A CRITICISM OF THE DOMINANT MODEL OF VIDEOTEX AS A TELECOMMUNICATIONS SERVICE AS EXEMPLIFIED BY PRESTEL AND TELIDON

by

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ABSTRACT

In many countries including Canada, a great deal of activity has been directed towards the development, testing, and implementation of a new computer-mediated interactive information retrieval technology -- generically referred to as Videotex. The activity has been undertaken in the belief that videotex will soon become a mass medium as a telecommunications service. The thesis examines and criticizes this belief, beginning by examining the current thinking in the literature about videotex.

Four basic assumptions underlying current approaches are derived from an examination of the literature:

1. Prestel and Telidon are viable, both technically and economically, and can provide a service that is desirable (in the sense that people are willing to pay for it).
2. There can be a clear separation between the systems provider and the information or content providers.
3. The level of interactivity provided by the systems will be sufficient to provide access to many distinct informational and communications services.
4. Prestel and Telidon are capable of storing and providing access to all kinds of content.

A detailed description follows of the hardware, access software, and serviceware of two major systems -- the British Prestel and Canadian Telidon. The assumptions are then analyzed critically.

The thesis argues that the assumptions cannot be considered valid under present circumstances because the development of Prestel and Telidon was undertaken primarily to meet institutional and economic goals, rather than to address specific social needs for information access. The thesis concludes that a mass market for videotex services will require a long time to develop.

DEDICATION

This thesis is dedicated to the memory of my father.

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I would like to thank my supervisor, Bill Richards, for his patience and confidence in me.

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1.1 General Introduction

A variety of sources tells us that in the near future we will be able to do our banking, shopping, consult our libraries, exchange electronic messages with friends, access computer software and data-banks and obtain legal, medical and financial assistance, all from within the comfort and security of our homes. Furthermore, these exotic services will not only be available to the wealthy few but will be so inexpensive that everyone who desires will have access to them.

This promise is nothing new. It has been known for many years that computer-mediated communications systems are quite capable of providing such services on a mass scale. The problem has always been that the necessary technology has been quite expensive. Over the last few years, however, this situation has changed dramatically. For instance, small, yet powerful computers have become a consumer item -- being, in some cases available at a cost substantially less than a colour television (Toong and Gupta,1982). Relatively low-cost information retrieval services are available to any person who has a telephone and a personal computer (Cavuoto,1982). Some cable television companies are providing multi-channel informational

or non-broadcasting services, enabling viewers to have convenient access to community information via their television sets. [1] In the business world as well, there are many electronic information technologies including: optical character recognition, communicating word processors, electronic storage and filing and intellegent printers, which are encouraging the move towards the integrated electronic (paperless) office (Giuliano,1982; Coates,1981; Tapscott and MacFarlane,1979).

As these trends seem to indicate, low cost computer-based information and communications services can be provided by a variety of different technologies and operating systems -- all of which are at present in an embryonic state of market development. But even at this early stage a dominant approach to facilitate the provision of such new services on a mass scale seems to be emerging. This technology, called "Videotex", is based on the idea of using a modified television set to receive and display computerized information. It is currently being developed and implemented in many countries by governments and various telecommunications interests. It requires the use of a centralized "host" computer, simplified home terminals built around modified television sets, and specialized information provider terminals which facilitate the creation and inputting of content into the host data-bank by separate organizations.

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[1] Premier Cablevision, in Burnaby, is presently providing such a nonbroadcasting information service which utilizes the Telidon graphics protocols to format its presentation of community information.

This conceptualization of a videotex system is found in all countries which are begining to develop and implement this technology in order to eventually provide a public service.

1.2 Goals of the Thesis

My goal in this thesis is to examine and criticise the conceptualization of Videotex as a mass oriented telecommunication service. Since this particular model is based on a technology which was developed in the mid 1970's, the thesis will confine itself primarily to videotex developments which took place in the late 1970's. I begin my criticism by examining the thinking about the essential structure of a Videotex system and the characteristics of the service which was evident at that time. This examination is undertaken from a perspective which includes the social and institutional context in which all technologies are developed. I outline four major assumptions which underlie this model of Videotex. I follow this with a detailed description of two actual videotex technologies and systems: the British Prestel system -- the first videotex system to enter public service and model for many systems being considered in other countries -- and the Canadian Telidon technology, an example of the second generation of videotex development. Although the essence of Telidon is essentially a graphics protocol, my use of the terms "Telidon" or "Telidon system" will refer to any videotex system which utilizes Telidon

technology. I then systematically criticise each of the four major assumptions with reference to data drawn from the descriptions of Prestel and Telidon. This criticism is also undertaken from a social perspective -- its purpose being not only to test the validity of the four assumptions -- but to delineate the type of social process driving the development of Prestel and Telidon.

1.3 Organization of the Thesis

The thesis is divided into three parts: a literature review; the description of Prestel and Telidon hardware, access software and serviceware; and the critical analysis of the four assumptions essential to the dominant conceptualization of Videotex as a telecommunications service.

The literature review begins in chapter two with a brief comment concerning how technology is viewed in the thesis. An examination of recent literature dealing with the social implications of computer-communications technology, or "Telematics", provides a context within which to locate Videotex technology. In chapter three the discussion focusses more narrowly on literature about Videotex. After some of the writing dealing generally with Videotex as a communications system is reviewed, the emphasis is shifted to literature concerned with the two actual technical systems that are the subject of this thesis -- Prestel and Telidon. The four essential assumptions

are then derived from this literature and summarized at the end of the chapter.

The second part of the thesis starts with chapter four which presents an overview of international developments in Videotex technology and systems implementation. This is followed by chapter five which provides a systematic description of Prestel and Telidon hardware, access software, and serviceware which is presently available on Prestel and Telidon.

The third part of the thesis begins in chapter six with a systematic criticism of the four assumptions outlined in chapter three. Each assumption is criticised in relation to actual data about Prestel and/or Telidon drawn from chapter five. Finally, in chapter seven, the results of both the technical description and the critical analysis of the assumptions are summarized. These results are then briefly examined in relation to a scenario describing the results of recent trends in Videotex developments. Final conclusions are then drawn and presented.

1.4 Limitations of the Study

As with any study there are a number of limitations which must be stated at the outset. Some are due to shortcomings in the data, but others are artifacts of the method of analysis used.

The literature on Telematics, as a body of writing, has several characteristics which must be made clear. It is perhaps

because the technology is so recent -- the computer-on-a-chip microprocessor became commercially available only in 1975 -- that the literature is mostly concerned with attempting to assess the potential social implications of the technology. Although some writers are concerned with the implications for society as a whole, and others concentrate more on the impact of Telematics in specific areas, all are engaged in an assessment of the implications of the technology rather than a critical analysis of the underlying social, institutional and political factors contributing to the development and implementation of the technology.

In the second and third parts of the thesis, that is, the description of Prestel and Telidon technology and the criticism of the underlying assumptions, the relative newness of the subject places constraints on the thesis in several ways. First, videotex has only reached the status of a public service in a few countries with many field trials still underway to provide additional data, therefore, many of the parameters of the videotex system configuration or service, in particular -- the serviceware, have simply not yet been established. Second, because of the commercial potential of certain items of hardware and of the service as a whole, much of the information that has been gathered is proprietary and therefore unavailable. And third, as with any rapidly changing technology, it is very difficult to keep abreast of many recent developments. As a result of these restrictions, the description and analysis that

I undertake in this thesis must therefore be considered only a tentative probing into the subject rather than a definitive statement.

II. Chapter Two: Telematics and Society: A Literature Review

2.1 Some Comments on "Technology"

This thesis is about a technological innovation that, many say, will have a significant social impact. While the physical characteristics of the technology -- of the "hardware" itself are clearly important, the way the technology fits into the social, institutional, economic and political context will be the real determinants of what the technology does and what is done with it.

I follow three paths in my analysis of this particular innovation. First, I examine the characteristics of the hardware of Videotex and how these elements are connected together to form larger systems. Second, I discuss the "techniques" which are used to store information in the videotex databanks and which gave subscribers access. Finally, I look at the interrelations between the varicus social institutions like common carriers, information providers, and others involved in some way with videotex.

While I have approached the innovation from three pespectives, it would be incorrect to believe that the perspectives can really be separated. Indeed, they are strongly interrelated. For example, a given change in hardware requires

changes in technigue as well as concomitant changes in social institutions if the innovation is to become established in society. This perspective also implies that the study of the social consequences of technological innovations must not be separated from the institutional nor the methodological context.

2.2. The Social Implications of Telematics

A fascination with the potential of computer technology to transform society has been evident in the literature for the last thirty years. Presently, due to the massive developments in all aspects of information technology, there is increasing concern of the implications of such innovations for society. This is to some degree reflected in the increase of literature devoted to this topic. The perspectives taken are varied, ranging from the fictional to the academic. Science fiction has been an area wherein writers have never hesitated to explore the possiblities of any new technology -- including computers. Abbe Mowshowitz, a computer scientist, has compiled an anthology of science fiction writing dealing with the impact of computers. In the preface to the book, Inside Information, he states:

> Fictional treatments of the computer are used as a vehicle for illuminating the discussion of social issues. Naturally, one cannot expect to find definitive answers--the intellectual contribution of computer tales lies in their inventiveness and in their openness to unconventional alternatives. Technical problems associated with computer applications are less important than the human dimensions of the issues. Ascertaining desirable uses of the technology depends more on understanding social conditions and priorities than it

> does on familiarity with the latest refinements in hardware and software engineering. A secondary emphasis of the work directs attention to contemporary attitudes toward computers. Attitudes constitute a sensitive barometer of changing social arrangements, and also point to value-conflicts produced or sharpened by technological innovation. (Mowshowitz,1977:xiii)

As well as the many excellent works of science fiction dealing with this topic, popular journalists also have dealt with the possiblities of computerization. Alvin Toffler, in his most recent work, The Third Wave, describes a civilization built upon the humanizing potential of computerized communications systems. Computer scientists and other academics have also concerned themselves with examination and speculation about the social, psychological, economic and cultural significance of computer technology. For instance, Paul Baran and Harold Sackman have dealt with the emerging social problems of time-shared systems such as information utilities. [1] Even though the information utility concept did not become reality on a large scale, the social implications presented by such technology are still of concern today -- with the possiblity of the merging of computers with communications becoming ever more likely. For two contemporary academics, Murray Turoff and Starr R. Hiltz, this possiblility is of foremost importance. They state in The Network Nation, that the emerging integrated computer communication system "is a technology several orders of

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[1]See Paul Baran, "The Future Computer Utility", in Irene Taviss, ed., The Computer Impact, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970, pp81-92,and; Harold Sackman, Mass Information Utilities and Social Excellence, Auerbach Publishers, Princeton, 1971.

magnitude more powerful than either the telephone or the TV" and a major step on the way to the "information society"(Turoff & Hiltz,1978:16). Daniel Bell is another writer who feels that the computerization of communications will have major implications for social change. He sees communications networks as an infrastructure in much the same way as transportation highways or energy distribution systems. According to him:

> The really major social change of the next two decades will come in the third major infrastructure, as the merging technologies of telephone, computer, facsimile, cable television and video discs lead to a vast reorganization in the modes of communications between persons; the transmission of data; the reduction if not the elimination of paper in transactions and exchanges; new modes of transmitting news, emtertainment, and knowledge; and the reorganization of learning that may follow the expansion of computer-assisted instruction and the spread of video discs. (Bell,1979:195)

The major theme which runs through much of the popular literature seems to be that the possibilities for social change presented by computer technology are not only due to the applicatior of computers directly, but to the merging of communications with information manipulation. Several names have been advanced in the literature to describe this development. These include; "Compunications", "Informatics", "Telecomputerization", and "Telematique" (which can be anglicized to "Telematics" and which will be the term that I will use in this thesis) appears to be the most popular (Howkins,1980:16).

The Implications of Telematics have been of concern to national governments worried about their economic standing

relative to the international community, to industries applying new technology to increase productivity, and to individuals whose jobs may be in danger due to increasing mechanization. In many countries, including Canada, major studies have been undertaken to examine the problem and to make recomendations for action. In 1978, for example, the French government was presented with a report commissioned several years earlier, which examined the issues related to Telematics. According to Simon Nora and Alain Minc, the implications of Telematics for French society will be profound -- requiring major changes in the structure of society in order to deal effectively with them. They state in The Computerization of Society :

> Telematics offers varied solutions which can be adapted to all forms of control or regulation. It allows the decentralization or even the autonomy of basic units. Better still, it facilitates this decentralization by providing peripheral or isolated units with data from which heretofore only huge, centralized entities could benefit. Its task is to simplify administrative structures by increasing their effectiveness and improving their relations with those under their jurisdiction. It also allows the local municipalities more freedom. It reinforces the competitiveness of the small and mid-size business vis-a-vis the large enterprises. Telematics finds itself at the heart of the power game through the movement it generates in information networks. It shifts the balance between rival markets and among municipalities. It influences certain professions by modifying their social status. It increases contact between social groups and the vulnerability of large organizations. (Nora & Minc, 1980: 5)

In Canada too, Telematics has the potential to affect the political structure of the country in a fundamental way, namely the erosion of national and cultural sovereignty:

> Canadian sovereignty in the next generation will depend heavily on telecommunications. If we wish to have an independant culture, then we will have to continue to express it though radio and television. If we wish to control our economy then we will require a sophisticated telecommunications sector developed and owned in Canada to meet specific Canadian requirements. To maintain our Canadian identity and independence we must ensure an adequate measure of control over data banks, trans-border data flow, and the content of information services available in Canada. If we wish to build a Canadian presence in world industrial markets then we will be required to encourage the growth of Canadian telecommunications industries that will be competitive in world terms. (Consultative Committee on the Implications of Telecommunications for Canadian Sovereignty, 1979:2)

Another area of concern is the relatively poor state of the Canadian computer and data processing industries and the lack of a coherent government policy for dealing with the implications of Telematics. This has been pointed out by many studies in the past.[2] Other studies have taken the more dramatic position that the ultimate implication of Telematics is that it will result in an "information society", that is, "a society economically based much more on the production, transmission, processing and storage of information than on industrial goods"(Sindell,1979:2). This is the position taken in the GAMMA Information Society Project -- a series of studies designed to focus upon this change (referred to by some as the "information revolution") in order to examine the central process more

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[2] See for example: Science Council of Canada, Communications and Computers: Information and Canadian Society, A Position Paper, Supply and Services Canada, Hull, Quebec, 1978, and; C. C. Gotlieb and Z. P. Zeman, Towards a National Computer and Communciations Policy: Seven National Approaches, report prepared for the Department of Communications, the Institute for Research on Public Policy, Toronto, 1980.

closely, and in particular; to note its causes; to describe several scenarios of the resulting information society; and, to outline some potential socio-economic impacts (Valaskakis, 1979).

One of the more interesting observations in relation to Telematics was made by Kimon Valaskakis, the director of the GAMMA study just mentioned. He noted that three types of scenario for an information society were possible. The "Telematique" scenario emphasizes a "central electronic highway" interconnecting computers in the home, office, and factory. A second scenario, the "Privatique" scenario, deemphazies the role of the electronic highway. Although computer are still commonplace, the tendency is for small decentralized systems rather than a centralized network.[3] Finally, third, there is a "Rejection" scenario which conceptualizes an information society without high-technology. This alternative, he argues, considering the low quality of content in most high-technology communications system, is quite likely (Valaskakis, 1979).

As well as implications for society as a whole, Telematics also has serious possibilities for individuals, both as consumers and workers. As a stark contrast to the new consumer goods and services resulting from computerization, the impact on the workplace, whether in industry or the office will be substantial and, for those whose jobs are lost to the new

---

[3] This possibility was first advanced by Bruno Lassato and Jean Bourine in their criticism of the Nora-Minc report; Telematique. . .Ou Privatique? Question a Simon Nora et Alain Minc, Edition d Informatique, Paris, 1979.

technology the impact will be severe. Many recent studies have supported this view (Moorehouse, 1980). One report in particular, written by Shirley Serafini and Michel Andrieu of the Communications Economics Branch of the Department of Communications, has warned that the development of the new information technologies may make Canadian society more vunerable by the increasing reliance on computerization and data networks (Serafini & Andrieu, 1981:29). The "information revolution" is also expected to have a significant impact on employment and productivity, especially with respect to the service and goods producing industries, all this leading to "pervasive changes in production processes, the size of firms and the relative importance of different industries in the national economy including the emergence of new and decline of old industries" (Sarafini & Andrieu, 1981:37).

Many writers are also becoming concerned about the consequences for personal freedom and privacy. In particular, there is concern "about the growing potential inherent in the new information technology for massive serveillence and control of individuals" (Serefini and Andrieu, 1981:40). Even more frightening is the possibility that much surveillance and control will not be in the hands of government (which is ultimatly responsible to the citizen), but of private multi-national corporations. This possibility has been documented by Schiller (1981). Issues of personal privacy have also been considerably complicated since computer technology now

makes it relatively easy for smaller organizations, such as local cable companies, to provide computer-mediated "interactive" services. The technology that allows individuals to return information to a central source is called "Incasting". This technology can take many forms, depending on the medium of communications and the type of home terminal used (Pergler,1980). Some methods of incasting raise serious questions of privacy and personal automony. John Wicklein, a journalist examining the implications of Qube, a computer-mediated two-way cable system in Columbus, Ohio, observed:

> Two-way cable is <u>fun</u> . Playing the system, subscribers are only vaugely aware that the preferences they state, the products they select, the personal opinions they express can all be stored in the computer's memory and tallied, analyzed and cross-referenced with the demographic and financial information that is known about them (Wicklein,1979:27) (his emphasis)

Incasting and other interactive technologies also raise important questions of how to deal with their implications on the political process and other forms of social acitivity (Wicklein,1979; Pergler,1980).

The impact of Telematics on the office is also an area that is ripe with serious possibilities. A reason for this may be that the office environment is at the center of a convergence of several social and economic trends. First, it has been argued that there has been a major shift in the structure of the economy from industrial occupations to service, especially information occupations. This has been argued for the United

States economy by Edwin Parker (based on a study by Marc Porat,1974) and has been reafirmed in the Canadian context by others (Parker,1975:11-20). Although the significance of this shift as a basis for the reorganization of society must be questioned, it is clear that many "information occupations" are low-status, clerical-type jobs (Leiss,1982:12-13). Second, the application of computer technology to office equipment has resulted in a generation of machines which permits many separate and diverse tasks to be performed at a single workstation (Guiliano,1982). And third, because of the continual decrease in price of microelectronic-based equipment, it is becoming cheaper to mainpulate information electronically rather than on paper. Consequently, the concept of the paperless electronic office (Coates,1981) is gaining widespread attention. If such technology is applied then many office workers, especially women, since they make up a large fraction of "information workers", may become redundant. This is supported by a recent study, Women and the Chip, by Heather Menzies. This report examined several case studies in different industries, used this information to construct several scenarios of the probable outcomes from the diffusion of Telematics into society. "The solutions suggested by the scenarios are to steer young women away from seeking clerical-skill-level work, to help women already in the clerical ghettos to move out, and to narrow the skills gap" (Menzies,1981,xxi-xxii).

