to do with dialogue design and training will be particularly important. Some important ones are:

a) Input related issues:

- what input devices are needed?
- how can each device be made easy to use?
- what is the best method of restricting users?

b) Output related issues:

- what is an effective formatting of dialogue?
- how should error messages be presented?
- in what form can the graphic be displayed?

c) General workstation design:

- what placement of input and output device is best?
- what other resources are needed at the workstation?
- what environmental factors will reduce fatigue?

d) Functions:

- what functions should be provided?
- how does each function get selected and used?
- what can be done to minimize training time?

e) Quality of product:

- what guidelines are needed for information providers?
- how can these guidelines be effectively presented?

DATABASE MANAGER

The final and most neglected individual involved with videotex, is the person who has the responsibility for

keeping the hierarchical database in good condition.

At present, because of the small volume of information involved in the demonstration databases and the small number of people who have to be trained to interface with this aspect of the system, very little is being done to suppose the database manager.

Psychologists with some training in database design and knowledge of database management systems should be involved in the design and testing of such a system and in the training of database managers.

Excerpts from:

Jo Tombaugh, Richard Dillon.

Videotex: Who uses it and how well? (November, 1980)

Department of Psychology, Carleton University, Ottawa, Ontario. K1S 5B6

Description:

Evaluation of consumer responses to a prototype Telidon videotex system.

Basic Questions:

- Who attempted to use Telidon?
- How successful were they in operating the system?
- What kinds of errors did they make?
- Would added feedback from the system increase performance?

Subjects:

Weekend visitors to the Museum of Science and Technology, Ottawa, Canada - who elected to use the system.

Results:

1) Some considerations of use frequency considering age, sex, type of user (individual - group, composition of groups). In general, very few persons attempted to use the system - especially females.

2) Improving instruction is needed.

3) Nonmeaningful commands (i.e. F 5:1) are very difficult for new users.

4) In terms of typing errors: punctuation type symbols are frequently omitted.

Excerpts from:

Scott A. McEwen, Eric Lee and Thomas Whalen

Ease of use in information retrieval on Telidon and other Videotex systems

Behavioral Research & Evaluation, Department of Communications,
Ottawa, Canada, June 1981

Objective

To develop a set of recommendations and methods to help the information provider to design tree indexes in order to ease the retrieval process for the general public.

Revision of the following studies

1) "Evaluation of tree-structured organization of information on Telidon". Lee & Latremouille (1979).
2) "The effectiveness of tree-structured index when the existence of information is uncertain". Whalen & Latremouille (1980).
3) "An investigation of user search performance on a Telidon information retrieval system". McEwan (1981).

General Results

1) Users make errors on approximately 50% of the search problems = at least 1 error on half of the tasks.

   Hhe problem of making errors: select an incorrect index term when presented with an index page which contains the correct term ranged from .14 to .35.

2) Two basic sources of errors: a) information classified under the wrong category; b) inappropriate terminology.

3) When a modified tree index was used (index developed by common users) the proportion of errors was reduced to .40.

4) For answer-questions, the average of index pages to be accessed in order to retrieve the information is

3.5, users employed 4.5.

For no answer questions, the user employed:

21.9 - First attempt
10.1 - Second attempt learning process
8.8 - Third attempt

5) Descriptors seemed to be very useful in helping users to reduce errors.

APPENDIX 6 CANADIAN TELIDON FIELD TRIALS - EVALUATION

Excerpts from:

Evaluation of Canadian Telidon Field Trials
Dorothy Phillips
Behavioral Research and Evaluation
Department of Communications
Ottawa, Canada

Trials:

1) British Columbia Telephone Company. Test of business services on Telidon. Businesses of various sizes will be asked to cooperate in designing information for their needs and an additional business magazine of general interest is planned.

2) Alberta Government Telephone VIDON. Calgary. 100 homes are being wired for the VIDON system which includes Telidon, security alarms and other services.

3) Manitoba Telephone System. Winnipeg. Evaluation of user preferences concerning the magnitude of databases.

4) Bell Canada VISTA. Toronto, Montreal, Quebec City. 500 terminals will be installed in homes, institutions and public places. The terminals aat home are going to be placed for different periods of time, in order to see if there are differences in attitudes between groups which have terminals for different phases of the study.

5) New Brunswick Telephone Company. (Project Mercury). Quasi-experimental design of 4 groups:

   G1 = terminals for 3 months

   G2 = terminals for 6 months

   G3 = terminals for 12 months

   G4 = control group

   +5 terminals in public places

6) Ontario Educational Communication Authority. 55 terminals have been located in educational settings,

libraries, and homes.

7) Telecable Videotron. Cable trial in Montreal.

Types of Data Collected

1) From interviews with users:

i) demographic information
ii) information about household
iii) attitudes toward videotex, the services offered and toward technology
iv) perceived changes in family life and in information related activities
v) positions regarding cost and payment for the service
vi) opinions about the difficulties involving the use of the system

2) From measuring actual usage:

1) Number of active terminals on the system in the time period analyzed.
2) Terminal reponse time including computer response time and user response time.
3) Cost calculations based on unit charges specified at the systems.
4) Frequency of keypad sequence types pressed by users.
5) Frequency of user pages by account.
6) Frequency of user pages for all accounts during the analysis period.
7) Sequential record of each user's activity.