III. Chapter Three: The Social Significance of Videotex

The fact that computers are also becoming a part of the domestic environment has been well documented in both the popular press and the more specialized literature. Although much of domestic computer technology is in the form of stand alone devices -- video games, home computers and the like -- some writers feel there is a good possiblity towards the integration of many of these with sophisticated communications into a total "home information and entertainment appliance". Although generally, such a development would be seen in a postive light, there are those who disagree. John Wicklein, for one, feels that an innovation of this kind could threaten personal privacy and automony (Wicklein, 1979).

A number of recent developments bring such a possibility much closer to reality. Many organizations in different countries have for some years been developing a technology which will permit specially modified television sets to recieve and display, on command by the user, computerized text and graphics. The generic name for this technology is "Videotex". What makes this technology significant is that it represents an attempt to mass market the services of a computer mediated communications system. Such a system consists of a central computer which, as well as storing information for access by individual subscribers, also mediates requests for information stored in

external data-bases and, more significantly, maintains records on individuals for billing and other commercial purposes. The computer would be connected to the subscriber's terminal via the telephone network or a coaxial cable. The "serviceware", that is, the content of the data-bank, could be provided either by the service provider or by an independent "information provider" (IP) or a combination of both.

3.1: Some Comments on Terminology

As suggested above, the generic term, "Videotex" can refer to any approach which utilizes a television receiver for information retrieval and display. Although the first-generation videotex system (Prestel) which was developed in Britain utilizes the telephone network, other advances in communications technology require that the definition be a broad one. John Madden, one of the major figures in the development of Canadian videotex, provides such a definition:

> By Videotex I shall mean the whole class of electronic systems which comprise at least the following five elements,
>
> (a) A source of information remote from the user.
>
> (b) A connection to the source via a telecommunications link, such as a radio wave, a coaxial cable, a copper wire, or an optical fibre.
>
> (c) An information display which will normally be a standard black and white or colour TV set. The information will normally be shown as a still frame, although some animation of the images is possible.
>
> (d) The information appears at the express command of the user as part of a larger selection made available by information providers, and
>
> (e) The service is designed for a mass market rather than a few specialist users. (Madden, 1979:3)

Clark (1979) has proposed that videotex systems be defined according to two characteristics or parameters of the communications links used to interconnect the host computer (or data-bank) with the subscriber terminals. These are the bandwidth of the link and whether it is one-way or two-way. On the basis of these two parameters, it is possible to distinguish four basic kinds of videotex system.

1. One approach is to use an unused portion of the signal normally devoted to broadcasting television pictures. This is called "Broadcast Videotex" because the encoded information is "piggybacked" onto a broadcast signal. (The television signal can be used because the vertical blanking interval (VBI) in most cases contains no information). The encoded information is sent as a sequence of "pages" each of which has a unique number. If the user desires a particular page he enters the number into the keypad and the terminal electronics then "grabs" the page as it comes along. It can be displayed immediately or stored within the terminal for later display. Broadcast videotex is also referred to as "Teletext". Although a teletext system offers simplicity of installation, operation and maintainance, as well as low cost, it has the disadvantage of being one-way and severely limited in the amount of information which can be sent in a reasonable length of time. Consequently such systems are considered inappropriate for more complex information retrieval services which require some kind of interaction

with a data-base.

2. A second approach utilizes the standard telephone line as the connection between the computerized data-bank and the home terminal. Because a telephone line is two-way a subscriber can request that particular information be sent to his terminal. Such systems are called "Interactive Videotex" and represent the dominant approach being considered in many countries. The British Prestel system and Canada's Telidon system are examples of this type of approach.

3. It is also possible to establish a domestic information retrieval service using other communications technologies. Coaxial cable could be used to provide a teletext system which, in some respects, could represent an alternative to interactive videotex since the wideband capacity of the cable would allow enough information to be sent downline in a sufficiently short interval of time so as to create, from the users point of view, an illusion of interactivity. Another possibility is to use an entire television channel dedicated to this purpose. Such systems are referred to as "Wideband Teletext" or "Wideband Interactive Videotex". In contrast, the two systems mentioned earlier which are distinguished by the narrow bandwidth, could therefore be called "Narrowband Teletext "and "Narrowband Interactive Videotex" respectively.

4. The fourth class of videotex system combines both a two-way

communications medium with a large bandwidth. Since a coaxial cable can also be used to carry signals upline it is a candidate for a communications links for such "Wideband Interactive Videotex" systems. It is also possible to build "hybrid" systems which combine different communications technologies. For example, wideband coaxial cable might be used for the downlink, while a telephone line provides the uplink. Newer communications technologies such as fiber optics and microwave transmission via satellite could also be used.

3.2: The "Potential" of Videotex

In much of the literature there is an emphasis on the wide variety of services which could be provided by a videotex system. As well as information retrieval, an interactive system could provide: banking services, teleshopping, electronic mail, telesoftware and opinion polling (Madden, 1979: 3). Other writers have suggested that videotex opens the door to electronic publishing and distribution of newspapers and magazines (Winsbury, 1979, 1981; Kent Report, 1981). Still others feel that videotex offers possibilites for the business sector in "private" (closed user group) systems and specialized information retievral (Kurchak, 1981; Castell, 1981; Fredida and Malik, 1979).

The primary reason that videotex can provide, in principle at least, so many different kinds of services is that it is a computer-mediated system. Such systems are capable of operating in several different modes because the central or "host" computer, can switch information flows between elements of the system according to the needs of particular services. To illustrate this, imagine a videotex system consisting of a host computer, several subscriber terminals, several external data-banks, and a local data-bank. host computer itself. These components might be interconnected as illustrated in figure 3.2 on the next page. Furthermore, it is assumed that the subscriber terminals have the necessary technological sophistication required for the system -- that is, color display with full-alphanumeric keyboard and some graphics capability (Noll,1980:19-20).

Such a system could provide many computer mediated services, depending on the kind of information flows. (These are indicated by the numbers in the diagram which correspond to the descriptions below).

1. Terminal to terminal communications. This opens the door to electronic mail, personal messaging, and other forms of information exchanges between individual subscribers.
2. Terminal to local data-base communication. Provides access to information stored in local data-bases. This information could be of a popular and generalized nature, since this would be accessed most frequently.

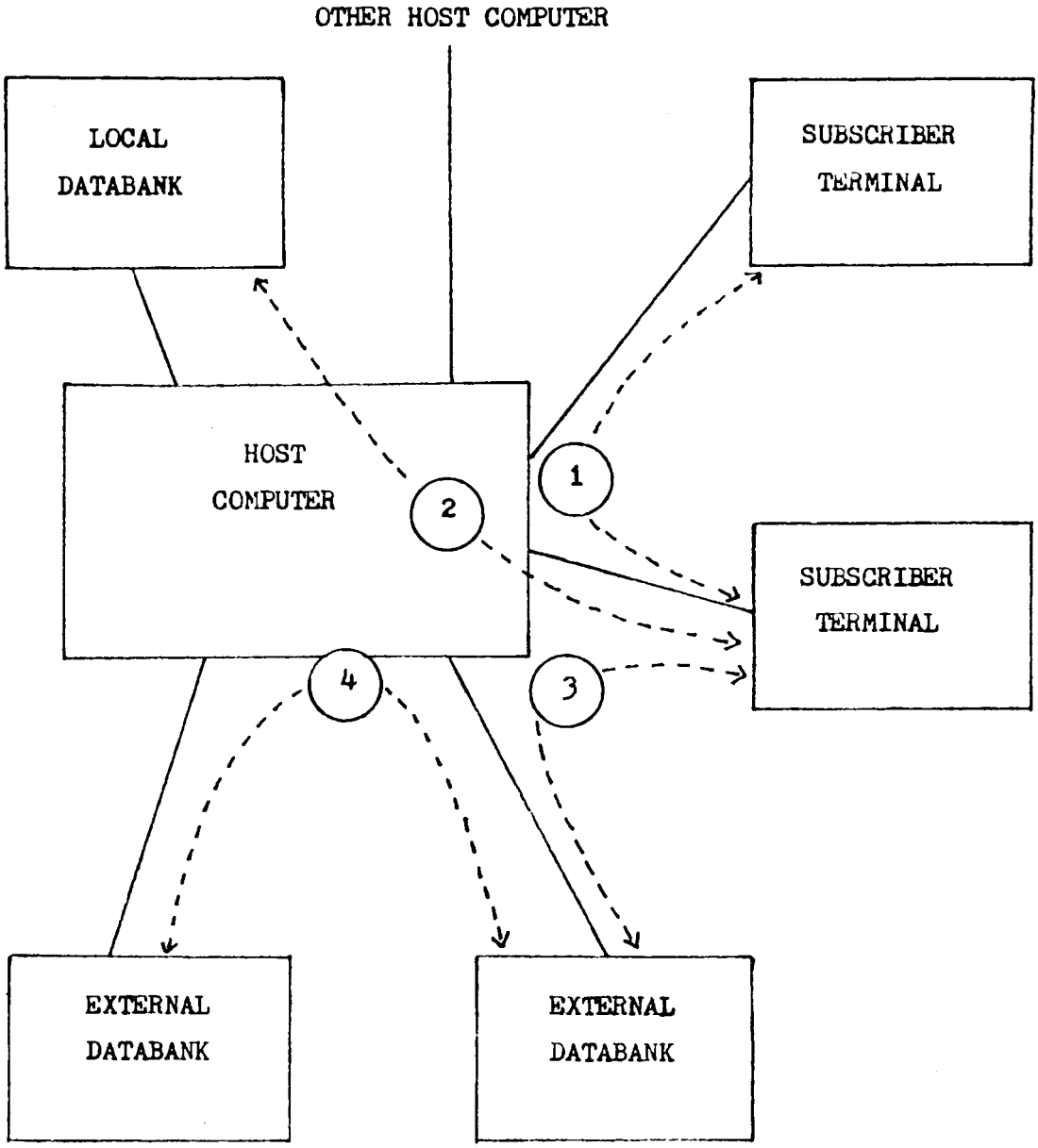

Figure 3.2: Information Flows in a Hypothetical Videotex System

3. Terminal to external data-base communication. Provides access to information stored in external data-bases, and thereby opens up the possibility of a large-scale information retrieval service. Many external data-bases could specialized in particular kinds of information products. Other services, such as electronic funds transfer (EFT) and teleshopping are possible if the appropriate computers are interfaced with the videotex system.
4. Data-base to data-base communications. This mode facilitates the transfer of information between data-bases for purposes of updating, duplicating or otherwise transfering information on a large scale and at high speed.

The exact role of the host computer in this hypothetical system is to ensure the smooth operation of the system as a whole. As it receives a subscriber's request for information it switches his terminal to the appropriate data-bank -- ensuring that all communications protocols are compatible. It also maintains records of transactions for billing purposes and compiles usage statistics which aid in the provision of a proper level of service.

It is also becoming increasingly possible to set up a videotex system based on a different mode of organization altogether, that is, using a network of personal computers and decentralized databanks. The hardware for this approach is now begining to become available on a sufficiently large scale. (Some of these developments are briefly discussed in chapter

five.) As a design model for Videotex systems, a computer network of this kind represents a decentralized "bottom-up" approach rather than the dominant centralized "top-down" approach that is the subject of the thesis. As my concern in this chapter is to examine the thinking underlying the dominant model, I will not examine the significance of this approach here but will leave such a discussion for later chapters.

The establishment, on any significant scale, of a public service embodying some or all of the above-mentioned characteristics will have a major effect on many industries in Canada. This has been argued by many writers: Godfrey (1979), Parkhill (1979), Science Council (1979), and Leduc (1980). Telecommunications carriers will find markets for new services developing. Commercial computer firms, software houses, and data communications services will also see an expansion of their markets. Eventually these industries will find themselves competing for the expanding videotex markets. New opportunities for manufacturers of telecommunications and computer equipment will eventually bring this industry into competition with manufactureres of videotex decoders, modified television sets and home computer systems. More traditional industries such as newspapers and publishing will also feel the effects of this new medium. In fact, some writers have even suggested that in the future newspaper publishing will be altered dramatically by videotex or other information technologies (Desbarats,1981; McPhail,1980).

It is possible that completely new industries will develop to service some aspect of the public videotex system. As videotex is a means for domestic information retrieval (among other things) there will be a strong need for information provision. This could in principle be provided by any organization, institution or individuals which has information in computerized form that it may want to make available to interested parties. Since in this hypothetical example there are no technical limitations on the number of data-banks that could eventually be interconnected in a large-scale public system, it is quite probable that some IP's would specialize and provide obscure rather than popular information products. Gordon Thompson has suggested that this possibility could eventually lead to an "information marketplace of ideas". In Memo from Mercury: Information Technology is Different (1979), he points out that an interactive videotex system, specifically the British Prestel system, (presumably because Prestel was the only operating videotex system at the time he wrote those words), has most of the characteristics needed to create such a marketplace.

It is obvious that any innovation in communications technology having the the potential that videotex does is bound to raise many issues in social policy. In essence these issues stem from the fact that videotex represents a "blending" of formally separate media into a new synthesis. This raises the question that if videotex should be regulated -- how should it be done? Videotex has the potential to redefine the relationship

between an individual and the channels of information access available in society. It presents both new opportunities and a redefinition of the more established communications channels. James Feeley has examined the policy issues raised by videotex from two perspectives: as "a new technology delivering new services to potentially new users", and as "just another information service -- open to the same opportunities, temptations, and barriers as the others" (Feeley, 1981:1). He condenses the major social policy issues into four main questions. These are:

1. What's available?
2. Who has access?
3. Who pays?
4. Who controls it? (Feeley, 1981:7)

Although the public policy debate has barely begun and it is expected that it will take many years to resolve all the issues, there are those who advocate the necessity for government to take an initiative to ensure that the most postive impact accrues to Canadian society from this technology (Science Council, 1978;1979).

3.3 The Assumptions Underlying the Videotex Concept

Up until now I have been discussing the significance of videotex in hypothetical and general terms. Actual videotex systems, however, are being developed, tested and implemented at an increasing rate in all of the western industrialized countries. I will examine here the assumptions underlying the

design of the technical elements, and the proposed (and actual) nature of the videotex service, in reference to the two videotex systems which are the subject of the second part of this thesis -- the British Prestel system and the emerging Canadian Telidon system.

The basic concept behind Prestel and Telidon as a telecommunications service is that both systems are means to facilitate the mass marketing of information stored in computerized data banks. This information or serviceware is provided by a select group of information provider organizations (IPs). The serviceware is stored in a central data bank usually provided by the "systems provider" who also provides the communication links which interconnect the information provider, the data bank and the subscribers. The systems provider also maintains a "host computer" which as well as storing the serviceware also performs systems control, indexing and billing functions. The information providers use specialized terminals to create and modify pages of information while subscribers use home terminals designed around modified television sets and a telephone line (or any other means of two-way communication, i.e. the coaxial cable or even fibre optics).

The technical elements just described are also grounded in an institutional context, that is, the systems providers are likely to be established telecommunication common carriers, and the information providers are either publishing companies or other corporate organizations who have information they may want

to make available to customers. This raises some very important social issues about how Prestel and Telidon function as a communications system in a social context.

1. It is apparent that the information flow is really one-way, from the IPs to the subscriber. In addition the system provider, since it mediates this flow actually has a great deal of control over the content.
2. The emphasis is on providing information as a commodity rather than information which might enable people to better deal with life in a complex society.
3. The systems are designed for individual rather than collective information access. Taken together with the second point, this means that the emphasis is on individual consumerism rather than enhancing cooperation between social groups.
4. Because of the consumer bias to both systems they may only appeal to certain sectors of society rather than being of mass appeal.

None of these issues are currently recognized in present thinking about these systems. This is clear from the literature.

One thing in particular that is apparent from the literature on Prestel or Telidon is that its focus is almost exclusively on hardware and software rather than on serviceware. There is also little or no discussion of the importance of the social aspects of Prestel or Telidon as a communications system. The emphasis always seems to be on the potential of these

systems as a new service to be provided by the telecommunications industry, or the new market opportunities for publishers presented by an electronic distribution system for their wares. There seems to be no awareness of any social problem that might be alleviated by the application of a videotex-like system: rather, it is the other way around. The reason for the decision made by the British Post Office (BPO) to proceed with the development of Prestel (then called "Viewdata") is an example of this kind of thinking.

> This decision was influenced by four main factors. Firstly, the product itself was very appealing--almost hypnotic when well demonstrated. Secondly, there was already tangible support for viewdata from British TV -set manufacturers. . . .and from information providers. . . . The third factor was that the Post Office Telecommunications Business was conscious that its good record of productivity improvement and harmonious industrial relations owed much to the enormous rate of growth in telecommunications; if this growth was to be sustained over the next twenty years, new services such as viewdata would have to be created. A particular attraction of viewdata lay in the fact that it would generate telephone traffic and extra revenue through more extensive use of the existing telephone network. Moreover, after a period of heavy losses caused by anti-inflationary tariff restraint, the Post Office Telecommunications Business was now producing a good financial performance, and was in the mood to expand (Reid, 1981: 13-14).

And in Canada too, it is possible to find an example:

> Some readers will have noticed that the fundamental question of whether or not Videotex services should be developed at all has not been addressed. This was deliberate. I have assumed that since competitive market forces are causing Videotex systems to be developed simultaneously in several different countries, only a deliberate renunciation of the pluralist system and its substitution with highly centralized government control could prevent Videotex development--so that the question is an academic one. The more important question is therefore how we can ensure that Videotex development

will serve Canada's best interests (Madden,1979:6-7).

The first major assumption underlying this kind of thinking appears to be that videotex, specifically Prestel and Telidon, satisfies some kind of market demand for such a service. In other words, people would be willing to pay to access information using these systems.

There are also other assumptions which underlie the way Prestel and Telidon are conceived of as total systems. These have to do with the relationship between the three major institutional components of Prestel and Telidon mentioned above. Many writers have stated that the separation between the functions related to content production and those related to the carriage of the information should be continued in the provision of videotex services (Madden,1979:7-9; Parkhill,1979:91-92; Clyne Committee,1979:19; Kent Report,1981:205). The same thinking is also evident in Britain. Although the BPO originally intended to have complete editorial control over the content stored in its host computer, the approach now favored by the BPO is that it will act only as a "common carrier". This

> means that anyone can become an Information Provider, that is, buy space on the PRESTEL computer (or computers) and say whatever he or she wants (subject only to the law) to whoever he or she wants, at whatever price he wants. The Post Office exercises no control over content, quality, relevance, style, price (except within broad system limits) or the frequency with which information is changed, or indeed on how it is sold or marketed to the customers. The role of the Post Office is that of a neutral operator of the technology through which other parties communicate with each other (Winsbury,1979:6).

This then is the second major assumption: that there will be a clear separation between the information providers and the system provider.

In the literature it is also emphasized that videotex is interactive, that is, it permits a user to actively and deliberately choose the particular page of information he would like to see. Consider the following quotation:

> . . .in "two-way" or "interactive" Videotex systems, the user truly interacts with the information base by selecting from a theoretically unlimited number of pages of information those particular pages he wants. Of course, with an interactive Videotex system the user can do more. He can feed information back to the computer to do such things as pass a message to a friend, order a pair of jeans, or play a game of chess (with another person or with a computer). The PRESTEL service, offered by the British Post Office is the world's first commercial two-way Videotex service. The Bell Canada VISTA service is also an interactive Videotex service, as is the version of Telidon which has thus far been demonstrated (Madden, 1979:4).(his emphasis)

Implied in this quotation is the possibility that an interactive Prestel or Telidon system will enable a user to access services similar to the above. A user can not only choose a desired information page but also use videotex to perform many other retrieval and transactional functions. Such a scenario however, is based on the assumption that the level of interactivity provided by the system will be sufficient to enable such services to be provided.

And finally, there is a fourth major assumption which is essential to the concept of videotex as a telecommunications service. This assuption, that Prestel and Telidon are capable of storing and providing access to a great variety of different

types of information products, is evident from the thinki underlying both systems. In the British case, this assumption i- fundamental to the BPO's "common carrier philosophy" (Winsbury,1979:5-8), and has also been expressed in Canada by Thompson (1979), Madden (1979), and others.

As a summary I will now restate the four main assumptions underlying much of the thinking about Prestel and Telidon.

1. That Prestel and Telidon are viable, both technically and economically, and can provide a service that is desirable (in the sense that people are willing to pay for it).
2. That there can be a clear separation between the systems provider and the information or content providers.
3. That the level of interactivity provided by the systems will be sufficient to provide access to many distinct informational and communications services.
4. That Prestel and Telidon are capable of storing and providing access to a great variety of different types of content.

IV. Chapter Four: An Overview of International Activities in Videotex Development to 1982

From initial developments in Britain and Japan in the early 1970's, the concept of a large-scale, domestically-oriented information retrieval service utilizing a television receiver has gained wide attention in many countries. Richard Clark comments:

> In Europe nearly all the PTT's [National postal, telegraph and telecommunications authority] are investigating the possibilities of introducing an interactive version of the service--administrations in the UK, France, the FDR, Sweden and the Netherlands have already made statements committing themselves at least to market trials and only uncertainty over current international standards seems to be dissuading other PTT's from public committment to the new service. The picture is repeated around the world. Australia, South Africa, Hong Kong and the USSR, are all actively interested in the potential use of simple systems, and in Japan and Canada comprehensive developments of the new service are under research, each bringing a range of new concepts and features to add to the early pioneering work in the UK and France. (Clark,1979:51)

Despite this, however, there are marked differences between countries in their approach to the design and implementation of the various systems. To a certain extent these reflect differences in national philosophy (Winsbury,1981:181-185). These different approaches can be treated as variations on the basic theme of marketing information in electronic form. These are:

1. Whether videotex should be oriented towards the domestic or

the business sectors.

2. Whether the systems provider should be a public entity or a private one.
3. Whether all the information provided by the system should be stored in data-banks internal to the system, or whether the system should function as a "gateway", that is, provide switched interconnection to data-bases external to the system.
4. The degree of emphasis placed on the ability of the system to handle graphics.
5. Whether serviceware or content should be provided strictly as a response to market forces or whether some kind of government regulation is necessary.

4.1 Videotex Activities in Europe

4.1.1 Videotex Developments in Great Britain

Videotex developments in Europe started in Britain in the early 1970's, when a British engineer, Sam Fedida, developed a system whereby members of the public could access a computerized data-bank to gain current information of interest. Although the first system of this kind was used in the hotel industry, it attracted the attention of the British Post Office (BPO). By 1975 the BPO had demonstrated a working videotex model

(Woolfe,1980:74). The British videotex system, intially called "Viewdata", (but since changed to Prestel) is a two-way narrowband system requiring the use of a telephone line as a communications link. The BPO, as central communications authority, oversees all aspects of this system. It provides the central host computers which store all the serviceware and system operating software. Since subscribers have access to local databanks, which are duplicates of the main databank, no long-distance telephone charges are incurred. Each local data-bank also functions as an update center. The Prestel system underwent experimental field trials in 1976, a limited public trial in 1978, and in 1979 became the first interactive videotex system in the world to offer a public service (Woolfe,1980:76-80).

The British have also been active in the development and implementation of broadcast videotex (Teletext) systems. There are at present two commercial systems which have been available since 1976 to anyone having the required decoder. One service called Ceefax is provided by the British Broadcasting Corporation (BBC), and the other -- Oracle by the Independent Broadcasting Authority (IBA).

Although Prestel originally was conceived as a public system, the private sector has a major influence on the direction of new developments. The British government has actively promoted the sale of Prestel technology and services internationally. An organization supported by the BPO, called

Prestel International, is concerned with selling Prestel abroad. In 1980, users in Australia, Holland, Switzerland, Sweden, West Germany, the United States, and Britain itself were able to access a specially prepared data-base in a field trial of this concept. Its purpose was

> . . . to explore the type of information wanted, how often it would be wanted, and at what price. It would also be an opportunity to resolve some of the many technical, social and legal issues arising from international database access. It would be aimed solely at business users, particularly multinationals, and would include closed user groups (Woolfe, 1980:115).

This system became a commercial service in July, 1981 and is currently available in nine countries. [1]

4.1.2 Developments in West Germany

The German PTT, the Bundespost, is developing a videotex system called Bildschirmtext, which is based on a direct adaptation of Prestel technology. The Bildschirmtext network, however, differs significantly from the Prestel approach. It does not use a system of duplicated data-bases, but relies on independent data-banks which can be accessed by subscribers via a switching facility built into the telephone network (Woolfe, 1980:132).

A field trial in the cities of Berlin and Duesseldorf/Neuss which was hoped to involve approximately two thousand households

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[1] Rice and Paisley's article The Green Thumb Videotex Experiment, provides a detailed chart from which this information has been taken.

and one thousand commercial users began in 1980 (Ratzke, 1981:187). Although there is considerable interest in information provision since about 212 IP's with a total of 60,000 pages of data are participating in the trial, public response has been very slow. (Ratzke, 1981:188-189). By mid 1982 the hoped-for total of three thousand users had not been reached (Tonnemacher, 1982:22).

4.1.3 Developments in Holland

Holland's videotex system is also a development of the national PTT -- the General Post Office. The brand name of this system is Viditel. The entire system, except for the software which has been modified somewhat to take into account Dutch needs, is based on Prestel. A public field trial involving approximately 4000 user participants started in late 1980 (Woolfe, 1980:134). The system is expected to meet the needs of both public and private business as the Dutch are also planning a closed user group service.

As of 1980 the network configuration, although initially based on the Prestel approach, was described as being in a state of flux (Woolfe, 1980:135). The West German "gateway" approach seemed to be getting more serious consideration.

4.1.4 Developments in Sweden

The Swedish videotex system, "Datavision", like that of Holland is based entirely on Prestel. The system is being implemented by the Swedish PTT -- Televerlet. The Swedes however, are developing their own software, specifically for information access and system control, rather than modifying that of the British. A private pilot trial started in 1979, with a public trial scheduled to begin in 1981. The goal was to start a public service in 1983 (Woolfe,1980:137-138).

4.1.5 Developments in Finland

Unlike the countries I have been discussing, the telecommunications industry in Finland operates in a different context. The national PTT (post, telegraph and telecommunications administration) only serves about 30 percent of all telephone customers -- the other 70 percent being served by private telephone companies. The PTT however, is responsible for all long distance trunk lines. The largest telephone company, the Helsinki Telephone Company (HTC), has been involved since the mid 1970's with a private videotex experiment called Telset. The public trial started in 1978 and continued through 1979. In January 1980, a company called Teletieto Oy -- a partnership between HTC, the Sanoma Publishing Company (the largest in Finland) and Nokia Electronics, was established in

order to provide videotex service in the Helsinki area. This made Finland the second country to have a public videotex service (Hannuksela,1981:202-205; Woolfe,1980:135-136). Public response to this service, although small, was more than was initially expected. By the end of 1981 there were 250 user of the service. All together these users access about 65,000 pages in approximately 2,600 monthly sessions. Based on recent trends it is predicted that by 1985 there will be approximately five thousand terminals in use (Howkins,1982:48-49).

The overall system configuration is similar to that of Britain, that is, a network of regional and local databases connected to a central database by telephone lines. The only difference being that plans call for them to be interconnected with a packet-switched network rather than dedicated telephone lines (Hannuksela, 1981:203).

4.1.6 Videotex Developments in France

In terms of advanced telecommunications development, France stands unique. Based on the reccmmendations in the Nora/Minc report (1978), France has embarked on a massive state program to improve its computer and communications facilities, which formally were the worst in Europe. The French approach can be best summarized as "the information society by decree". There are currently several major videotex-related projects underway.

One of them is the development of a special domestic terminal to integrate television and telephone communications. This "electronic telephone directory" is a videotex terminal designed to replace the standard printed telephone directory. Rather thar waiting possibly many years for a mass market to develop, the French hope to create an "instant mass market", by simply giving subscribers the terminals. The field trials in the Ille and Vilaine regions involve 250,000 subscribers. The French government expects the service to grow to 30 million subscribers by 1992 (Woolfe, 1980:128).

France has also been involved in the more conventional approach to videotex for some time. The first studies on broadcast videotex were initiated as far back as 1973 (Marti, 1979). The first two-way videotex system, Tictac, was a very simple system which utilized a touch-tone telephone. This system was demonstrated in the mid 1970's (Woolfe, 1980:126).

It soon became apparent that a universal standard for both videotex and teletext was needed. Efforts in this direction eventually lead to "Antiope" which was adopted as a standard for both videotex and teletext in 1977. With this the way was clear for the French PTT to proceed to establish a public videotex service called Teletel.

Plans called for a public trial to commence at the end of 1980, and to be followed with the introduction of a public service sometime in 1982. The market trial was to take place in Velizy, a Paris suburb. Two thousand to 2500 households were

expected to take part as well as approximately two hundred potential IP's. This trial is designed to gather information on terminal design, applications, market response for certain kinds of services and so on (Woolfe, 1980:126).

The French are also considering a "gateway" approach to the system configuration. Each local Teletel center will serve to connect subscribers with external data-bases rather than storing information for local access. Each center functions as a "data concentrator", that is, "performs the task of transmission speed and protocol conversion" automatically. The centers also maintain subscriber records, high-level indices, and perform messaging functions (Woolfe, 1980:127; Marti, 1979).

4.2 Videotex Developments in North America

There are only two countries in North America that are involved in videotex technology and services: Canada and the United States. Although developments in Canada got off to an early start, the United States with its large internal market, will have a determining influence on the direction future videotex developments will take in North America.

4.2.1 Videotex Developments in Canada

Videotex and teletext development did not begin to gather momentum until the late 1970's. The situation in the commercial sector regarding videotex at that time has been summarized by Madden:

> By that time it was known that one company had developed in Canada a copy of the British Prestel system, another was contemplating purchase of a French Antiope system, a third has aquired some U.S. made teletext terminals based on a British design and a fourth was negotiating with the New York based agents for Prestel for the aquisition of Prestel terminals and software. (Madden, 1980:314)

Most of these organizations were unaware of the initial developmental work on a more advanced approach to videotex that was being conducted at the Communications Research Center (CRC) of the Federal Department of Communications (DOC). The existance of a Canadian version of videotex was formally announced in August, 1978. This approach, later called "Telidon", is considerably different from any of the systems mentioned previously.

Unlike Prestel or Antiope, which are alphamosaic or text orientated, Telidon is alphageometric, or graphics orientated. A typical Telidon terminal receives only the information necessary to enable the terminal, using its own internal computer, to assemble theoretically any graphic image. The heart of the Telidon approach is the "picture description instruction" (PDI)'s system which is discussed in more detail in the next chapter. This is the software which not only gives a Telidon

terminal its flexibility, but can also be used as a videotex standard.

Since the existance of the Telidon system was announced, interest in its capabilities has grown considerably. As of the begining of 1982, there were approximately fourteen Canadian trials either in operation or just starting. These trials take place in every region of the ccuntry, in both urban and rural environments, and include content in both official languages. As a group these trials represent one of the most extensive videotex develcpment efforts taking place anywhere (Parkhill, 1981:5-6; Telidon Reports, Jan. 1982).

The largest trial in Canada is Bell Canada's Vista which is expected to have up to one thousand terminals and 100,000 pages of data available (Kurchak, 1981:12&18). Several provincial telephone companies are also staging much smaller trials: New Brunswick Telephone with thirty terminals and 3000 pages in the data-base, Alberta Government Telephone also with thirty terminals and the British Columbia Telephone Company with 150 terminals geared primarily to business rather than residential applications (Kurchak, 1981:29). Another common carrier, the Manitoba Telephone System (MTS) is conducting a trial for more than just videotex. Also being tested are a full range of home communications, security and other essential services. The goals of this trial according to Marie Kurchak:

> Telidon is part of a larger integrated services trial in which all communications (television, telephone, emergency alert, energy management, fire and burglar alarm status mcnitcring) are controlled at the user's

> site by a microproccesor called the Subscriber Terminal Unit... All services will be delivered by one "electronic highway" composed of coaxial cable, though initially the telephone line is being used for videotex. (Kurchak, 1981: 26-27)

MTS is also involved in a second trial in Elie, Manitoba which is testing a similar range of services utilizing fibre optics rather than coaxial cable (Kurchak, 1981:27).

In addition to these field trials there are currently four commercial telidon-based systems in operation. All of which started public service in 1981. The first of these, called "Grassroots" started in May, and was developed by Infomart in cooperation with MTS, the Manitoba Department of Agriculture, and the DOC. The goal of this system was initially to provide agricultural information to farmers which included: reports from the Toronto Stock Exchange, the Chicago Board of Trade and Broadcast News. More recently, however, it has expanded to include a teleshopping service involving the Hudson's Bay Company (Parkhill, 1981:11; Telidon Reports, Jan. 1982:15; Telidon Reports, June 1982:4-5). The second commercial service, called "Novatex", is available to the international community through Canadian embassies and consulates. The system provides information on such things as trade regulations, statistics, news briefs, tourism and travel, and business opportunites in Canada. The communications link between Canada and the various countries is provided and maintained by Teleglobe Canada (Telidon Reports, Jan. 1982:5). The third commercial system provides a stock market analysis service called "Marketfax" to closed user groups. This system is operated by Cablefax Limited

which is jointly owned by Faxtel Information Systems and Cableshare Limited (Parkhill,1981:5). As well as the private sector, the Federal Government is also using telidon to provide services to the public. In October a public information bank called "Cantel" was made accessable to the public, via telidon terminals located in government offices, libraries and shopping centers, by the Task Force on Service to the Public. By April, 1982, the Cantel database contained more than fifty thousand pages. This makes it the largest government videotex databank in the world. It is also the first telidon service available coast-to-coast which is designed specifically for the general public (Canada, Cantel,(1982)).

In addition to the major trials and commercial service now underway, the DOC is funding through the Telidon Industry Investment Stimulation Program (TISP), approximately fifty smaller projects. Each of these is experimenting with Telidon technology in order to deliver some kind of information service. The total number of terminals involved is about 8500 (Telidon Reports,June 1982: 1-2 & 13-21).

4.2.2 Videotex Developments in the United States

Interest in the possibilities of videotex has been slower to materialize in the United States than in other countries. Uncertainty about the commercial potential of videotex, confusion as to its regulatory status and the lack of a single

organization which can coordinate and implement vidoetex activities on a large scale, have all contributed to this delay. Recent changes in the regulatory environment as well as technological advances in Telematics may, however, be making it more attractive for organizations to become involved with videotex.

The videotex scene in the U.S. is currently characterised by a wide range of different systems, services and different technical approaches by many organizations (Hindin,1982; Truxal,1982). What follows will be a brief description of some of the major efforts.

One of the earliest experiments in vidoetex was project "Green Thumb" funded by the National Weather Service, the U.S. Department of Agriculture (USDA) and the University of Kentucky. This system was designed to provide farmers with essential information on weather conditions, commodity prices, farming techniques and other areas of importance. This information is sent downline in "bursts" which are stored in a simple home terminal for eventual display on a television set (Nylan, Johansen and Plummer,1981:213). Another early experiment was the Ohio College Library Center (OCLC), "home access to library services" -- a project utilizing videotex to deliver library services into homes in the Columbus metropolitan area (Cherry,1980:98). Columbus, Ohio, is also home to Qube, Warner Communications' two-way cable television system. This cable system is unusual because of the way the audience is allowed to

interact with some of the programming (Wicklein, 1979).

The giants of the American telecommunications industry are also becoming involved with the possibilities of new services based on videotex. AT&T has developed a system called "electronic information service" (EIS) whose data-bases include news and sports headlines, weather information, horoscopes and advice and even the Manhatten yellow pages. A small field trial took place in Albany, New York in 1979. General Telephone and Electronics (GT&E) is also involved with videotex, having purchased the exclusive rights to Prestel for the North American market. It hopes eventually to expand into the residential marketplace with serviceware being provided by major companies such as McGraw-Hill, Time, Merrill Lynch and J.Walter Advertising Agency (Woolfe, 1980: 145-146).

Other mass media enterprises are also becoming involved in videotex trials. Knight-Ridder Newspapers has formed a wholly owned subsiduary, Viewdata Corporation of America (VCA), which is developing and testing a videotex service -- using modified television receivers connected to a central computer via the telephone network. This system is called Viewtron and it is being field tested in approximately 150 homes in Coral Gables, Florida (Nyhan, Johansen and Plummer, 1981: 214).

Some organizations now feel that the time is right to go beyond field trials and start public service. Keycom Electronic Publishing is planning to launch one of the first American commercial videotex services in the Chicago area in 1983. It

will provide banking, shopping, news and restaurant listings, soap opera synopses, and other services for approximately twenty-five dollars per month including subscription and terminal rental. Knight-Ridder Newspapers (since joined with AT&T) is also planning to expand the Coral Gables field trial into a commercial service. It will be available in three Florida counties later in 1983 (Truxal,1982:55).