Reasons to implement trials

Companies

a) To assess whether the technology can be implemented in a cost effective manner and will be used in a manner that will provide adequate revenue. This information is used to make decisions about their involvement in an operational service.

b) To train personnel.

c) To project an image to the public of their involvement in the new technology.

Federal Government

a) To assess possibilities for videotex technology.

b) To develop policy for new technologies.

c) To inform the public about forthcoming issues or changes in society.

d) To assist in making decisions about technical features of the terminal equipment and the systems.

DOC

a) Economic or marketing issues

b) Social issues

c) Technical issues

d) New applications

APPENDIX 7 TECHNICAL CONSIDERATIONS OF TELIDON AFFECTING APPLICATIONS

In analyzing or evaluating prospective TELIDON applications it should be kept firmly in mind that TELIDON was not designed for the application under consideration. In fact, it was not designed for any particular application - it has general generic characteristics. These technical characteristics therefore must be well understood if the application of TELIDON in a particular situation is to be assessed.

TELIDON is very much a "solution in search of a problem", but the problems it has the potential to solve are basic human problems. The solutions are future oriented, the introduction of TELIDON (and its sister systems) will create a different society than the one that exists today, as all new technologies do, but that does not invalidate the assumptions of the designers that information systems with the characteristics of TELIDON will serve many of the needs (both current and future) of society and business. The introduction of TELIDON is 'technology -push', rather than 'market-pull', but that is to be expected. In an analogy that may not be too far-fetched, the telephone was installed and operated for many years before it was socially or commercially accepted: a market study would have revealed very little interest in it, and a social-impact study would have revealed very little of its effect simply because no one alive at the time of its introduction had ever experienced its use: it would have been impossible to predict its impact.

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The question still remains, however, that 'with the experience of the introduction of the telephone, radio, television, computers, word processing, video terminals, xeroxgraphy and other communication technologies, what attributes of TELIDON are explicitly designed with the information provider or information user/consumer in mind; and, which of these have been designed with the aid of evaluation of the actual tasks that information providers and/or information users perform?'.

Evidence would tend to support the conjecture that the technical characteristics of TELIDON have not been determined by evaluation in any formal sense of the information requirements of potential users. The technical characteristics have been determined by and large by the evolutionary development of TELIDON (computer graphics,

Great

shared graphic spaces, high-level graphics programming languages, and subsequent applications to videotex in competition with Prestel) and the inate belief of the developers that graphic communications and access to stored graphical information was an inevitable extension of human communications that started with the telegraph and progressed through the telephone, radio and television and the marriage of the telecommunications technology with computer information processing and communications.

One very important technical consideration is whether or not a new product or process is compatible with existing products or procedures. Even though videotex and TELIDON are relatively new, information processing and electronic communications are well established functions in the home, business, schools and institutions, and one might expect that TELIDON might have been designed to fulfill functions in this environment or to capture some share of the existing market on the way to replacing it with new modes of information processing and expression.

Prototype models of TELIDON could not:
be used as remote computer terminals on time-shared computers;
be used as stand-alone computers; or
be used to provide compatible video signals.

In other words, they were stand-alone devices, able to communicate only with TELIDON data bases - they were not compatible with standards in data communications, personal computer software, or television; and as well well introduced a totally new method of image communications (at least in the videotex world). The situation has changed since the introduction some three short years ago. TELIDON developers have devoted major efforts to ensuring that TELIDON is compatible with world standards in videotex systems - chiefly by ensuring that TELIDON is recognized as a world standard. That is certainly an approach, but one could seriously question whether or not a TELIDON applicaton might not end up changing the environment it is placed in to match the peculiarities of TELIDON rather that vice-versa. The telephone analogy should be kept firmly in mind: telephone sets, lines and switches carry human voices from one subscriber to virtually any other subscriber in the world regardless of the language being spoken or what is being said. That technical characteristic of the telephone has a fundamental nature about it that has enhanced rather than hindered its acceptance. Expectations about the applicability of TELIDON cannot assume the same sort of universality of its technical characteristics.

The understanding of the precise capabilities of TELIDON compared to the expectations of its capabilities is essential to the evaluation of any application.

The technical characteristics of TELIDON might be summarized under the following headings:

- the image
- the Picture Description Instructions (PDI)
- telecommunications
- the data base design
- access to the data base (the information consumer's problem)
- image creation (the information provider's problem)

APPENDIX 8 FORECASTING FOR NEW TELECOMMUNICATIONS AND INFORMATION SERVICES

TELIDON (videotex) is a new technology; a new service; and a new media. It is untested and virtually no one has had any experience with its use over any significant length of time or for any significant purpose; particularly not in the general business community, within institutions or among the general public.

Market forecasts for new (information) technologies are highly suspect for these reasons. The Bell Canada Delphi surveys of the 1970's can be examined. The Hough survey of forecasting methods can be looked at. In general, market penetration, acceptability, costs, volumes and all of the other variables that a business plan might be based on, have no basis for extrapolation. Forecasting is usually a projection or extrapolation of a model of the existing situation, when the field is changing rapidly (as the electronic technology consumer market is) extrapolation of currrent experience is very questionable; when no comparable experience exists, forecasting is extremely unreliable.