And finally, there are services available which represent a novel approach to videotex. These services are designed for home computers which can then be used as "smart terminals" for information access and telesoftware. Telecomputing Corporation of America's, "The Source" and Compuserve are examples (Woolfe,1980:148-149; Cauvoto,1982).

4.3 Videotex Developments in Japan

Japan was one of the first countries to become interested in the potential of alternative uses of the television medium. They began to experiment with alternative uses of coaxial cable in the late 1960's. These experiments still continue in a variety of cable-based information services currently undergoing field trials. For example, in Tama New Town, a suburb of Tokyo, a two-way cable service trial called Co-axial Cable Information Service (CCIS) is currently underway. A variety of services were tested including "a still picture request service" drawing from over 6000 pages stored in a data-bank. Although technically this

service is a kind of videotex, most users found it of no or little use (Woolfe,1980:160).

The Japanese videotex system, called Captain, an acronym for Character and Pattern Telephone Access Information Network, can display as many as 3500 distinct characters with very high resolution. This is necessary because the Japanese Kanji ideographic characters (adapted from Chinese) are not only very complex in shape but daily use requires anywhere from 2000 to 3000 of them. This factor has been suggested as a major impediment to the application of computerized technology in Japan (Komatsubara,1981:206-207). It is also a reason why the Japanese have not attempted to sell their videotex technology to other countries, particularly the United States (Truxal,1982:53). Unlike Prestel or Antiope which have their character generators located in each terminal, Captain has a large centralized character generator which stores all the information needed to produce this number of characters. This information is then transmitted to each terminal as required. Because of this it takes on average, about two to three times as long to build up a single frame on the screen as it does with Prestel or Antiope (Woolfe,1980:159). The Japanese also have a Teletext system, called Character Information Broadcasting Station (CIBS) and like their videotex system it can also reproduce many graphic characters. This is accomplished by a large memory in the receiver (Roizen,1980:122). And finally, the Japanese are also experimenting with a two-way cable system

which uses advanced fibre optic technology (Woolfe, 1980:161).

As this overview has shown, international interest in the possibilities of videotex has grown dramatically. This has been aided to some extent by the activities of Great Britain, France and Canada, which have developed specific videotex technologies. These three nations, as well as selling the technology in as many countries as possible, are also competing for the potentially lucrative American videotex market. Furthermore, the Prestel, Antiope and Telidon systems themselves are being continually improved. This means that the situation in regard to possible commercial videotex service will remain in a state of flux for some time while many of the technical and socio-economic issues raised by this technology are resolved.

V. Chapter Five: Prestel and Telidon: A Description of Hardware, Access Software and Serviceware

In this chapter I provide a detailed description of three fundamental aspects of any videotex system: the hardware of the terminals and the system as a whole, the characteristics of the access software, and the type of serviceware available. I focus on two systems: Prestel and Telidon. I have chosen Prestel because it is the first videotex system to achieve public service status. Telidon is examined because of its inherent flexibility due to its sophisticated design.

5.1 The Hardware of Prestel and Telidon

This section describes the technical apparatus used in these two videotex systems. As this consists of two main elements -- the terminals and the configuration of the system as a whole, I will examine each in turn.

5.1.1 Prestel and Telidon Terminal Apparatus

The basic elements comprising both Prestel and Telidon terminals are: a keypad, a decoder to interpret the incoming data, a display memory to store graphics and text, and a character generator. As both terminals also utilize a telephone

line to connect them to the host computer, they also contain a modem. This device converts the digital pulses used in the terminal itself to an analogue waveform -- and vice versa -- for both transmission and reception over the telephone network. Additional circuitry is also required to protect the network from the high voltages present in the terminals. The terminals may also contain an autodialer which calls the number of the computer center and a terminal identifier which permits identification of the subscriber for billing purposes (Clarke, 1981:36; Bown, O'Brien, Sawchuk, Storey, 1978:3-6). Although videotex terminals can be added externally to any colour TV set via the antenna input, the internal connection, directly to the "red", "green" and "blue" electron guns is preferred since this gives a higher quality display.

Although both terminals contain technical components which perform similar functions, they are considerably different in the manner in which they operate. With Prestel incoming digital data from the computer first enters the decoder circuitry where it is converted into the seven bit parallel code which is used in the terminal. The decoder also separates the control characters, which format the data, from the data characters which are stored in the memory. Each screenfull of information is thought of as a mosaic of 40 x 24 cells, and each cell in turn consists of a 6 x 10 matrix of picture elements (pixels), which can represent a single alphanumeric character or graphic

shape. [1] A page is displayed on the TV screen by converting the data in memory into alphanumeric characters and graphic shapes, a process which takes place in the character generator. The formatting of the Prestel page is accomplished by the control characters which alter the location in the memory (and hence, on the screen) of certain data characters. A block diagram of the terminal is shown on the next page. In essence, a Prestel terminal, constructs an image by piecing together specially coded graphic characters. This technique is called "alpha-mosaic". The final result on the terminal screen corresponds directly, character for character, to the way the original data (including both text and graphics) is stored in the central computer. This means that the terminal is entirely dependent on the means of image description which is used. Furthermore, any improvement in this software will also require changes in hardware.

In contrast, the approach taken by the developers of Telidon has been to make the image description software; "completely independent of the data access arrangements at the central computer, the characteristics of the communications medium and what may be most important, completely independent of the display terminal construction and resolution capabilities"

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[1]To use a 6X10 matrix to represent graphic shapes would require a sixty-bit code to specify all the possible combinations. Since this is impractical, a 2X3 matrix is used for graphics. Although the resulting graphics can easily be specified with the seven-bit code, it does result in "chunky" appearing images (Woolfe, 1980:28).

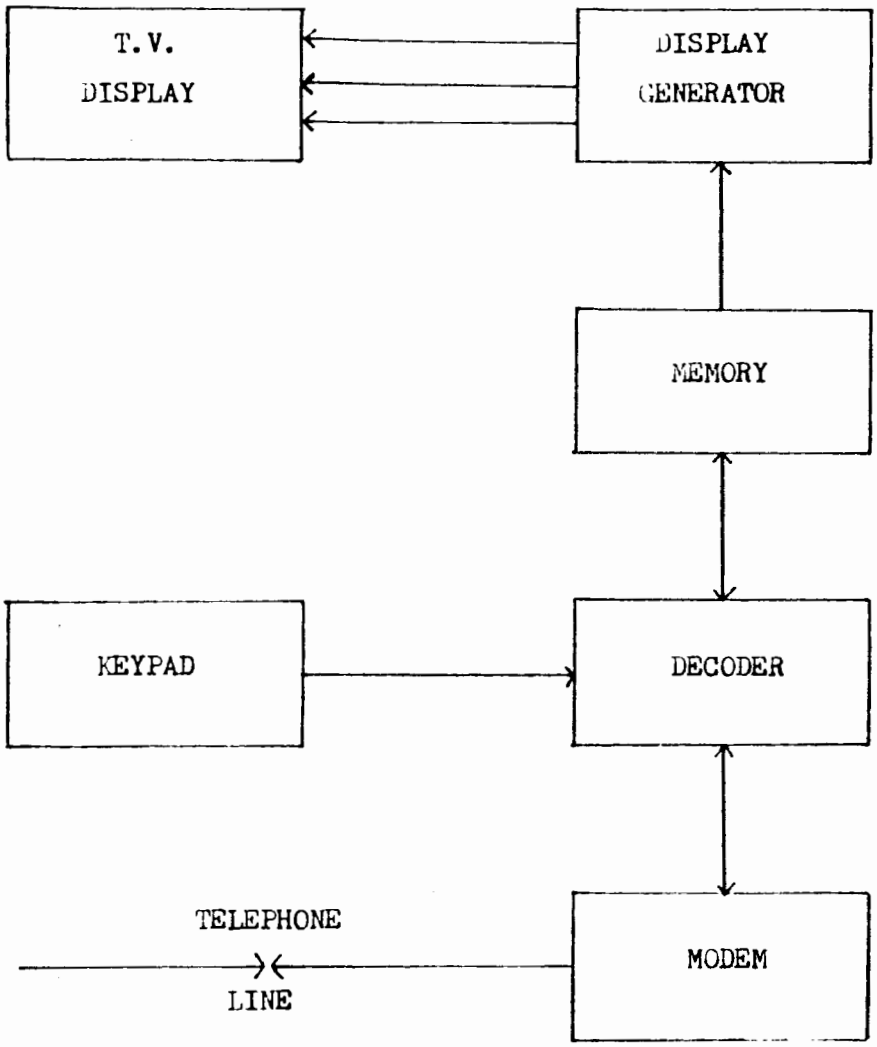

Figure 5.1.1 (a): Block Diagram of Prestel Terminal

(Bown et al,1978:2). Herb Bown, one of the pioneers of the technology, summarized the reasons behind this approach:

> We wanted this independence because we know there are different rates of change for the terminal, transmission and data base management technologies. For example, existing communications are constantly being improved with fiber optics, satellite and other broadband services as well as improvements in the telephone networks and we know the resolution of TV itself may well be improved or it may even be replaced by a totally new display technology. The additional electronics we're putting into a TV to allow it to display this new alphanumeric, graphic and tonal image material will also change rapidly with advances in micro-processors and memory systems and large scale integration. (Bown, cited in Wright,1979:8)

The independence of the Telidon image description software was achieved by the use of "picture description instructions" (PDI's). Each PDI consists of a few bytes of information which defines its function combined with additional data which defines the parameters (that is, values for radii, start and stop coordinates, and so forth) of the desired graphic. The Telidon terminal is designed to decode the PDI's and to create the specified graphic to within the limits of its resolution (Bown et al,1978:17). In fact, any terminal as long as it is equipped with a Telidon decoder, will be able to generate graphics described in PDI's, to whatever resolution capability it has.

The PDI's consist of seven basic instructions, called "geometric drawing primitives", which are: LINE, ARC, AREA, POLYGON, BIT, POINT and CONTROL. Only the first four are actually used to generate graphic shapes. Although it is assumed that these commands will be sufficient to generate "practically all" graphic images, it is also acknowledged that some images

may need to be approximated. For example, ellipses must be approximated since the use of a primitive to create this shape would require excessive computational power in the terminal. In cases where the structure is so complex that it cannot be duplicated by any combination of primitives, the BIT instruction is used. It indicates that the data following is in "photographic" or "bit" form, just like the output of a facsimile machine. The POINT instruction is used to define position of objects and to plot random points on the display by setting the drawing beam to the appropriate position on the screen. And finally, the CONTROL instruction is used to "set a status register prior to sending other instructions". This is useful for setting up the colours or values of particular objects (Bown et al,1978:6-7,17-22).

The basic philosophy of maximum flexibility extends even to the terminal design. It is possible to change graphics capability, in response to differing economic criteria, simply by changing the memory configuration. Two basic memory systems have been designed; "bit-map memory" for high quality graphics, and a less expensive, "character oriented memory". The internal configuration of both of these systems are illustrated on the following two pages.

The flexibility is provided by a small microcomputer in the heart of the Telidon terminal which responds to the commands entered by the subscriber via a keypad, and interprets incoming PDI's and translates them into suitable signals which are then

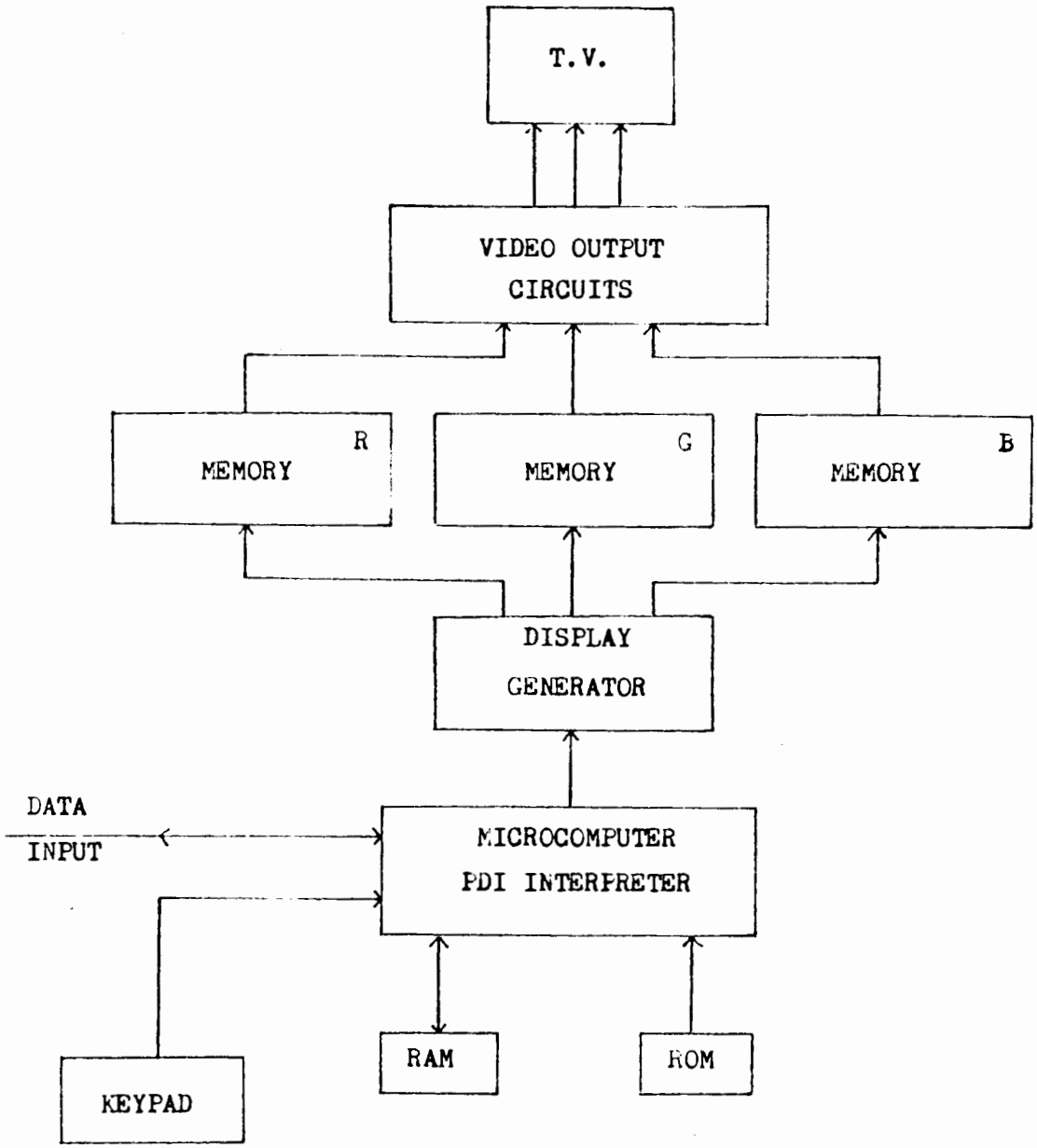

Figure 5.1.1 (b): Telidon Terminal with Bit-Map Memory;
Source: Bown, et al.

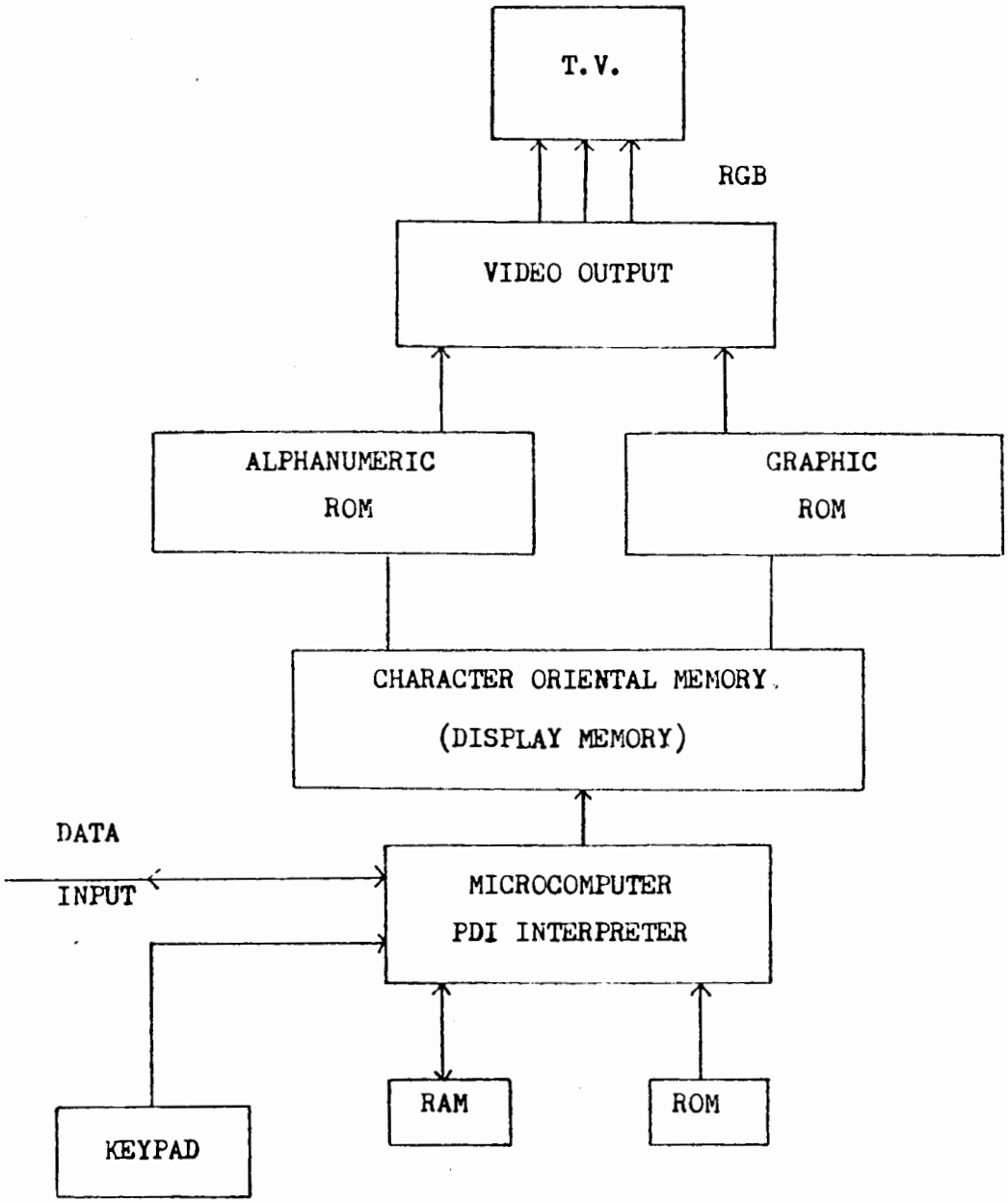

Figure 5.1.1 (c): Telidon Terminal with Character Oriented Memory:
Source: Bown, et al.

deposited into the terminal memory. Interacting directly with the microcomputer are two smaller memories: a random access memory (RAM) which is used as a temporary store while the microcomputer is processing instructions, and a read only memory (ROM) which is used to store essential software. This gives the additional flexibility since the software can be changed simply by unplugging the ROM and replacing it with another containing different software. Both terminal configurations, bit-map and character oriented, are identical as far as the microcomputer and related equipment are concerned. Furthermore, both types of Telidon terminal will, because of the reliance on PDI's, also operate either via a telephone line, coaxial cable, fibre optics, or even, with suitable equipment, a microwave link.