The introduction of TELIDON (videotex) should be based on an appreciation of its generic qualities; that is on the provision of a generic service, such as that provided by the telephone. It is instructive to realize that the telephone carries voice signals, or anything else that is similar, from one terminal to another. The operation of the normal switched telephone system does not depend upon the language being spoken or the meaning of what is being said. It is independent of language and content. videotex should be similarly considered. A separate system for pictures of this and one for pictures of that will NOT succeed.

The constraints on TELIDON as a generic information system must be understood and evaluated as a potential problem.

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Teletex Field Trials in the United Kingdom

1. Sherry

IEEE Transactions on Consumer Electronics, Vol.CE-25, No.3, July 1979.

Aspects Considered:

- Evaluation of quality of reception
- Examination of the transmission chain
- Quantification of improvements gained by using data regenerators

Basic Results:

- Weak signal reception
- Reception interferred by reflections
- Combination of both

Teletex Field Tests

Robert O'Connor

IEEE Transactions on Consumer Electronics, Vol.CE-25, No.3, July 1979.

Aspects Analyzed:

1) An appropriate bit rate
2) Evaluation of the relative merits of the FIXED format vs variable format
3) An appropriate display configuration (number of characters per row and the number of rows)
4) Specific lines in the vertical interval, and the pulse amplitude levels that may be used.

incorporate in every report an introductory summary of major findings in order to give the reader an immediate sense of the report's relevance and importance.

4.2.3 The third functional element - Policy Analysis - represents the attempt to present to decision makers a comparative analysis of the complete range of feasible options available now or at some defined future date. Two levels of analysis are distinguished. The first level concentrates on specific policy options for implementing each technological alternative. The second level, more general in character, supplements the first one by identifying uncertainties, concerns, and issues, many of which fall outside the applicable policy community for the technology being assessed (p.51). Such policy analytic considerations would be relevant for, say, a decision to involve TELIDON technology in implementation of Canada's prospective Freedom of Information Act (Coll et al., 1981).

The first level of policy analysis - implementation of technological alternatives - involves:

- a formulation of the feasible policy options for implementing each technological alternative;
- a comparative analysis of the options within each alternative;
- a synthesis of the best combination of policies and strategies for implementing each technological alternative.

The second level of policy analysis implies to take into account aspects concerning legal, economic, technological, institutional, physical, environmental, social, cultural, political, and jurisdictional aspects.

It is suggested that in the process of accomplishing the tasks associated with the three functional elements, it is necessary to consider other aspects. Of those, the ones that emerge as more relevant are:

- "The quality of team interaction necessary to achieve an integrated and multidisciplinary assessment;
- The iteration and sensitivity analysis used to insure an adequate assessment.
- The alternative whole-societal future contexts within

which the technological alternatives are embedded and against which the judgements of impacts and implications are made.

- The context of specific societal values assumed, and the way in which they are accounted for in sub-element application.

- The uncertainty of alternative projections of the technology, of the societal and value impacts that results from the technology projections, and of the effectiveness of proposed policy options.

- Validation and public participation." (p.57)

Some of the foregoing considerations may seem of remote relevance to any specific, local field trial. By the same token, however, they have clear bearing to the more broad question of giving videotex, and particularly TELIDON, an important place in Canadian society. Thus, although these proposals and cautions may not in their general statement appear as points to be checked, among the list which concludes this report, many of their indications will later appear, and then specific relevance will be obvious.

4.3 General Guidelines for Assessment of Information Technology

4.3.1 The general guidelines for conducting technology assessments may differ depending upon the type of technology being evaluated. The following types are distinguished:

- Problem-oriented versus technology-oriented assessments
- Physical versus management (social) technologies
- Existing versus emerging technologies
- Major versus minor technological interventions

i) Problem-oriented versus technology-oriented

A problem-oriented technology assessment is characterized by alternative solutions that contain a mix of various physical and management technologies. This type of assessment is often more complex than technology oriented TA because detailed information on several different technologies must be assimilated and compared; in the latter case, future projections involve that of a single technology along alternative paths.

ii) Physical versus management technologies

The formulation of technological alternatives for a physical technology rely heavily on projected technical feasibility. Policy considerations are deliberately excluded from the initial formulation of alternatives. In the case of management (social) technologies, the technological alternatives are largely dependent on political and social feasibility, and technical feasibility plays only a minor role.

iii) Existing versus emerging technologies

Feasible technological alternatives are narrowed for an existing technology as compared to an emerging one. These limitations are mainly derived from the existence of positions or interest group that may be affected for innovations. Thus, an existing technology requires a complete and detailed impact analysis to satisfy the specific attention of various interest groups. An emerging technology requires greater emphasis on establishing and justifying the major impact comparisons intended to serve as a basis for future, more detailed impact analysis.

For existing technologies, policy alliances are likely to be already formed which may be difficult for the

assessment team to understand the power positions and to seek realistic policy options accordingly. Emerging technologies are likely to have no such defined political interest structure; consequently, much wider and less specific policy options are needed.

iv) Major versus minor technological interventions

In the case of major technological intervention, the technological alternatives strongly interact with whole societal projections and are likely to embody policy thrusts as inherent elements of the alternative. Just the opposite is true for minor interventions. Major interventions are likely to generate ripples at secondary and terciary levels. Minor interventions may well have far reaching impact also, but the effects are more likely to be subtle, difficult to identify, and even more difficult to measure.

Since policy analysis is likely to be an integral part of alternative formulation for a major intervention, implementation policies - for this type of intervention - are likely to involve high-level concerns and will probably require adjustment throughout the government and within the affected industrial sectors. Policies for minor intervention are likely to be enveloped within other policy programs and thus will be difficult or impossible to isolate or be extremely diffuse and difficult to identify.

4.3.2 Evaluation Research and TELIDON

This topic must be addressed briefly, if only because the concept of "evaluation research" has become one of the buzz words of the contemporary scene. There is now a professional society for people interested (not necessarily skilled) in evaluation research, and the concept of evaluation and accounting have become part of most bureaucracy-based interventions in the world of commerce or social issue. We do not deny that evaluation has been too often overlooked; indeed, it might be possible for us to advise that every proposal for a TELIDON trial make provisions for an evaluation researcher among its personnel, because every proposal will probably be, for a while, at least, different from every other one. Depending on the budget of the applicant, this may not be a bad idea, but it should not conceal the fact that it is still possible to save time and money by having applicants anticipate all positive and negative outcomes possible, and indicate to GTA that these outcomes are, or are not, to be of concern and, hence, figure in any trial application. Important final steps in this direction are being taken already (Phillips,

1981, Appendix 6).

Some of the few current examples of evaluations of TELIDON (Tombaugh and Dillon, 1980; Dillon and Tombaugh, 1981; McEwen, Lee and Whalen, 1981) are included in the Appendix 5 for illustrative purposes. They are good examples - both of solid research and of the limited scope of the testable questions that have been - perhaps must be - at this early juncture.

4.4 General Considerations Concerning Past Resistance to Computerization

4.4.1 Introduction

In general, a spreading fear of progress and its unknown implications tends to distort the role of technological advances and innovations. It has been suggested (Rothman and Mosman, 1972) that every new technological advance has had its detractors who argue that it must be bad because it is new or different. Perhaps, this position is based on the uncertainty that accompany innovations and changes which in turn lead to resistance. Zaltman and Duncan (1977) note that uncertainty and thus resistance to change may happen when:

- "the change is not compatible with the values of the change target;
- the change threatens the self-esteem and cohesiveness of the target system;
- the change alters the balance of interdependency between groups and the distribution of power between individuals and groups in the target system;
- the change involves users acquiring new technical skills and the users do not perceive they have those necessary skills to implement the change;
- the change target is not clear of the objectives and rationale behind the change and therefore perceives there is not a good chance of successfully achieving their objectives;
- the change target is not involved in creating the climate surrounding the change, does not feel there is a potential for change in the system, and has little control or influence over the change process." (pp.88-89).

Computer-based technology(*) is present in almost all spheres of human activity with its advantages and disadvantages, opening new options, making reality of previous promises and possibilities. At the same time, it presents us with some of the recurrent problems that every

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(*) As stated previously, we must use "computer technology" as a generic concept, which necessarily subsumes computer communication systems generally, and, in turn, videotex and, in particular, TELIDON.

technological innovation seems to generate, along with new ones derived from its own peculiarities.

Gotlieb and Borodin (1973) note that the spectrum of problematic areas created by the introduction of computer technology can range from "well-structured unambiguously formulated problems" (i.e. technical, logical, etc.) at one end to those which are more loosely defined and not understood as well as the other (i.e. social, ethical, philosophical) with instances of overlap between them. It is suggested that many of the reservations and fears about computers originate from questions concerning the extent to which computers can replace men. This constitutes a source of anxiety which seems to stem either from ignorance, or from an understanding only of what Rothman and Hosman (1972) call 'computer mythology', in which the computer is portrayed as "all-knowing, all powerful, infinitely fast, completely reliable, totally rational; it uses hundreds of servants who are kept busy 'feeding' it information and 'listening' to what it tells them to do". With this image, they argue, that "it is no wonder that men feel diminished in its presence..." (p.11).

New users usually have had minimal experience with computer technology or technological innovations in general. Thus, coping with it may create personal and interpersonal stresses which arise from having to deal with new equipment and having to interact in a new social milieu which they may normally prefer to avoid.