Where the terminals differ, however, is in the structure of the memory. Bit-map terminals, as the name implies, store one item of graphic information (pixel) in exactly the same position in memory that it occupies on the screen. There is a one-to-one correspondence between a pixel on the screen and the representative bit in the memory (Bown et al,1978:14). In addition, colors can be created by the juxtaposition of corresponding bits in the Red, Green, and Blue memories. For example, a white dot would be created on the TV screen by the correspondence of appropriate dots from all three memories, while the correspndence of only two bits would produce a different colour depending on which of the two memories were accessed. Although bit-map systems allow a very high resolution

as well as theoretically permitting user control over every individual pixel, they are problematic because they require large amounts of memory, which at this time is still quite expensive.

Character oriented terminals operate on a different principle altogether. They contain smaller display memories which store codes that represent the alpha-numeric characters or graphic symbols which are to be displayed in fixed positions on the screen (Tyler, 1979:40). These codes usually take the form of eight bit words. A typical display memory configuration for North American TV receivers would be 20 rows by 40 characters, yielding 800 eight bit words. Each word also contains an "address code" which references the actual textual or graphic character patterns which are stored in a separate ROM. The display memory is scanned in synchrony with the 525-line TV display signal, producing a pattern of dots which make up the images. Although such terminals cannot provide the resolution of bit-map systems, they are nevertheless cheaper, and for some purposes just as good.

A Telidon terminal can also be built by modifying a personal computer. This is acccmplished by an "interface card" inserted into the computers expansion slots. Norpak, the manufacturer of Telidon terminals, has developed such a card designed for the Apple II and III personal computers. The card permits users to receive Telidon-based services as well as create pages (Telidon Reports, Aug. 1981:12-13). This approach,

if expanded to other less expensive personal computers, could be very significant for the acceptance of Telidcn on a large-scale.

In summary, the Telidon terminal system cffers greater flexibility than Prestel or any other first generation videotex terminal currently under development. This was made possible by building a terminal that uses software rather than hardware to perform most informaticn display functions.

5.1.2 The Systems Configuration of Prestel and Telidon

This secticn focuses cn the overall configuration of the Prestel and Telidon videotex systems. It describes the relationships between the majcr components -- databanks, information providers, common carriers, the subscribers -- and the nature of the communicatons links which interconnect the components. The discussion is in two parts: the first describes Prestel and the second focusses on the emerging videotex system configuration in Canada.

5.1.2.1 Prestel System Configuration

Prestel, has been offered as a public service by the BPO since 1979. The heart of the Prestel system is a small minicomputer (GEC 4080) with 70 megabytes of disk storage. The system is designed to have two hundred user ports per computer with a maximum waiting time of two seconds per frame of

information. Each central computer forms, in effect, a local data-base and is located within a telephone exchange. The computer sends information to the subscriber's terminal over standard telephone lines at the rate of 1200 bits per second (b/s). The return rate, from the home terminal to the central computer is lower, about 75 b/s, a speed which permits 7.5 characters per second to be returned and is considered appropriate for the average typist. More sophisticated modems would allow a fourfold increase in the date rate to 4800 b/s. Eventually however, the conversion to digital lines should permit even higher speeds (Wilkinson, 1980:69-70).

The second major component of the system is the Information Providers, who can either be individuals or organizations wishing to sell or "publish" information. The BPO's "system philosophy" has been to be concerned only with the development and maintenance of system hardware, access software and indexing. The content will be provided by others and the BPO will act as a "common carrier". This principle

> means that anyone can become an Information Provider, that is, buy space on the PRESTEL computer (or computers) and say whatever he or she wants (subject only to the law) to whoever he or she wants, at whatever price he wants. The Post Office exercises no control over content, quality, relevance, style, price (except within broad system limits) or the frequency with which information is changed; or indeed on how it is sold or marketed to the customers. The role of the Post Office is that of a neutral operator of the technology through which other parties communicate with each other. (Winsbury, 1979:5)

Also, according to the same source, this arrangement will open the door to new relationships in the information industry,

namely the possibility of electronic publishing:

> The common carrier principle transforms PRESTEL from being just another computer system into being a genuine new publishing medium. By enabling (in theory if not yet in practice) any information supplier, big or small, new or established, to communicate information of whatever kind he chooses, it offers a range of choice, a freedom of expression, a flexibility and a responsiveness between suppliers and users, that is unique in electronic media, and conceptually at least is a rival or complement to the massively variegated output of traditional printed publications. What is more, for the first time it creates a genuine marketplace for information, quite unlike either broadcasting or existing computer systems. Many suppliers can offer their information wares to many users at a range of variable market prices, and either succeed commercially, or not. (Winsbury, 1979:6)

It is also possible for a subscriber to become a member of a "closed user group" (CUG). Such a group is, in effect, a private group of subscribers who are using Prestel to provide them with specialized (and private) information. This can be accomplished quite simply by using secret passwords and codes to restrict access to the proper storage locations. In this case, the public videotex system functions as a carrier of private and confidential information is thereby competing with private data communications services. Considering the present reluctance of many individuals to become subscribers to videotex and the strong desire of business to reduce the expense of information manipulation and distribution within their organizations, further developments in CUG services may signal the reduction of the "public" aspect of the Prestel service.

At this stage in the development of Prestel, the system architecture is a relatively centralized configuration with two

levels. A national update centre occupies the top level with many regional service centres below which serve the major metropolitan areas. The update centre is really the "master data-bank" because it is here that Information Providers rent space and perform the editorial functions needed to create new pages or update old ones. It is expected that a single update centre can serve approximately fifteen service centres. Each service centre is connected to the update centre by a two-way high-speed data link operating at 2400 b/s. In addition, each service centre is designed to support between 200 and 400 customers, a figure which the BPO has found, by analysis, to be the most efficient. The entire contents of the master data-bank are duplicated at each service centre -- an arrangement which tends to enhance system security (Woolfe, 1980:94-95).

It is recognised by the BPO that star networks, as this type of structure is called, pose several problems for future development and improvement of the service. For instance, as the number of service centres grows, additional update centres will have to be brought online and eventually, it may become too difficult to duplicate all the serviceware at each service centre. This will create a need for switching capacity in order to connect a given subscriber to the service centre whose data-bank contains the desired information. Another limitation of the present arrangement is that it is difficult to expand the serviceware capacity of the system as a whole. To do this would require that an update centre and all the service centres served

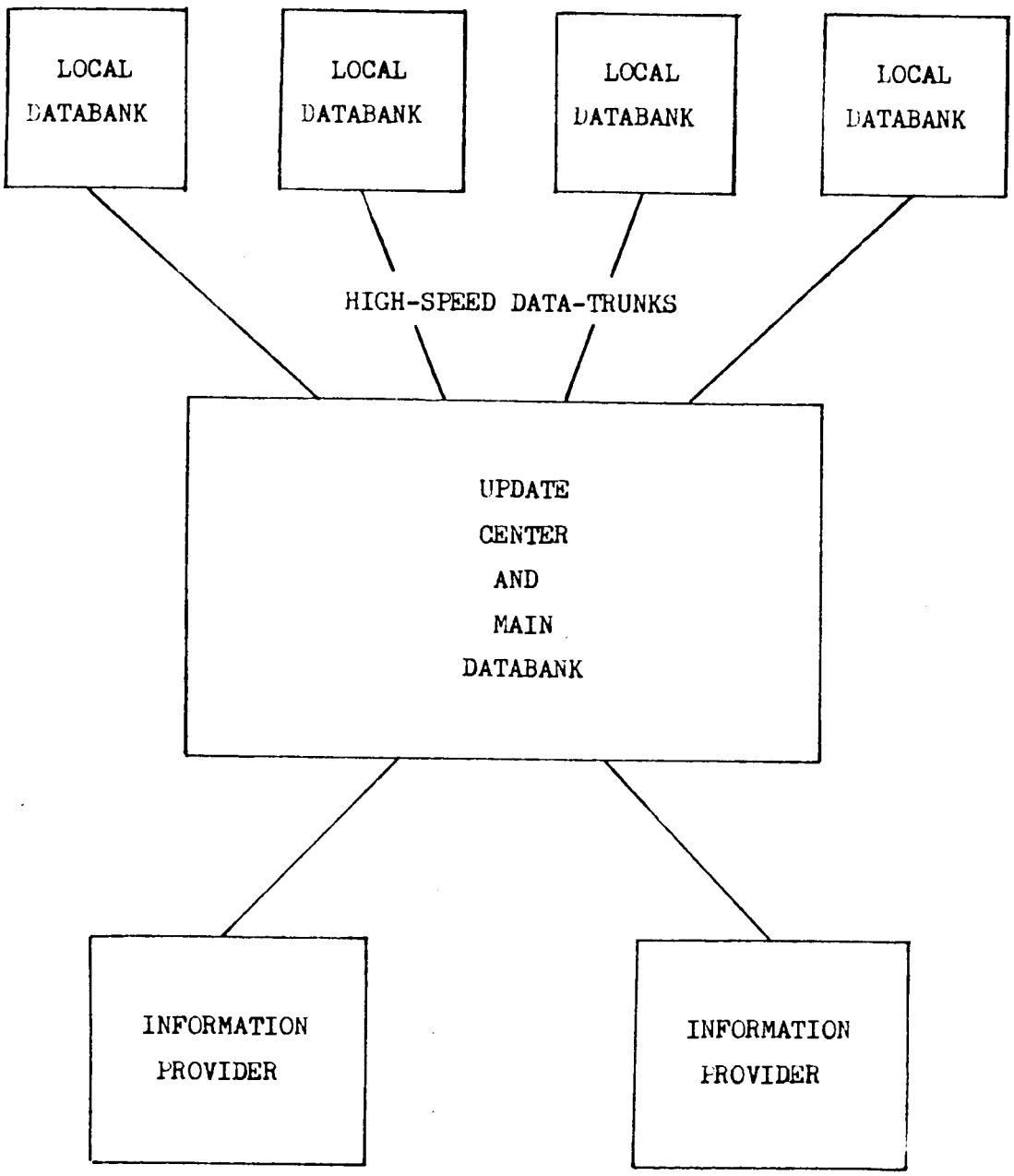

Figure 5.1.2.1: Prestel Systems Configuration

by this centre would have to be expanded simultaneously. A finally, there are plans to use the videotex system for new services including messaging, software distribution and many other computerized services. It will be difficult to provide an efficient message service with a hierarchically organized network. Eventually the BPO plars to mcve towards a videotex system consisting of distributed data-banks interconnected by high-capacity digital trunks. (Woolfe,1980:112-116) This arrangement could lead to greater independence of the local data-bank which, although it would still contain a complete index of all available serviceware and could also contain much content of local interest. A switching facility would connect any subscriber to any other data-bank if the information that he was seeking was not available in the local service centre.

5.1.2.2 Description of Emerging Telidon-Based Videotex Systems

Videotex systems in Canada are still in an early stage of development. Although some commerical services have started, most systems are still in the field trial stage. Since one of the majcr goals of the field trails is to determine the technical viability of different system configurations, and since the commercial services are being provided by differing organizations, it is not likely that a single systems configuration will developed in Canada. I will therefore describe some of the experimental configurations which are now

being used and compare them with the Prestel configuration just described.

With the exception of the Manitoba Telephone System's (MTS) "Ida" experiment, all of the field trials are using some form of host computer. But unlike the British approach many of these host computers will have the capacity to interconnect with external data-bases. This is facilitated by a "window" or "gateway", in which, the host computer operates as a switch allowing the user to access the external data-base just as if he were a standard user of that system. However, there are some differences, specifically in the number of windows and in the way the host computer interacts with the external data-bases, between the test systems used by the field trial participants. For instance, Bell Canada's Vista host computer provides only two or three windows, as does B.C. Telephone, while a cable company -- Telecable-Videotron, will not provide windows at all. Upon receiving a subscriber's request, its host computer permits the external data base host to transfer the information into itself whereupon it is then sent on to the subscriber. The required high rate of data transfer is facilitated by utilizing packet switching and multiplexing techniques and a coaxial cable channel (Kurchak,1981:18-30). A different concept altogether is used in MTS's Ida trial, where a switching system is built into each user's home control center, to connect the subscriber to any remote data-base that can be accessed. This approach is not as "transparent" as the others since since users' do not have a

master index and therefore need to choose in advance the data-base that may contain the information desired (Kurchak,1981:26).

The host computer with windows to external data-bases is an improvement over the monolithic Prestel host computer and data-base in several ways. First, a provider of a data-base containing a mixture of general and specialized information is faced with the problem of differing rates of access to the different types of content. Generalized content, by its very nature, will be accessed most frequently -but prices for this type of serviceware need to be reasonably low. (High prices will force subscribers to access such content via other media channels [newspapers, etc.]). Specialized information, however, can fetch much higher prices but the rate of access will be low. And furthermore, since the storage of specialized information requires large amounts of space in the data-bank, the result may well be an inefficient use of expensive storage space. An obvious solution is to store specialized content in external data-bases which can then be accessed as required. Second, such a system is far easier to expand since all the system provider need do is provide additional windows to new data-banks. In addition, access to external data-bases as part of the videotex service could avoid the problem with the severe limitation on available data-bank space which is plaguing the Prestel system.

Although it is usually assumed that the provision of videotex systems will be left to large telecommunications

organizations, recent technological developments may allow much smaller organizations to provide such services. For example, software has been developed that permits an IBM personal computer to be used as a host for a one thousand page database. The system can also drive a user terminal and a display device. Such a system represents a reletively low-cost way to maintain and update a small inhouse database. It is considered especially useful for "sales presentations, briefings, interactive training packages, monthly reports, company manuals and other applications" (Telidon Reports,June 1982:9). Additional software and hardware development focussed on the personal computer may help to bring vidoetex systems to the level of small firms and even individuals.

In comparison to Britain with its single national Prestel system, the situation in Canada appears very fragmented with several isolated services and many different systems undergoing tests. There have also been some recent developments in telecommunication technology which may signal a trend toward a more integrated system.

Cableshare has recently announced an "intelligent gateway system", called the "Viewdata Gateway". This system permits terminal users to choose from a number of data bases and access them with a single keystroke (Telidon Reports,January 1982:6-7). Another similar system, called "INET" is currently undergoing field trials. This system is a central gateway computer which can provide easy access to a large number of data banks. If the

field trial is successful, the sponser -- the Computer Communications Group (CCG) of the TransCanada Telephone System -plans to start public service in mid 1983 (Telidon Reports, June 1982:10-11). With commercial services such as these it may be possible tc integrate the many separate videotex systems into a single nation-wide distributed network.

5.2 The Access Software of Prestel and Telidcn

Perhaps the most important aspect of any videotex system from the point of view of the subscriber, is the access software. It determines what the system does in response to a command, the nature of the procedure used to access the information, and most important, the ease and flexability of the system as a whole for users who are unfamiliar with it. Good software design is essential if the videotex system is going to attract new customers (most of whom will have little or no experience with computerized systems and some of whom will actually feel intimidated by them), in order to grow and become a valuable component of society. However, videotex software is very complex and demands a great deal of time to write. The software of Prestel, for example, represents more than 40 man-years of developmental effort. The reason for this, according to one writer, is that:

> The basic database and retrieval software for videotex is relatively simple. But with Prestel there are a large number of additional tasks to be considered including usage statistics, billing and payment

> routines, editing and bulk transfer arrangements, closed user group operations, performance testing, test monitoring and error recovery and backup procedures. It is these additional tasks which have made the Prestel software as complex as it is. (Woolfe,1980:97)

Rather than describe all aspects of the videotex system software, I will concentrate only on the information retrieval software since it is this which the subscriber will be using. Since it appears likely that the user access software and the data bank structure planned for Telidon will, on the whole, be similar to that of Prestel, my examination will focus on the British experience. I will start the discussion by describing how data, or more correctly, content, is stored in the data-base, and then I will describe the actual search procedure that an information seeker would use.

5.2.1 Organization of the Prestel Data-Base

The smallest unit of information which can be directly accessed is called a "page". Although it corresponds to a "screenful" of content on the subscriber's terminal, it is not a large unit -- a page holds only 960 characters, which occupy 1000 bytes of disk storage. There are two types of pages: "end pages" which contain only content and, "index" or "routeing" pages which direct the user to appropriate end pages. In addition, each page can also be extended or scrolled by 26 additional screenfuls. These sub-pages or "frames" are identified by the number of the page followed by an alphabetic character starting with 'a' and going, in cases where it is

necessary, to the maximum 'z'.

All the pages are arranged in a hierarchy, generally shaped like a pyramid or inverted tree. The entry point for all subscribers is via the top of the hierarchy (level 1) which contains only a single page (page 0) and which gives the user access to additional index pages on level 2. There can be up to ten additional pages (numbered 0 to 9) on this level, and each of these indices give access to yet other indices on level 3. Assuming an increase by a factor of ten at each level, level 4 will contain about one thousand pages and level 5,ten thousand pages. Assuming available space on disk storage, this arrangement permits a very large number of pages to be accomodated in a small numbers of levels. Each page, whether an index or end page, has its own unique number which is proportional in size to its position in the hierarchy, for example, a page on level 5 will have a five-digit page number. Once a subscriber has signed on to the system any page can be accessed directly by keying in the number corresponding to that page. Another access technique, to be used when the desired page number is not known, requires a series of choices based on information presented in index pages and keying various page numbers until the correct page is reached.

The BPO, as system provider, also performs an indexing function for which it reserves the top three levels in the hierarchy. This forms a master index to the entire data-base. Space rented to individual IP's starts at the fourth level where

each IP receives a unique three-digit number which is in effect the "gateway" to his portion of the data-bank. This means, for example, that if an IP's number is "123" his information would only be found on pages whose numbers had these first three digits. Since such numbers have now become established as standard master numbers for IP's it is much easier for subscribers to access frequently used information. Sub-IP's, since they rent space from IP's do not of course have such numbers.