Focussing on computerized technology, authors tend to agree that the basic threats, fears and resistances are related to the following dimensions:

i) employment structure
ii) privacy
iii) becoming a technological society

4.4.2 Effects of Computerized Technology on the Employment Structure

a) Unemployment - job displacements

It is clear that a technological innovation, when it is first put to limited use, often replaces work formerly done by hand. People whose jobs are eliminated because of the technological innovation may be expected to be either

skeptical of its advantages or to completely reject it. The computer emerges as a technology that potentially can replace a wide range of human occüpations and activities; thus it is perceived as the ultimate symbol of automation and, consequently, as a threat to many workers and their jobs. In this context, for those workers who feel that their jobs are jeopardized by computer-based-technology, it is difficult to think of the computer in unemotional terms "... it must appear to them as indeed very much like a mechanical brain, coldly and relentlessly replacing men and women in all aspects of life ... the computer becomes a monster, it coldly and ruthlessly removes all human aspects of person-to-person relationships and makes it difficult, if not impossible, for an individual to be treated with respect and individuality" (Rothman and Mosman, 1972, p.13).

Factual information concerning the effects of computer technology on employment levels is controversial in its estimations. On one hand, it is argued that automatic machines and computers perform jobs formerly done by men and thus they limit the job availability. On the other hand, it is said that the development of these new technologies creates new industries and new working opportunities for the manufacture, sale, use and maintenance of these machines. But, in relation to the last arguments, Briefs (1980) notes that it is based on incorrect assumptions. The labour saving effects of computerization would not be compensated for the creation of new job positions "... computer systems quite simply replace human activities by machine activities. The large majority of computer applications are of this character and do not introduce additional activities" (Briefs, 1980, p.58).

Although, it seems impossible to estimate accurately the extent to which employment levels have been affected by the introduction of computer technologies and to estimate how many jobs will be abolished by their implementation and usage, some experts state that computers displace 40,000 workers for a week and that computers create only one new job for every five they destroy.

It is said (i.e. Rothman and Mosman, 1972; Cooley, 1973; Briefs, 1980, etc.) that the types of working positions most often displaced by computers are the non-skilled jobs as well as the semi-skilled ones which have been introduced by automation (i.e. programmers. It is argued that fewer programmers will be needed since computers will themselves be used to generate new programmes once the logic has been defined.). Other types of job activities in which computers seem to have a large impact concern

secretarial and clerical tasks.

b)Qualifications - work careers

Concerning the issue of qualifications, it is argued that computerization has effects in two directions. On one hand, it creates new jobs that demand more scientific and technical skills, but, at the same time "dequalifies" workers by destroying or making obsolete existing qualifications and generating a large number of marginal mechanical activities with low and specific qualification requirements.

In relation to this point, Briefs (1980) comments that computerization seems to mean the end of professionalism, especially in clerical work. The typical white collar worker having a set of functional and extra-functional qualifications and a material knowledge in his line of profession will cede his place to the semi-skilled office workers, who will have a broad but rather shallow training in school and will have no chance to acquire any substantial functional knowledge in any line of activity." A new but not so well integrated professional group of computer specialists will emerge. However, with increasing maturity of computers and increasing standardization and uniformity of business organizations, their number too will be reduced and they too will increasingly be split into a priviliged few and a large majority who are increasingly under social pressure" (Briefs, 1980, p.59).

Concerning job careers, Coley (1973) states that computerized equipment changes the organic composition of industries and enterprises. They become capital intensive rather than labour intensive. For some professionals, this means that the peak age performance is around 29-30, followed by a career plateau of 3 or 4 years. Thereafter, unless the employee has moved into management he (she) will be subjected to a process of career de-escalation. In this context, older workers are eliminated or downgraded to lower pay rates on the basis of their age and under the assumption that they are no longer able to respond to the requirements of the new technology.

c)Working conditions

Bjorn-Anderson and Bloch (1980) discuss the effects of computerized technology on job settings, distinguishing between direct and indirect effects. Direct effects refer to the "ways in which computer systems change the role of man in relation to organizations, i.e. the 'objective'

behavioural characteristics of his situation". Indirect effects denote "the ways in which computer systems change man's relation to others and himself, e.g. the attitudes, feelings and emotions encountered as a result of the introduction of the computer system" (p.98). In the area of direct or objective effects, they argue that computers affect non-managerial positions by introducing more standardization, formalization and specialization. The implementation of computerized technology tends to make clerical and general office work more organized, more like factory floor procedures; it decreases the communication between employees as interpersonal communications become dominated by the exchange of impersonal information by means of the computer; and it reduces the employee's possibilities to choose work methods and sequence of work operations.

In analysing the effects of computerized systems on middle managerial positions, Bjorn-Andersen and Block (1980) state that the number and variety of responsibilities has increased. More training and experience is demanded of the supervisor as well as a higher degree of accuracy in his actions. Furthermore, there is less freedom to shape his own job and the ones of his subordinates. Concerning the effects of computer systems on high managerial positions, they assert that computers have had very little impact on the general character of the tasks involved. Computers primarily would only affect the peripheral aspects of manager's tasks. However, there is no concensus about this assertion; therefore, they conclude that: a) the impact may be significant, but there is a lack of knowleddge that prevents generalization; b) variations in impact of the system may depend on the application, philosophy of the design, type of company, ability of the designers to realize the needs of the users, etc.; c) the impact may depend on the use managers make of the system and their willingness to be encouraged to revise their policy and methods (p.108).

Another organizational dimension that computerized technology seems to affect is power. At the structural level, power refers to the steps at which decisions are taken and the means and degree to which control is exercised. Power, at the behavioural level, concerns the individual and his potential to define or shape his own work environment.