The data-bank structure which I have just described has been generally referred to as a "tree-search", a name which is not quite accurate in this case. A problem with the tree-search data-structure is that once a user gets to the bottom of the hierarchy, there is no way to obtain additional information pages other than by starting the entire search process all over again. The Prestel data-structure avoids this limitation by permitting branching from some end pages to other related pages at different locations in the data-base. This has the advantage of greater flexibility since the user of the information is less restricted to a single structure and since individual IP's are free to arrange their information in the most useful manner.[2]

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[2] This description was compiled from the following sources: Woolfe, 1980:81-83; Williams, 1981:104-106; Winsbury, 1979:20-25.

5.2.2 The Prestel Information Retrieval Procedure

Access to the Prestel data-base, either from the home or business, is accomplished via a terminal (the technology of which has already been described) by using a keypad to enter commands into the computer. A typical keypad has ten keys numbered 0 to 9 and two additional keys (* and #). The extra keys can be used to instruct the computer to perform such things as; recalling a previous frame, return to page 0, to correct a keying error, and others. In order to request a page directly the subscriber keys in the sequence *A# where A is the number of the desired page. If the subscriber does not know the page number he can find it by performing the following search procedure.

A user usually starts his search at the apex of the data-base hierarchy, "page 0", which gives him a master index of other indices found at lower levels. Selecting appropriate categories from these indices and keying in the corresponding numbers gives him access to yet more indices at even lower levels. This process may be repeated several more times, but eventually will lead to the end pages which contain the desired information.

The essence of this process is the assumption that the content categories chosen by the IP's and the index categories provided by the BPC will be sufficient to give the user enough assistance so that he is able to find the content that he wants.

This is a very complex process and problems have already emerged. One solution which I mentioned earlier has been the provision of routeing pages to avoid the "mineshaft syndrome" which is characteristic of this type of search procedure. Other innovations include the provision of additional indices by IP's who presumably, have a better understanding of the characterisitics of their product, and are therefore able to provide better guidance for the user than is the BPO. There is also a trend towards the blending of index and information pages, again to increase the flexibility of the procedure for novice users. And finally, it is possible to perform a type of keyword search, but this requires a special arrangement of the index and end pages (Woolfe,1980:65-67). Despite all this, much more developmental work needs to be done in this area.

5.3 The Serviceware of Prestel and Telidon

In this section I want to examine what I feel will be the most important aspect of Videotex in the long run. This is the nature of the content or serviceware that the system will give access to. Besides being the raison d'etre of Videotex, the kind of content available will constrain considerably the ultimate impact of the medium on society. For example, it can be argued that an overabundance of commercial and trivial information such as video games, puzzles, quizzes, and the like, could turn videotex into just another bland mass medium. On the other hand, excessive reliance on very specialized informaticn which sells

at a premium price could turn it into a medium for the elites of business and government.

Although initial serviceware developments seemed to be directed towards the mass market, more recent trends are in the other direction towards more specialized serviceware. Since it is far too early to determine, with any accuracy, the extent to which each of these trends will influence serviceware developments, my concern here will be to delineate the kinds of information providers and the types of information products that are available on Prestel and some Canadian systems.

5.3.1 Description of Prestel Serviceware

According to Winsbury (1981), there were 131 Information Providers and 116 additional organizations, acting as sub IP's, providing content for Prestel. The potential of videotex as seen from the point of view of many of these IP's appears to be as an electronic information distribution or even an electronic publishing medium. There are many reasons for this perception. For instance, much business and economic information is currently being computerized and electronic access to it speeds up considerably the process of information retrieval and reduces the costs associated with it. Another reason is that electronic publishing offers additional opportunities for diversification in new markets for equipment, transmission services and information products. And finally, Information Providers who become involved in this service at an early stage will be in a

good position to influence later developments.[3]

Such motives have certainly had their influence on the kinds of organizations who are presently providing serviceware for Prestel and on the kinds of serviceware being provided. Some IP's, especially transportation carriers and cthers providing consumer products and services, are concerned with using videotex as a means to "advertise" the availability of their products and services. Other IP's, in particular, publishers, are more concerned with actually providing information to customers in electronic form. This is in most cases an electronic version of content which has been published in the traditional paper-based medium, but sometimes the content is developed only for videotex application. In addition, the BPO's policy of giving access to all ccmers who can pay the price has created some competition between various IP's who provide similar types of serviceware. Winsbury has described the result:

> Thus, for train times we find on PRESTEL both ABC rail guides, a private publisher, and Britsh Rail, the train operator. For motor car purchasing advice, we find both commercial magazine publishers that publish car magazines, and the Consumers Association. For official statistics on, say, the retail price index, we find both Fintel, a financial publisher, and the Central Office of Information on behalf of the government itself. For theatre reviews we have both a magazine group providing reviews culled from its normal publications and an independant journalist (or rather him and his wife) writing direct for PRESTEL. Then there are banks, universities, retail groups, computer bureaux, tour and travel operators, airlines, research bureaux, libraries,

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[3] Winsbury's article, "Why become an electronic publisher", in Viewdata in Action, p.91, provides more details on the motives for various organizaticns to become electronic publishers (or IP's).

> and so on . The gamut of information is similarily large -- jokes and quizzes, classified advertisments, economic data, company information, timetables, price and shopping guides, share prices, credit card information, horoscopes, games, weather forecasts, and so on. (Winsbury, 1979:13) (his emphasis)

Table 5.3.1 shows that the total spectrum of Information Providers is very wide. * Even though the serviceware available on the system is very diversified, the public reaction has been to strongly favor some types of content over others. Results from the early days of the public service and the test service have shown that the most popular kinds of content are those that have some kind of entertainment function: games, quizzes, sports informtion, jokes, business news, travel and restaurant information, and consumer information. (Williams,1981:103) Other forms of content which were initially expected to be quite popular, such as directories and small classified ads, have proven to be rather unpopular. The reasons for this shift are somewhat difficult to determine with accuracy, but some feel it is because the videotex medium is poorly suited for the presentation of content that is normally scanned at a high speed by users (Williams,1981:103).

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*Table compiled from information presented in Ederyn Williams, "Who's Who on the Prestel Database", in Winsbury, ed., Viewdata in Action:100-101

Table 5.3.1 - Information Providers on Prestel

Source: Williams, 1981

Organization Type	Number of IPs	Comments
National Newspaper Groups	4	show little interest in videotex at this time
Local Newspaper Groups	5	
Magazines	6	
Other Publishers (Directories)	15	
Central Government Departments	8	
Government Agencies	17	
Nationalized Industries	7	
Other Companies	28	serviceware is primarily advertising material
New Companies	8	companies formed to be IPs on Prestel
Other Media Companies	4	
Associations	9	
Computer Software Companies	5	
Miscellaneous	15	provide specialized information

5.3.2 Information Provider Activities in Canada

It has been the policy of the DOC via it's "Telidon Program" to:

> ...to promote development of a national videotex infrastructure through appropriate standards, regulations, and technology; and,
> ...to encourage the creation of a viable Telidon industry producing hardware, software, systems and services through appropriate joint government-industry research and development, product development, promotional activity and support of market trials and operational systems (Parkhill, 1981:2).

This program has resulted in a great deal of activity reflected in the number of projects, systems trials and commercial services that have become established. Many organizations have also become involved in the provision of information in one form or another for the various services and experiments. Table 5.3.2(a) indicates the kinds of organizations that are involved in information provision. And table 5.3.2(b) indicates the kinds of information products that are currently available on the commercial services and in some of the trials.

One thing that is apparent is the degree to which Canadian newspaper interests are involved in this activity. They are active in several ways: First, two major newspaper interests in Canada: Torstar and Southam, a national chain, have established an umbrella information provider called Infomart, in which they each own fifty percent. This company's objective is to provide videotex services such as page creation for its clients which include, retail stores, a bank, newspapers, a travel service and

Table 5.3.2(a): Potential Information Providers in Canadian Videotex

Source: Kurchak, 1981

Organization Type	Firms
Commercial IPs:	
Directory Publishers:	Dominion Directories Tele-Direct 2 "Yellow Page" publishers
Videotex Brokers:	Infomart Infoscope Hemton Corporation
Merchandise-Retail	2 firms
Newspapers and Wire Services	7 firms
Computer Service Organizations	2 firms
Non-Commercial IPs:	
Public Broadcasters	CBC OECA
Government Departments	4 Departments
Community Information Organizations	Community Information Center of Toronto
Libraries	2 Libraries
Citizen Organizations	Consumers Association of Canada (CAC)
Education Institutions	5 Universities Ryerson Polytechnical Ontario Institute for studies in Education

Table 5.3.2(b): Some Information Products Available on the Canadian Videotex Services

A. Educational Information:
- -illustrated histories
- -educational games
- -quizzes
- -self teaching aids
- -special events

B. News, Weather & Sports:
- -Parlimentary News
- -International News
- -National News
- -sports
- -detailed weather data
- -updated weather maps
- -current and long range forecasts

C. Business Information:
- -Commodities Exchanges (Winnepeg, Chicago)
- -Stock Exchanges(TSE,VSE, NYSE, Amex)
- -Market Analysis
- -International Trade Regulation & Statistics
- -Canadian Business Opportunities

D. Advertising:
- -Ads for Retailers
- -Electronic catalogue

E. Consumer Services:
- -"Carfax"-choosing an auto (750 models)
- -Restaurant Guides
- -Electronic Yellow Pages

F. Tourist Information:
- -Route Maps
- -illustration of historic sites
- -available services
- -travel schedules

G. Two-Way Services:
- -Teleshopping
- -Messaging(interoffice)

H. Government Information:
(Federal and Provincial)
- -government programs
- -location of government offices
- -National Job-Bank listings
- -etc.

Sources: Telidon Today, May 1982.
Telidon Reports, January 1982
Telidon Reports, June 1982

others (Kurchak,1981:50). Many of these pages are being used in the Bell (Vista) field trials. Infomart is also involved in Grassroots and together with Times Mirror Videotex Systems of Los Angeles, is attempting to sell Telidon technology in the United States (Telidon Reports,June 1982:4-5). In addition, Infomart is a voting member of VISPAC as well as Southam and Torstar, and has been very active in this organization.

In Canada there has also emerged an information providers association called the Videotex Information Service Providers Association of Canada (VISPAC). According to it's "articles of association", the objectives of the organization are:

> to promote videotex standards; to ascertain the views of its members and promote, develop and represent their interests; to encourage exchanges of information; to develop and maintain standards for conduct within the industry; to strengthen protection for IP's intellectual property; and to encourage the unrestricted flow of information. (Kurchak,1981:Appendix 3:i)

As of June 1980, this organization had 41 members, 17 of which were voting members, that is, members who have the right to vote at a General Assemblies where outstanding matters will be decided (Kurchak,1981:Appendix 1:vii). The remaining 24 members are non-voting. If VISPAC becomes an influential organization in the Canadian videotex industry then the system providers and the major IP's are in a good position to influence later developments. Of the 17 voting memberships, four are the major telephone companies, and if the memberships of Torstar, Southam, Infomart and Tele-Direct (a Bell subsiduary) -- companies which have close ties to Bell Canada via their participation in the

Bell field trails, are included, then eight out of seventeen voting members are tied to the interests of the common carriers, especially Bell. The remaining nine voting memberships are split between broadcasters, newspaper publishers, and other organizations providing specialized serviceware. It also appears that the cable operators have no direct voting representation on VISPAC (VISPAC,1980).

Finally, an area in which there has been much recent activity is in page creation services for videotex applications. Many organizations who wish to become information providers find that it requires sophisticated and expensive equipment and highly skilled and creative labour. A solution is to hire a specialist videotex broker who may provide these services. As of October, 1982, there were thirty-one companies providing such services in Canada. The total number of pages that had been created was aproximately 167,000 at an average cost of thirty-five dollars a page. [5] Despite the existence of three major videotex brokers (Infomart, Infoscope and Hemton Corporation) much of the growth in page creation services has been in smaller firms. This is because they usually produce a better information product which is more relevant to the specialized needs of their customers.

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[5]This information was obtained in an interview with Peter Booth of Westcom, March 22,1983.

VI. Chapter Six: A Critical Examination of Assumptions Underlying Present Thinking about Prestel and Telidon

In chapter three of the thesis I examined some conceptualizations of possible videotex systems and some of the services which could be made available with these systems. These services were based on several major assumptions concerning the demand for the service, sufficient interactivity, separation between the essential institutional elements of the system, and the capacity tc provide acceptable levels of serviceware.

In this chapter I critically examine these assumptions as they apply to the British Prestel system and the emerging Canadian Telidon-based systems. In doing this I will be able to examine more closely the process driving the development of Prestel and Telidon.

6.1 Criticism of the First Assumption

The analysis begins with the assumption that both Prestel and Telidon are ecconically and technically viable, and that they provide a service which is desirable to subscribers. The assumption may be broken down as follows:

1. That Prestel and Telidon are viable technologies in the sense that both hardware and software of the required level of sophistication needed for the service has been developed.

2. That Prestel and Telidcn are economically viable, in sense that services provided by them will be affordab the subscribers.
3. That there is a demand for Prestel and Telidon based on their merits as providers of information and communications services.

I will examine each of these in turn.

6.1.1 The Technical Viability of Prestel and Telidon

A domestic videotex service requires the use of several items of apparatus which provide the infrastructure on which the service is built. As well as the systems provider's host computer, a service requires two-way communications links into the home. These currently can be provided by the telephcne network in both Great Britain and Canada. The coaxial cable (which in most cases is not presently a two way facility) is also a possibility but only in Canada since the U K dces not have an established cable television industry which uses this technology. Also required is an electronic display which is already present in the form of the domestic television receiver. In the last chapter I examined the hardware and access software of both the Prestel and Telidon terminals. It is obvious that this technology is at a high stage of technical viability. The host computers, the disk files for content storage and the systems operating software have all been adequately demcnstrated in Britain and in the field trials in Canada.

Recent statistics also demonstrate that the communications infrastructure and the television sets needed for videotex are already in place to a significant degree in Canadian and British homes. As of May 1980 Canada had 7,807,000 households. Of these, 7,622,000 households or 97.6 percent, had one or more telephones (Statistics Canada, 1982; 10-12). Television sets, both black and white and colour, are also very popular. By May 1980 the number of households with one television set was 4,639,000 or 59.4 percent of the total. Households with two or more sets added another 2,989,000 or 38.3 percent to give a total market penetration of 97.7 percent or 7,628,000 households (Statistics Canada, 1981: 10-12). Although cable television service is not yet as popular as the previous two, it seems to be catching up -- cable services have the highest annual growth rates of the three. As of May 1980 the total number of households with cable was 6,110,762, or about 78.2 percent (Statistics Canada, 1981: 10-12).

In Britain telephone penetration is considerably lower than in Canada with only 60 percent of homes and businesses having service (Fredida and Malik, 1979: 2). Television penetration, however, closely parallels the Canadian situation. Overall some 98 percent of households have a television set and some 70 percent of these, or 68.6 percent of the total, have colour television. Also approximately 33 percent of the total have at least two television sets (Tipping, 1981: 82).

Although these statistics seem to support the point that an infrastructure for a videotex service in the two countries is more or less in place, this does not necessarily mean a home videotex service will actually be perceived as necessary for the personal needs of the potential subscriber. There is still the question of the cost of the service and whether it can provide relevant and useful services.

6.1.2 The Economic Viability of Prestel and Telidon

In the last decade there has been a spectacular decline in the cost of electronic circuits. Costs have declined approximately 28 percent for every doubling of output of the microelectronic industry. Put in another way, this translates into a reduction in price of one hundred times over the last decade (Noyce, 1977:67). Such a large cost decrease occurred because of two sets of factors: innovations in the fabrication technology for microelectronic circuits (Oldham, 1977:128) and the demands of a very competitive marketplace. It is expected that these price reductions will continue for some time. The electronic circuitry for a videotex system, since it is based on the same technology, will also become cheaper especially if the production levels for this circuitry can be increased. Experience with Prestel seems to bear this out. The first versions of the Prestel decoders cost about $600 but as production levels increased to hundreds of units per month, the

prices dropped to $300. It has been predicted that when production volumes reach thousands of units per month the price will be below $30. (Woolfe, 1980: 102) As for Telidon, many experts have made similar predictions. In 1981, a price of $300 for a Telidon decoder seemed possible by 1983 (Telidon Today, March 1981:3). This development however, depends on the availability of a custom LSI chip which as yet does not exist (Hindin, 1982; Truxal, 1982). Even to use a personal computer as a Telidon terminal is expensive. The Apple II and III are some of the more expensive personal computers and the Norpak telidon board is currently selling for about $500. [1]

There are other costs that a subscriber has to meet. A Prestel user not only has to pay for the page of information that he accesses at rates ranging from as high as 50 p. per page, but he also pays a telephone charge and a "connect-time charge" to the Prestel systems provider. The telephone charge is usually the standard local call rate of 3p. for 2 minutes, but it can be less at non-peak times or on weekends. The connect-time charge is 3p. for one minute at peak times and 3p. for three minutes at non-peak times. In addition, some subscribers are also faced with a monthly rental charge for the adapted television used as a terminal. This can cost about 30 pounds per month and is the single largest cost component that a videotex subscriber will have to pay.

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[1] Interview with Dennis Anderson, Datum Electronics Inc., March 30, 1983.

As these figures imply, Prestel, if used on a regular basis, can be an expensive proposition. Winsbury has analyzed the economics of Prestel under a variety of asssumptions concerning the duration of access time, the costs of information pages, the number of pages accessed by subscriber per month, and so on. He concluded that the total average cost per page accessed will be about 3 p. (Winsbury,1979:43-44). This means that a user session where only ten pages are accessed will cost 30p (approximately 60 cents). Since about 50 percent of this cost represents the amortization or the rental cost of the home terminal, it is clear that a significant reduction in the price of terminals due to increases in production levels, will only slightly affect the user cost of the service.[2]

As mentioned in the last chapter there are currently three commercial services that are available to residents of Canada (Novatex is only available to users outside the country). One of these, the Federal Government's Cantel is provided at no cost to the consumer. Subscribers to Grassroots however, lease terminals from MTS at a cost of $47.50 per month. They also pay a toll charge of five cents per minute to access the data base located in Winnipeg. These rates only apply to users within Manitoba. Those outside the province pay an annual fee of $500 and all

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[2] Because of the relatively high cost of colour television sets (one thousand Pounds), approximately 60 percent of the market for new sets is filled by rentals (Woolfe,1980:97). This means that large price reductions in the price of Prestel terminals, probably will not affect the rental price of a modified TV set significantly.

long-distance toll charges (Telidon Reports,June 1982:5). The other commercial service, Marketfax, is even more expensive, with a possible annual subscription fee of $5000 plus $500 per terminal per month being considered (Telidon Reports,June 1982:3).

6.1.3 The Question of Subscriber Demand for Prestel or Telidon

Despite the fact that Prestel and Telidon are rather expensive propositions, some arguments could be made that eventually subscribers will find the concept of paying for content as they use it more attractive. For instance, with the increasing popularity of home video games and the advent of Pay TV, a perception is emerging of the television set as more than just a passive entertainment medium. Also, the increasing use of home computers and the popularity of computer training in educational institutions may create a greater sense of the utility and growing importance of computers for individual lifestyles. Furthermore, the increasing availability, in some areas, of limited interactive cable televison services may also be contributing to redefining the perceptions of users towards more interactive forms of service. In other words, a market for more sophisticated telecommuncations services in the home may be beginning to develop.

Recent research in this area seems to support this point. A review of a number of studies indicated "there is a home market

to be tapped, but it does need nurturing. As energy costs continue to rise and people become more familar with telecommunications in their wcrk environments, acceptance of services within the home may not be far away" (Goldman, 1980: 25). The reason for this rather cauticus conclusion is that the existing market is very fragmented with a confusing array of goods and services available. There are several reasons for this. First, the range of pctential home telecommunications services is vast. This is evident from many past studies. For example, Paul Baran, in a study examing the potential demand for such services, identified no less than thirty services in six major categories including: education, business conducted from the home, general information access, shopping facilitation, and persen-to-person telecommunications (Baran, 1971: 12-26). Telecommission, an even more ambitious study by the Canadian Government, indentified 117 services in twelve major categories which could be made available in the home by a multiservice cable system (de Mercade et al, 1980: 26). And Michel Guite, in a later study on potential cable services, identified nine major service areas (Guite, 1977: 55-57). I have summarized these results in table 6.1.3 on the next page.

This table also indicates other reasons for the confusion and fragmentation in this market. Observe that there is considerable overlap between some services and distribution technologies. This means, for example, that an electronic newspaper or general information retrieval service could be

Table 6.1.3 - Existing and Possible Telecommunication Services in the Home

Service Type

A) One-Way: Broadcasting or Coaxial Cable

1) Entertainment
2) Electronic Newspaper/Magazine *
3) Educational Programming
4) General Information *

B) Limited Interactive: Coaxial Cable or Telephone Line

1) Demand Entertainment **
2) Security Services **
3) Meter Reading **
4) Incasting/Polling **
5) Electronic Magazine **
6) Information Access **

C) Fully Interactive: Two-Way Cable or Telephone Line

1) Two-Way Voice
2) Electronic Mail and Messaging
3) Shopping
4) Financial Transactions
5) Information Access
6) Home Computer Networking **
7) Computer Assisted Education **

* can also be provided by Teletext

** can also be provided by stand-alone devices

Source: Based on Baran (1971), de Mercade et. al. (1980), Guite (1977).

offered by a broadcaster (via teletext), a cablecaster or the telephone company. Even more significant is the fact that some services do not require a telecommunications systems at all -- they can be provided, at reasonable cost, by a stand-alone product. Examples are computer-aided instruction via products like Texas Instruments' Speak and Spell, and an electronic newspaper using videodisk with a freeze-frame capacity.

In this context, videotex is just another way to provide telecommunications services into the home. Unlike stand-alone or add-on devices, videotex can in principle, provide many different kinds of services. But despite such advantages, consumer response to videotex has not lived up to initial expectations. The results of the Prestel field trials and the early stages of the public service support this -- with residential participants more likely to reject the service than business participants (Woolfe, 1980:78). The reasons for this are complex and varied. Psychological factors are certainly present: videotex requires changes in habits or new skills to be used effectively, it is in conflict with the traditional role of the television, and there is a fear of invasion of privacy, and the values of the content may be in doubt. Market factors also have their influence: Woolfe has suggested that "videotex will be perceived as competing with other TV-related devices", including VCR's, videodiscs, teletext, and even personal computers; but the single most important factor in terms of limiting the potential marketplace, appears to be the high price of the

service. (As I have just shown, videotex may be inexpensive when compared to other online services but it is expensive by consumer standards). It is for this reason that the BPO has changed its policy towards promoting videotex in the business rather than the residential market (Tipping, 1981:86; Desbarats, 1981:28). There is now a general feeling than additional research on consumer informational needs and expenditures to satisfy those needs as well as more extensive development of videotex to reduce its cost is needed (Tyler, 1979:47; Hindin, 1982:120-122).

6.2 Criticism of the Second Assumption

The assumption that there should be a clear institutional separation between the organizations providing the serviceware and those providing the technical system, is quite apparent from both the Prestel and the Telidon literature. In Prestel this assumption has been institutionalized into official Post Office policy and in Canada many writers (some directly involved with Telidon development) are suggesting such a separation. Although this section discusses the merits of this concept, my primary focus is to examine the many problems in maintaining such a separation which are now becoming very apparent.

6.2.1 Advantages of a Content/Carriage Separation in Prestel a Telidon

The principle of separation of content from carriage has been a part of telephone service for many years. The telephone company, since it is selling access to a two-way communications network, is under state regulation to provide service to all comers who have paid the tariffs. This means that the telephone company exercises no control over the content of any message providing its sender has purchased the right to use the network. In the publishing industry there is a long tradition of "freedom of the press" which means that a publisher is free to publish anything he wishes, subject only to self-imposed criteria of economic viability and concern for legal issues stemming from the nature of the content. Aside from these considerations a publisher, therefore, has the right to be free from any kind of censorship in his information dissemination activities.

As is apparent from the discussion in chapter three, current thinking about videotex recognizes the flexibility of this technology to provide many communications functions including those of an electronic publishing medium. This raises the possibility that the telecommunications industry (who are providing the communications and content storage facilities used in most videotex field trials in Canada and for Prestel), may get involved to a significant degree in the provision of videotex serviceware. This has greatly alarmed the publishing

industry, particularily in the United States and to a lesser degree in Canada and Britain. The fundamental issue, they argue, is access to the new medium -- which if controlled by the telephone companies may present great difficulties for publishing -- especially newspapers.

> In our own time, the number and variety of newspapers have been affected by competition from electronic media and other factors. They may be further reduced if videotex systems become important carriers of news, information, and advertising. If the carrier systems operate news services themselves, in competition with other information providers, the result could be monopoly news services provided by telephone and cable TV systems that are licensed and regulated by the state. In such a system, freedom of the press, as defined for centuries, would be extinguished almost by accident, through the unifying effects of modern technology and corporate management (Desbarats, 1981:87).

It has been argued by many writers (Parkhill, 1979: Madden, 1979: Serifini and Andrieu, 1981: the Clyne Committee Report, 1979: and Desbarats, 1981) that the way to avoid this and other problems related to the involvement of videotex systems providers in content provision for their own systems, is to strongly insist on a "legal wall" of separation of carriage from content.

6.2.2 Problems with the Separation Concept

Ostensibly, the reason for such a separation is to prevent the systems provider from having any influence over the content. As I will now attempt to show in the following discussion, with specific examples drawn from Prestel and Telidon, this will be

very difficult to achieve.

Lewis Auerbach (1981:4-5) in an analysis of this issue identified three ways in which a common carrier has control over content. These are:

1. Technological Influences which reflect the characteristics of the systems hardware.
2. Peceptual Influences which relate to limitations in the type of messages which can be sent over a particular medium. Such influences are significant because;

> . . . recipients of messages will eventually be conditioned to expect certain kinds of messages, but not others, over a given communications channel. Their perceptual expectations will reflect the adaptations of others to the characteristics of the channel, and become in time, a pervasive and thus almost invisible sociocultural phenomenon (p. 4).

3. Sociopolitical Influences: These are due to the impact of economic criteria for access to the medium on, not only the nature of the message, but also who the senders and receivers are.

Technological and sociopolitical influences over content are certainly evident in the Prestel system at its present level of development. Despite the BPO's insistance that the common carrier principle used in Prestel opens the medium to all those who wish to buy space on the Prestel computers, there are major problems with this approach. In the early days of the service, for example, the BPO found that smaller Information Providers (IPs) who did not have the financial resources and the technical expertise needed for the production of videotex pages, were

becoming increasingly reliant on the BPO facilities (Tyler,1979:44). This threatened to upset the BPC's common carrier policy. The solution was to set the information provider charges high enough so that only the larger oganizations could afford to become IPs. This has had several effects: First, it has encouraged the formation of "umbrella" IPs, that is, information providers who rent part of their data-bank space to smaller IPs (called sub IPs) who normally could not afford access. Second, since the umbrella IPs usually have legal and editorial responsibility for the information provided by their sub IPs, this raises important questions of control over access and content by the more powerful over the less powerful. And third, it has complicated the relationship between the IP's and the BPO considerably. Instead of there being a single class of information providers who provide content for the BPO computers, there are two classes of IPs which can have differing and unique relationships between each other. For instance, some sub IPs do retain editorial responsibility over their information while others do not (Williams,1981:99).

In spite of such criticsm the BPO feels that its common carrier approach has in general been successful. As of February, 1980, there were 131 Information Providers and another 116 organizations who were sub IPs. The Information Providers include newspapers; both national and local, magazines and other publishing concerns, nationalized industries, including British Rail, British Airways, and Post Office Telecommunications, and

even various associations (Williams,1981:100-101). This degree of success has meant that limitations in the number of available "pages" in the data-bank have become evident. The typical service center installation has four 70 megabyte disks which can provide a total of 250,000 pages of space. After system operating overheads and space allocated to closed user groups are subtracted, approximately 180,000 pages are left for the needs of all the IPs. The average allocation per IP is only about 1000 pages. Shortages of pages is another reason why some IPs are renting databank space from others. Eventually, the BPO plans to increase the storage capacity at each service center which should rectify the situation somewhat (Woolfe,1980:95-96).

Despite the infancy of Telidon-based systems development in comparison to Prestel, problems in relation to the separation of carriage from content have already emerged. These are mostly technological since the hardware and the systems operations software are still under development, and sociopolitical because the relationship between common carriers and information providers involves a considerable degree of control by the systems providers over the type of content produced by IP's.

In the Bell Canada field trials, for example, there has been a shortage of information provider terminals. This has required the Department of Communication (DOC, for whom the terminals were manufactured) and Bell Canada to devise a method of allocating terminals to IPs (Auerbach,1981:7). This method allocates terminals to IPs based on their content plans. In

order to recieve a terminal an IP must formally indicate that he intends to provide at least 6000 pages of serviceware (Kurchak,1981:38). In addition, technical limitations in the terminals themselves can also limit a users ability to create pages rapidly, as it can take up to twelve hours to design a single page (Auerbach,1981:7). Although as the information provision hardware becomes more sophisicated, such technological influences should become less evident. However, more sophisticated technology is usually more expensive and or as a result, economic influences over content provision should become more evident.

Even though the telephone companies have emphasised that in relation to videotex services, they will have no direct involvement with content production, they are becoming much more directly involved with this activity in the field trials. Of the five telephone companies involved in the trials only MTS is not concerned with data-base management. The other telephone companies, especially Bell Canada, have definite goals as to the kind of content that they will be seeking to fill their data-bases (Kurchak,1981:36-42). Rather than taking on all IPs they are selecting only those whose content fits in with their conceptualization as to the nature of the serviceware they will make available to customers.

The telephone companies are also becoming more directly involved in the emerging information provision industry in other ways. First, as already mentioned, all the major telephone

companies are members of the Videotex Information Service Providers Association of Canada (VISPAC). Second, many telephone companies are affiliated with or directly own some publishing interests -- specifically directory publishers. Bell Canada, for example, owns Tele-Direct, a Montreal-based directory publisher and B.C. Telephone is affiliated with Dominion Directories. These companies are also members of VISPAC and are providing content for the current field trails (Kurchak, 1981:48). And finally, there are some questions of economic control by the carrier over those who provide content. For example, Wilson, in regards to Bell Canada's videotex billing policy, has observed:

> Of fundamental significance though, is the point made earlier, that all revenues should be billed for and collected by the carrier. The way in which these revenues are shared by the various provisioners will be crucial to the success of any videotex system. All competent players must be winners while at the same time the fee structure must encourage the entry of high revenue generating information products and discourage the entry and maintenance, of low revenue producing applications (Wilson, 1979:6).

It is apparent from the material that I have presented here, that a continuation of the traditional separation between content and carriage may, in the future provision of videotex services, be in doubt.

6.3 Criticism of the Third Assumption

In this section I will examine critically the assumption that the degree of interactivity currently available with Prestel or Telidon is sufficient to provide the full range of services envisaged.

6.3.1 Interactivity in Videotex Services

The term "interactivity" refers to the amount of feedback that is available in any communications process or system. Communication modes that offer many possibilities for feedback are generally referred to as interactive, while non-interactive modes have no way to facilitate feedback. A good example of a non-interactive communication mode is radio or television broadcasting. These are also referred to as one-way since information is only capable of flowing in one direction -- from a single broadcaster to many receivers. Two-way communication modes, for example, two-way radio or a telephone network, permit information to flow both ways. Two-way modes, however, can not always be considered interactive. The essential distinction between the two takes into consideration the amount of time elapsing between the initial message and the response to the message. If the response time is too long the perception of interactivity will be lost.

Communication processes and systems also differ in the kinds or "channels of feedback" that are available in them. The availability of certain channels depends on the physical characteristics of the communication system and the type of modulated energy chosen to carry the information. For example, consider two conversations between two individuals in two situations which differ in the way communications takes place. In the first situation the two are talking face to face, and in the second they are using a telephone. Both media are considered to be interactive. There are, however, obvious differences between the two in terms of the number of feedback channels -- the face to face conversation permits much more interaction since the participants can see each other and respond to visual gestures, body language and so on, while the telephone conversation only permits vocal interaction. Clearly it make sense to distinguish between different processes of communication in terms of the degrees or amount of interactivity available in the process.

Doug Seeley, in a recent study on databanks in Canada (Seeley, 1981), modeled the "information environment" in which databases operate. One perspective views this environment in terms of "levels of interactivity", that is, in terms of the degree of information feedback built into communication systems and processes. This concept will be useful for my discussion here.

Seeley's model conceptualizes eight levels of interaction. These are, from least to most interactive: Reactive, Selective, Informative, Responsive, Malleable, Structural, Functional and Knowledgeable. Both Reactive and Selective systems only permit users to make a choice out of a number of alternatives, the difference between the two being that a Selective mode of interaction permits selection from a large number of alternatives by the use of software. Systems which exhibit Informative or Responsive interaction modes are two-way since a user can actually return information to the databank. In addition, Responsive interaction would also permit a user to "actively control the flow of information" (Seeley, 1981: 21). Even more interactive modes: Malleable, Structural and Functional, differ respectively in the degrees of user control over the categorization of items, how these are catagories interlinked within the system itself, and the users' ability "to construct new program tools from a workbench of programming tools" (Seeley, 1981: 22). And finally, there are systems which are interactive to such a degree that they are capable of a dialogue with a user based on a model of how that user views the world. Seeley refers to these as "Knowledgeable systems".

In chapter three I examined some of the literature describing the services which could be made available to the public on a large scale via Prestel and Telidon. These included: information access and retrevial, telesoftware and also transaction services, in particular: electronic banking,

teleshc ing and even personal messaging. According to Seeley's model, 'ard' information access and retreival, and telesoftware, require le irstem that is capable of a level of interactivity which allows selection of certain items from many that are stored in a data-base. Such a system is called "Selective" since:

> The user is seeking some particular informatien record and may search for it using such soft devices as menu-trees in Telidon, however, such systems tend to promote through its software a passive relationship to the data-base and its "knowledge" (Seeley,1981:21).

Transactional services, however, require some information to flow from the user back to the data-bank. This is true to some extent for banking services where customer records are modified as the transactions occur, but is even more true for messaging services. In order to send a message a user must specify the individual to whom the message is to be sent, and provide the content of the message. This information can then be stored in an "electronic mail box" and either forwarded to the recipient or made available for access by the recipient. Such interaction cannot be accomodated in a selective system. It requires a system with at least one more level of interactivity -- which Seeley refers to as "Informative":

> The user may provide actual content to a data-base, or generate displays, as in videotex information providers, community computer bulletin boards, computer conferencing (e.g., EIES) (Seeley,1981:21).

The conclusion here is that a videotex system able to provide these services must be at least capable of an "informative" level of interaction.

6.3.2 Hardware Constraints on the Level of Interactivity Available in Prestel and Telidon

A major constraint on the interactivity of any videotex system as a whole is the use of a numeric keypad as an input device for the domestic terminal. These are being used by Prestel and are part of some of the Telidon terminals which are currently being used for field trials and in some of the public services in Canada. These devices limit interaction by restricting the users' response to either "page numbers" of various preselected content pages or to simple binary choices. More sophisticated search procedures, for instance by "keyword", can only be achieved by a clumsy set of numeric codes corresponding to the appropriate letters, and then only if this arrangement has been made in advance by the systems provider (Woolfe,1980:67). [3] Although a much more effective mode of input would be possible with the use of a standard alphanumeric keyboard, this option was not considered because of the need for system simplicity. Such requirements have also limited the data-return rate of the Prestel terminal to 75 b/s. Although this is adequate for the kinds of user reponses that will be generated, in the long term it could become very difficult to upgrade the home terminal with more sophisticated input devices.

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[3]On Prestel such an arrangement is usually made by an Information Provider to help search their pages.

I do not wish to give the impression that these hardware limitations result from any deliberate attempts to limit the interactivity of the medium, but only that they are the result of economic decisions directed towards making Prestel a viable product in the domestic marketplace. This is evident from the principles around which Prestel was initially designed:

1. It must be reliable. A system that frequently broke down would soon be discredited.
2. It must be simple enough for anyone to use without instruction.
3. It must be very fast, so that as many people as possible could be rapidly served by the computer.
4. The cost must be very low. Both sets and the computer centers must be designed to be as inexpensive as possible.
5. A network of computers storing identical data, rather than an interconnected network [of] different data bases, was to be established. (Wilkinson,1980:68-69)

As well as limiting the interactivity of the terminals, the requirements for system simplicity, low cost and high speed also dictated the requirements for the access software, and most importantly, for the host computers.

The computers were selected to meet the requirements of principle four (above). This meant they must occupy a minimum of floorspace, require no air-conditioning, and need a minimum of support staff with unmanned operation an eventual goal. The machines were also chosen to be inexpensive with a good input/output performance as well as being rugged and reliable enough for continous 24 hour operation. Each was required to accomodate between 200 and 400 simultaneous users. This number was chosen to keep the capital cost of each port to a minimum

while having the maximum number of ports available for users in relation to the capacity of the telephone network to handle the requests (Clarke,1981:39). This criterion also reflects assumptions that users would have to wait no more than two seconds to receive a requested page and that users would request additional pages, on average, every ten seconds. Predictions based on these assumptions indicate that the computer equiped with a single 70 megabyte disk would be able to handle up to 400 users at a rate of 40 requests per second with the average waiting time within two seconds, 99 percent of the time (Woolfe,1980:115-116).