Generally, the issue of organizational power has been discussed in terms of centralization versus decentralization where computerized systems can be used to promote either places. However, the majority of the arguments indicate

that these systems increase centralization. Top managers are able to have more information, in more detail and thus, more control. Middle management becomes less important and employees loose power and become more controlled and supervised.

Since managers and enterprise owners are confronted with technology and equipment that becomes obsolete in a matter of 3 to 5 years after an enormous amount of capital investment they will attempt to recover this investment by intensively exploiting the technology. Consequently, it has been suggested that employers and managers will try to eliminate the so-called nonproductive line, to subordinate the employees more and more to the machine requirements(*) in order to get the maximum performance. The equipment must be worked upon oveer three shifts to attain a 24 hours exploitation or on a continuous overtime basis. Cooley (1973) argued that this trend, which has been evident in the manual field on the workshop floor, is now beginning to appear in a broad range of white collar occupations.

The topics just presented have been discussed in the literature as job satisfaction, depersonalization, alienation, etc. It is argued that employees will fail to become involved in their work activities since they will no longer be provided the opportunity for self-expression. Computer systems will create a work environment characterized by a sense of powerlessness, meaningless and self-estrangement which in turn provide the basis for non-acceptance of them not only in job settings but in other areas of human activities.

4.4.3 Privacy

Another factor causing feelings of threat that is constantly noted in relation to computerized technology is the access and misuse of information that is considered to be private. "The privacy problem relates to the individual's perception of how information is used to influence him; in a larger sense, to the extent and comprehensiveness of the information collected about him; and in the fullest sense, to these matters measured against his social environment" (Ware, 1975, p.292).

It is suggested that computer technology has created a situation in which different organizations (i.e. tax

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(*) This refers to a "highly synchronised, computerized environment where each element of the work has to be ready to feed into the process at the precise time at which it is required". Gooley, 1973, p.16.

agencies, insurance companies, financial institutions, government organizations, etc.) find it less expensive to share information than to collect it independently. The same is true with the storage of information, that is, it is less expensive to maintain an integrated file on a person than regather information every time individuals contact any of those organizations.

There is a tendency to believe that the more powerful and flexible computer systems become and the more information they contain, more opportunities to misuse of information are created. For example, Rothman and Mosman (1972) note that "the aggregations of information (whether) there are names attached to them or not are labelled dossiers and there enters the first irrational element into the situation ... dossier is on emotional loaded work, conjuring up images ..." (p.224).

For the common citizen, the most threatening computerized services seem to be credit and check verification. Somehow this is considered insidious, in the sense that it encourages an indiscriminant and uncontrolled sharing of information between banks, department stores, doctor's files, insurance companies and as forth. Other fears are related to criminal records unfairly causing and creating more difficulties than the law prescribes, welfare receipients being exposed to degrading inquiries; insurance, banks and credit being denied because of errors in semi-relevant data gathered for other purposes, public disclosure of private facts, appropiation of a person's name, false publicity, etc.

4.4.4 Becoming a Technological Society

Another concern related to the introduction of computer technology is a more general and less obvious in character. Somehow, computers are perceived as changing basic societal values, institutions and man's self-perception.

It is suggested (Rothman and Mosman, 1972) that the impersonal aspect of computerized systems has created some of the most violent reaction and opposition to computers. This has convinced some people that human beings have lost control, that no one care any longer for the contact among individuals, and that individuality and personal freedom have been lost.

A central issue in the above arguments is a presumed shift and concentration in power, the fear of becoming a technological society dominated by a group of technocrats.

Gotlieb and Borodin (1973) present this argument as follows: 'One fear is that the balance has been altered because the new preminence of social planning by technology results in major power being placed in the hands of a few technocracts. The fear is that such people are ill-prepared to exercise power because of their inability to appreciate human values when these run counter to the demands of efficiency, and because their decisions are not subject to the checks imposed by public debate and democratic processes." (p.223). Even outside considerations stemming from the deployment of computer-based technology, contemporary psychological research documents all too clearly that, when individuals lose, or even fear that they will lose, control of a significant area of their lives, they either (a) take steps to avoid the loss, (b) try to re-establish the control in one way or another, or (c) becomes aggressive. The literature on the effect of "psychological reactance" (Belm, Manchel,) is laden with implications for the introduction of communications technology.

4.4.5 Conclusion

If we search these general sources of resistance to computer-based technology for their implications for TELIDON, the following possibilities emerge:

possible job displacements.
possible alternatives in career trajectories.
changes in qualifications for prospective users.
changes in organization of the work place.
when stored information concerns individuals, may there be problems of:

- access
- privacy maintenance

the user's possible loss of self control, freedom of actions, etc.

5.0 GUIDELINES FOR THE ASSESSMENT OF PROPOSED APPLICATIONS

5.1 Assessment Procedure

It is proposed that potential applications be doubly evaluated, once by the applicant and once by the referee. The major requirement of the evaluation being that every conceivable factor be considered, it is proposed that for each item in the checklist, the applicant indicate:

(a) whether this is an important consideration - maybe checking yes - no on a scale of 1 to 5;

(b) how certain he is that his proposal covers it.

It is further proposed that the referee, or evaluator, on receiving the proposal, checks the same list for the same criteria.

If there there is a substantial overlap in the two assessments, negotiations for the development of services between GTA and the applicant could proceed. If, on the other hand, there were significant areas of disagreement about what was important and what was not, the basic issues would have to be examined before any thought was given to proceeding with the development of service.

5.2 Categorization of Guidelines

The guidelines are organized in four major categories, each with sub-categories.
The categorization is:

Planning Process

- Objectives
- Planning Factors
- Demographic Factors

Organizational Context and Social Aspects

- Operational Factors
- Utility of TELIDON
- Responsibility Factors
- Experiential Factors
- Social Environment Factors

Economic Aspects

- Economic Factors
- Risk Factors

Technical Aspects

- Information Use Factors
- Technical Characteristic Factors

5.3 Planning Process

The amount of thought that has gone into the concept of the application and the planning for it are of prime importance in its evaluation. The objectives must be clearly understood. Answers to the following questions about the planning process must be considered.

Objectives

Are the objectives of the proposed application clearly stated?

Are the objectives clearly related to the objectives of the proposer and user?

Are the objectives of the evaluation clearly stated?

Are the expected results defined?

Planning Factors

Is there a 'game' plan, that includes phase-in?

Is there an implementation plan that considers social/human factors as well as political/policy/economic/technical factors?

Does the proposal include prototype use; with evaluation and feedback in design before widespread implementation?

Does the proposal include a project management plan for the:

- design and specification
- purchase
- installation
- commissioning
- operation
- maintainance
- service
- training
- evaluation

which includes a thorough description of the budget, timing, schedule, and staffing and specification of the management control process to be used?

Does the proposal include enough information to allow it to be assessed, planned, managed?

Demographic Factors

Have the numbers of terminals, locations, organizations, and so on been assembled, and all of the participants clearly identified?

Has all of the apropriate quantitative information been collected and considered?

5.4 Organizational Context and Social Aspects

The following questions about the operational environment

of the application should be considered.

Operational Factors

Has a scenario of the operations of the proposed system once it is in place been prepared?

Has it been assessed in relationship to current activities and implications for change, new skills, job functions, procedures, training, etc.?

Can present staff operate terminals or Information Provider terminals?

Usefulness and Specific Applicability of TELIDON

Have the sponsors/proposers/users perceptions of the proposed service and the ability of TELIDON to meet them been carefully assessed in terms of:

information needs (privacy, data base complexity, graphical information, encyclopedeal information, remote access, dynamics of the information)
threats
work function enhancement/modification/creation
prestige
acceptability
priorities
economics
creation and maintainance of the data base?

Has the applicability of TELIDON in specific applications been assessed?

Have the dynamics (the rate of change) of the information needs been compared to those of the proposed system?

Responsibility Factors

Has responsibility for:
planning
specification
purchasing
installation
commissioning
operation
servicing

training
evaluation
development

and

management of the above

been clearly designated?

At what level in the organization does the proposed application originate?

Does the proposal have the clear backing of management; and, if so, at what level in each sector?

Experiential Factors

Has the experience of the sponsor/proposer/user vis-a-vis new information technology (computers, interactive computing, telecommunications, word processing, etc.) and the introduction of computer technology been catalogued and assessed?

Have attitudinal factors been considered, and, if so, from direct experience?

Social Environment Factors

Have the proposers assessed the social environment into which the TELIDON terminals and data base are to be placed, in terms of:

status of the proposed users
function of the proposed users
role of TELIDON to
  replace,
  enhance,
  degrade,
  create work functions, status, etc.
experience of the proposer user with computer technology
educational level of the proposed users

Has the proposal considered the acceptability of TELIDON with the proposed user group; or for its need?

What rewards are offered to the proposed users?

What promises have been made to them?

5.5 Economic Aspects

The costs of the applications obviously must be considered. An economic evaluation taking into account costs and benefits should be performed. Appropriate quantitative economic indicators should be used if at all possible.

Economic Factors

Is there a scenario/summary of expected benefits/costs/problems/advantages?

Has the penetration been predicted?

Is there a trade-off analysis of in-house or leased central (data base) facilities?

Has the impact on information handling costs been assessed?

Have the costs of the following been assessed:

- Planning
- Purchasing
- Implementation
- Operation
- Training
- Maintainance
- Evaluation (and Feedback)
- Staffing

Risk Factors

Have the risks and/or loss of investment associated with termination of the proposed application at each, or any, stage been assessed?

Has the effect on both economic and human resources been considered?

Has the risk/cost of losing the system (after dependency is established) been assessed? Can the organization afford to lose it?

5.6 Technical Aspects

The appropriate technical characteristics of TELIDON that will affect its use are discussed in Appendix 7. Relevant questions that should be considered are:

Information Use Factors

Is the proposed user's present use of information known and/or described?

Is the proposed user's present/projected use of information technology known and/or described?

Are the proposed user's present/future information needs known and/or described?

Are the information needs prioritized?

Has the graphical content of the proposed user's information been analyzed?

Have the sources and destinations for the proposed user's information been identified?

Has the information been characterized by type, volume, flow, etc.?

Have the bottlenecks/overloads/deficiencies in the proposed user's present information system been identified?

Have the working components of the present system been identified?

Technical Characteristic Factors

Has the application been assessed in terms of the following TELIDON parameters:

screen capacity
terminal configuration
communications requirements
page creation systems and support
data base design, access times, and size
number of users
number, and rate, of accesses

flexibility
adaptability
operability
compatibility
interoperability
reliability
maintainability

Is the system to be a turn-key system, or a subscriber service?

APPENDIX 1 THE INDUSTRY INVESTMENT STIMULATION PROGRAM

On July 16, 1981 the Department of Communications issued a Request for Proposal for the TELIDON Industry Investment Stimulation Program (IISP). The purpose of this program was to funnel $10.5 in fiscal 1981 and 1982 into the commercialization of TELIDON in support of the overall objectives of the TELIDON program:

> to promote development of a national videotex infrastructure through appropriate standards, regulations, and technology;
>
> to encourage the creation of a viable TELIDON industry producing hardware, software, systems and services through appropriate joint industry-government research and development, product development, promotional activity as well as support of market trials and operational systems.

The interesting feature of the IISP of relevance to this report is the fact that the IISP was the first major TELIDON activity in which an evaluation scheme was set up before the fact to assess the merits of TELIDON applications. Our discussions with responsible officials in the TELIDON program indicate that all previous TELIDON applications (which were almost without exception field trials) were entered into without any formal evaluation of their merits or of alternatives that might have been implemented.

The IISP was designed to provide for the manufacture of 6,000 TELIDON terminals and to make them available to eligible organizations for operational systems or market trials, provided the participating organizations purchased a matching number of terminals.

The objectives of the IISP were:

> to achieve the 'critical mass' in both data base content and audiences needed for a viable videotex market;
>
> to reduce the price of TELIDON terminals through volume production in order to facilitate end-user participation;

to improve price competitiveness of TELIDON in foreign markets, especially in the USA;

to stimulate new private sector expenditures of over $100M in the first year, as estimated by industry;

to stimulate the development of Videotex services in Canada which recognize social needs and cultural and regional realities;

The IISP Request for Proposal was followed by the submission of approximately 85 proposals from all sectors of the Canadian economy. The proposals were prepared according to guidelines presented in the RFP. Following receipt, the proposals were then evaluated in terms of criteria which had also been published in the RFP.

The evaluation criteria for selection of proposed TELIDON applications under the IISP were based on four major categories: economic, data base/page creation, social and behavioural, and timing; in context of the program objectives. The criteria in detail were:

Economic Factors (Business Plan)

A comprehensive business plan was assumed to contain:

marketing plan
- domestic and export segment coversge
- expected market penetration rate

financial plan
- 5 year cost and revenue projection
- proposed terminal cost sharing arrangement
- payback period
- Internal Rate of Return (IRR)
- existing investment base in videotex

organization plan
- qualifications and related experience of the organization staff and subcontractors
- overall performance on previous related projects
- project management

technical viability of project

additional benfits
- job creation potential
- technological spinoffs

Data Base and Page Creation Factors

A comprehensive data base/page creation plan was required to reflect the prime objective of achieving a critical mass of data base content. The plan was to be judged on how effectively it identified and focussed on viable user groups and stimulated information providers, page creators and system operators. The plan was expected to indicate:

the projected number of pages to be created, according to

- page type (retrieval, action)
- information provider category (commercial, education, government)
- category of user (general public, special closed user group, minority group)
- language (French, English, other)
- use of page creation equipment or software conversion programs

the projected number of users

the suitability of data base structure, page retrieval techniques and other access tools, such as directories

innovative systems and software enhancements, such as gateways and downloading

Societal and Behavioural Factors

The applicants were expected to indicate the extent to which they were willing to:

make reports and evaluation information available

collect and share user, system and behavioural data and analysis with government researchers

co-operate with researchers to study the impact of this new technology on society, for example on the human factors influencing acceptance/rejection

respect the privacy of the individual

support the involvement of non-profit oriented, public interest and/or educational institutions (minority groups; multicultural, regional groups)

Timing Factor

Applications were assessed on the ability and committment of the applicant to start the project as soon as possible.

The weights assigned to the various factors were not published. They, however were pre-determined by the IISP Evaluation Group and approved by DOC management, and reflected very strongly the commercial basis of the IISP.

The mechanism for assessing the proposals was also pre-determined. Proposals were assessed by a three-tier structure of evaluators. The initial evaluation was carried out by a team of evaluators in strict accordance with predetermined pr procedures which assigned a numerical value to each aspect of the proposal which was weighted to form an overall score. The evaluators had no previous experience with evaluation or with TELIDON: they followed a pro-forma procedure in the exercise of their duties. The second tier in the selection procedure comprised a committee of IISP staff who selected the most appropriate proposals and made recommendations to the top tier, a committee of senior management.

Awards under the IISP to 52 of the 80 applicants were announced by the Minister of Communications on January 13, 1982.

COLL, D.C.
--Development of guidelines for the evaluation of proposed telidon applications.