Since the computer configuration reflects assumptions about the rate at which users will interact with the system, any changes in the request rate or increases in the number of users could have negative consequences for the interactivity of the system as perceived by the users. For example, an increase in the request rate could have the effect of lengthening the waiting time for system response to beyond two seconds. Such an increase could occur if users requested additional pages in less than ten seconds. An experienced user searching the database would be quite likely to try to search index pages as quickly as possible. Since the system cannot accomodate a higher request rate and still maintain the same level of service, experienced users might find their search frustrated by a slow and seemingly unresponsive system.

In many respects the hardware constraints on the interactivity of Telidon systems are similar to those which I have just mentioned. This is mostly due to the fact that thinking about videotex in Canada has been greatly influenced by the British experience with Prestel. There are however, some differences that in the long run could result in an improved system in Canada.

One difference is the kind of keypads that are being used in some of trials. In contrast to Prestel, both the B. C. Telephone Co.'s field trial and the Cantel service use keypads that have an alphanumeric capability -- thereby making it possible to use a more powerful keyword search process to aid information access. [4] Another field trial, Manitoba Telephone Company's "Omnitext" trial has abandoned the tree-branch search procedure altogether in favor of keyword search with alphanumeric keyboards rather than keypads (Kurchak, 1981:24).

Another difference is in the planning for an eventual videotex network. In constrast to Prestel, the emphasis with Telidon is not on establishing a public service as soon as possible, but to determine accurately the most efficient way to establish a public service. [5] This is also reflected, for example, in the systems planning for Bell Canada's Vista:

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[4]The B. C. Telephone field trials took place in the Vancouver area from November, 1981 to July, 1982. I was therefore able to gain first-hand experience with this aspect of the system.

[5]This is quite evident from the objectives of the DOC's Telidon Development Program. See Parkhill, 1981.

> In considering how a Bell Canada Vista network might evolve it is currently felt that the design approach should be based on evolution from a few small, largely duplicated databases. These databases would be resident in Bell Canada computers located at so-called Vista centres. Additional service capability involving distributed data bases would subsequently (be) provided as required, some of these possibly involving the connection of externally owned computers. (Wilson,1979:11)

Another example of careful data gathering to facilitate accurate planning is also evident from the Vista trial, specifically concerning the host computer configuration that might eventually be required in a public service:

> The size of the computer will determine the number of accessible user ports which in turn will determine the system's ability to handle users. More efficient use can be made of user ports if information is down loaded to the user's own terminal so that the ports don't have to be tied up by one user. Access to ports will become a problem if many users simultaneously try to retrieve information or conduct transactions. All trial operators will carefully observe user behavior in this respect (Kurchak,1981:19).

In Canada as in Britain, uncertainty about the economic factors associated with a videotex service are certainly affecting developments (Kurchak,1981:6-7; Campbell & Thomas,1981). However, because Telidon system and services are developing along different lines than in Britain, it is still to early to determine the exact levels of interactivity that will be available.

6.3.3 Limitations Due to the Type of Access Software Used in Prestel and Telidon

The user access software referred to as "tree-branch" or "tree-search" which is currently being used by Prestel and actively considered for videotex application in Canada, [6] has already been described in the last chapter. In this section I will examine the limitations this method of access puts on the level of interactivity.

There are two sets of limitations related to the use of this type of software. First, there are problems associated with the effectiveness of the software in permitting an item of information to be found quickly and easily by inexperienced or expert users. Second, there are more fundamental problems related to the categorization of all types of information into "pages". These issues will be discussed in the next section.

The effectiveness of a tree-branch index in permitting information access has been investigated by several researchers at the Canadian Federal Department of Communication (DOC). Several different problems related to this type of index were examined. One study examined how effective a tree-structured index is when the existence of the information is uncertain. The study concluded "that people are very likely to stop searching

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[6] A virtually identical access software is in use for the Telidon terminals used in the field trials. See: A User Guide for the Telidon User Terminal, Version 1, Communications Research Centre (CRC), Technical Note No. XXX-E, June, 1979.

before they find existing information, rather than continue searching the database extensively. This implies that errors in the design of the index structure will disrupt a search of the Telidon database" (Whalen & Latremouille, 1981:3-12).[7]

A second study examined how the retrieval of information was affected by errors in the design of the index. These errors consisted of information that was included under an inappropriate category label, category labels which were vague, and category labels which were synonomous. This study concluded that "while all of the defects impaired the efficiency of the searches, the effect of the synonomous and ambigous labels were much smaller than the effects of a a miscategorization" (Whalen & Mason, 1981: 15-32).

A third study looked at the effectiveness of information trees in permitting naive users to find desired information. This study directed itself at the question: Is Telidon easy to use? It concluded that some problems for users did indeed exist and that additional research and development towards improving database configuration is needed. One suggestion was that a "combination keyword-tree retrieval system which provides a tree index for naive and a keyword system for experienced users may satisfy the needs of both types of users" (McEwen, 1981: 52).

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[7]It should also be pointed out that the "Telidon database" referred to in this and following studies was an experimental database created to test various hypotheses regarding tree-search access software.

Finally, a fourth study examined just how videotex tree-indexes could be improved by the use of descriptors and other forms of enhancement of the index pages. This study found that the retrieval of information, especially by naive users, could be improved by the use of descriptors, testing the index pages, and other strategies to improve the utility of the index pages(Latremouille & Lee,1981:66-67).

What these studies seem to show is the importance of good software design in permitting easy access to content. In other words, a poorly designed retrieval software can be very effective at "restricting" access for users who are "information poor" or not familiar with the use of an electronic retrieval system. These studies also suggest software which is slightly more interactive, in the sense of providing a higher degree of feedback to users, tends to facilitate easier serviceware access. (This was especially indicated in the fourth study above). Also pointed out was the need for more sophisticated software, capable of operating in several modes, in order to take into account the needs of experienced and novice users.

In Britian many of the problems in terms of access software are similar. However, since Prestel is already a commercial service, there are strong economic incentives to make the databases as accessible to as many users as possible. A poorly designed database structure and clumsy access software can spell commercial failure. With Prestel, it is BPO policy for the organization of content in each IP's database to be the

responsiblity of that IP (Woolfe,1980:84). (The BPO, as systems provider, provides only advice and information for users and IPs and some indexing functions). As a result much research has been done by IPs, in structuring the content in the database, "to match the logical flow of pages -- routeing and end pages -- to the perceptions of the user"(Woolfe,1980:85). It has also been determined that organizing content pages into a treebranch is not necessary in many cases since routeing choices can lead to many locations throughout the database. In addition, research has also been done to determine the best possible presentation of the content within the confines of the single page:

> The information imparted in this restricted area must stand on its own, and also link with its neighbouring pages. The message should be clear and concise, and also consistent. To achieve these aims requires careful attention to a number of matters including the wording of captions and text, punctuation, spacing, use of colours and graphics and overall page layout. (Woolfe,1980:86)

Obviously the British have gone a long way towards increasing the effectiveness of the user software. But, what about the utility of the "menu choice" system for more experienced users? Because of the penetration of computers into society in general, more and more potential videotex users will be familiar with computerized systems. Also, as a typical videotex user gains more experience with the system, he may find the software more and more limiting. As Ederyn Williams comments:

> The simple system of successive menu choices is easy for an inexperienced user to learn. However, an experienced user, particularly if he has worked with computers, may

> well tend to find it tedious. Online bibliographic systems, such as Lockheed Dialog, provide the users with the ability to search using Boolean operators (e.g., find all references containing the words (FILM or CINEMA) and (PROJECTION or DISPLAY) but not HOME). This kind of keyword search has its own difficulties, and uses more computer power, but it can be much more effective than menu choices when used by an expert. (Williams, 1979:58)

Despite awareness of the shortcomings of menu-type access software, it appears that this kind of software will remain for some time. The reasons for this are largely economic -- being related to the hardware configuration chosen to facilitate the mass marketing of Prestel. It is for similar reasons that keyword search and other, more powerful means of content access, will not be available on this videotex system in the near future.

I have touched upon only some of the complex factors contributing to the effectiveness of tree-search software in facilitating information retrieval for users. It is clear that much additional developmental work needs to be done in this area.

It is apparent from the discussion that Prestel only offers the ability to "select" content pages from a pre-arranged structure. The user access software functions only as a tool to aid in the search for the desired content. According to Seeley's model, this system can only be considered "Selective", which is only slightly more "interactive" than the selection of a single television channel out of the many that are available. The relationship here, like that a TV viewer and the programming, is "passive" -- the viewer (or in this case, user) cannot in any

way influence the content. As for Telidon it is not yet a foregone conclusion that this system will also offer the same level of interactivity. This depends on the extent to which the British model is incorporated into Canadian videotex. As I have shown, to provide all the proposed services, Telidon must be capable of providing an "Informative" level of interactivity. In view of the rapid pace of technological development in computer technology it would be well worthwhile if the Telidon system planners provided for even higher levels of interactivity as will be needed in order to provide even more sophisticated future services.

6.4 Criticism of the Fourth Assumption

This section examines the fourth and last assumption: that Prestel and Telidon are capable of storing and providing access to many different kinds of content. As the perspective taken throughout this thesis has been to view Prestel and Telidon in a social context, it seems reasonable to expect that, like any medium of communication, these videotex systems will exert some kind of influence over the content that they provide access to. My purpose here will be to explore and delineate some of the technical constraints due to hardware configuration and software characteristics that influence the types of content that can or will be provided. Since, however, the content is not an innate part of videotex but must be provided by external IPs, there are

also limitations on the type of content available due to the decisions made by the information providers. In order to examine these it will be necessary also to look at the motivations of the organizations who want to provide serviceware for videotex.

6.4.1 Technical Limitations on Prestel and Telidon Serviceware

There are many ways in which the technical characteristics of the hardware and the access software can influence the nature of the serviceware. Some of these are the result of the way that present systems are currently set up. As the technology improves and the systems develop, such problems should become less evident. There are other influences on serviceware, however, whose causes run much deeper -- being primarily due to the "deep structure" of the medium itself. An example is the necessity to confine all content within the context the single videotex "page".

The current technical organization of the Prestel system creates a substantial problem for IPs due to a lack of available space in the BPO data-bank. In large part this problem is due to the small size of the data-bank that was chosen at the outset of public service. Although I have already discussed some of the consequences of this decision, it is appropriate to reexamine them in this context of the lack of available pages. As each IP is a commercial enterprize, an appropriate response (i.e. to maximize revenues) to a page shortage will be to provide only the

most popular content. A net result could be that the utility of Prestel in providing varied and somewhat specialized serviceware could be significantly reduced.

The shortage of available data-bank space has also been exacerbated by the star-shaped arrangement of duplicated data-bases which was initially chosen for economic reasons related to the mass-marketing needs of the service. By interconnecting duplicated databases the total space available to IPs for content storage is much less than what would be available if the databases were distributed. This also means that the diversity of the content produced by IPs is reduced since each IP will try to maximize his own income by providing the most popular content. The net result is that the usefulness of the system in providing varied serviceware is limited. Building a system in this way also makes it very expensive to expand the total database capacity, since to do so requires an expansion of all the local databases simultaneously. The only viable long-term solution is to adopt a different database arrangement altogether. This is recognized by the systems planners but the implementation of a network of distributed databases will have to wait for additional developments in systems operation software (Woolfe, 1980:115-116) and increases in demand for the service.

At present in Canada, there seems to be close cooperation between potential systems providers such as Bell Canada, MTS, B.C. Tel., Telecable Videotron, OECA (a broadcaster), and the

various IPs who are involved in the field trials, in order to avoid some of the prcblems apparent in Prestel. The possible solution favored at this stage is the encouragement of strong umbrella organizations. But nevertheless, some uncertainty still remains:

> However, tension remains between non-interference in content by system operators on the one hand, and a need for control over quality on the other. It is being dealt with initially by such means as contracts between system operators and IPs, and agreements among VISPAC members cn topics of ethics and responsibility for content (Kurchak,1981:36).

There are also constraints on serviceware which cannot be dealt with by proper system design and close cooperation between system providers and IPs. This is because they are the result of the categorization and storage process applied to all potential content in order to create individual pages which can then be assigned a price and sold tc customers. Because a single page is a very small unit of information -- for example, a typical Prestel page contains only about one hundred words -- this process is very difficult. Consequently, much effort has been devoted towards developing literary and design techniques, both in Canada and in Britain, to overcome this limitation (Winsbury,1981:145-154; Kurchak,1981:9-10). There are also many problems associated with the design of index pages, which are the tools used by users to find desired content pages. Again, much developmental work has been done in the two countries, to try to increase the transparency of these tools for the user.

To point out the deeper implications of the data-structure used in videotex, that is, the potential impact of the categorization of contextualized information into "pages" of content, some writers have expressed concern that a reliance on such data storage and indexing procedures may have implications for public information retrieval systems generally. Gordon Thompson feels that this approach to the commoditization of information could limit significantly the ability of videotex and other information marketing systems to provide diverse and varied kinds of content:

> The problem is analogous to seeking something in the Yellow Pages without knowing what the thing is called. It is precisely this problem that could limit the usefulness of an Information Marketplace, and contrain it to dealing with supplying information that is time-varying, but otherwise well defined, like the weather, the stock reports, the football scores and other current news items.... Essentially, we can not describe information we might need when we do not know much about it. How much the brokers could contribute to solving this problem with simple hierarchical descriptive material is very much open to question. Other strategies are available, given the computational power of the technology underlying the Information Marketplace. (Thompson, 1979:44)

For Doug Seeley, a major implication is that this type of indexing, by imposing a single organizational and relational structure on the content, can control knowledge:

> The way in which information is categorized and organized reflects a model of knowledge. The more this model is used, especially if it is implicit, the more that model of the world will be assumed by its users. If we are dealing with a phenomenon that is largely dictated by market contingencies, that diverse alternatives in the organization of information will be unattractive to system operators. The designers of Videotex distribution systems will be tempted to stay with a singular and arbitrary approach. Not only that,

> but initial users will be satisfied in the first instance with the opportunity to apply a system in any form. By the time the lack of diverse alternatives becomes very apparent the initial approach may have become a new social convention. What is in danger of happening here, is the Tower of Babel in its computerized form. This is particualarly dangerous if only one social goal, that of increased profit, is reflected in its design (Seeley, 1981:47-48)

Despite all the efforts towards making both Prestel and Telidon into effective and useful media for the sale of information prcducts, it must also be recognized that some kinds of information are simply unsuitable for videotex. Micheal Noll has argued that in the case of specialized information that does not change frequently, like for example, technical or scientific data, it is not appropriate in terms of the efficient use of technological resources, to store such content in a central data-bank which is accessed by a remote terminal. A better approach would be to store it in a local storage facility, like a micro computer system (Noll, 1980:20-21). Other writers have also pointed out that the commercialization, via videotex, of consumer and variety information, and the access to large data-banks containing scientific and technical information is also problematic. In regards to consumer orientated content they state:

> With consumer services, demand is highly uncertain. A consumer service must achieve some winning combination of convenience, new or synthesized information, newly enabled activity, or novelty appeal. With a global lack of experience it is likely that considerable trial and error "sifting" will occur. The most popular Prestel files are astrology and computer games, and such variety services are even more uncertain in appeal and most vulnerable tc novelty erosicn. Generally, consumer and variety services have a vague and broad appeal; certainly scme efforts will be successful, with

> potential to interest mass audiences; but the sifting process may be quite long and costly (Plowright, Wills, De Melto, 1979: 2-3).

And in regards to the provision of specialized technical serviceware:

> Though intensely valuable to a small number of people, in general the use of large databases has proven limited in the United States, and these are the lowest used services of Prestel. In a two year experiment to make System Development Corporation's Orbit and Lockheed's Dialogue files available to the public through the Santa Clara, California library branches, usage was low, and these same files comprise much of the offerings of large Canadian information providers. In fact the main appeal of such large databases seems to be that several are already available (Plowright, Wills, De Melto, 1979: 2).

6.4.2 Attractiveness of Videotex as an Electronic Publishing Medium

It is clear that economic considerations were a major constraint on the development of videotex hardware and software. Since videotex is seen by many as a potential medium for electronic distribution of information products and services to customers, there is every reason to feel that economic factors will also be very important in influencing the availability or non-availability of certain types of seviceware. In this section I want to examine briefly some of the motivations that some organizations, both in Canada and Britain, have to consider videotex as a useful medium for the dissemination of information.

In Canada there is a fair amount of interest in information provision for the emerging Telidon system. There are several

reasons why this may be so. One very important reason is that videotex is perceived as a medium which blends both electronics and print. Consequently, some writers have argued that the traditional print-based media including paperback books, magazines, newspapers both national and local, directories and specialized classified ad papers, are all expected to feel the impact of videotex, although some more than others (Godfrey, 1979: 110-127). This is because much of the content provided by these media could also be provided by a videotex system. This is considered to be especially true for directories and newspapers who consquently, are expected to suffer the greatest impact. [8] Becoming involved with information provision, therefore, is a good way to protect vital interests should this possibility become reality. There are also hard economic reasons to become involved with electronic publishing other than the anticipated impact from a new but still very experimental form of communications. These include the impact of electronic technology on the production of newspaper content, the general decline of readership, and a decline in national advertising revenue (Desbarats, 1981: 1-6; McPhail, 1980: 10-21).

Over the last decade there has been a major change in the way information is manipulated and put together to form newspaper content. Reporters and editors now type directly into

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[8] It is interesting to note that both Godfrey and Noll (1980) believe that directories are the most suitable content for videotex. But the results from the British experience with Prestel indicate that this content is not the most popular (see Williams, 1981: 103).

video display terminals (VDT's) which are a part of a computer system which can also perform the composing room functions. The result has been the almost complete automation of the modern Canadian newspaper. This change has been driven by the continual increase in the price of labour, energy, transportation costs and newsprint, (this last item for example, increased in price from $148 per short ton in 1969 to over $500 in 1981) (McPhail, 1980:14) and by the dramatic price decrease of computer equipment over the same period. Computerization also enables increases in productivity and greater accuracy in the production process (Desbarats, 1981:5). Consequently, the penetration of this technology into the Canadian newspaper industry has been substantial:

> Terminals began to appear in Canadian newsrooms in the early 1970's. There are now more than 1200 video display terminals (VDTs) used for inputting and editing text in Canadian newspapers. Editors on the copy desks of virtually all Canadian newspapers with daily circulations of more than 40,000 are using VDTs for editing; on all but a few of these newspapers, reporters are typing their stories on VDTs. . . .
>
> The use of computers isn't limited to large metropolitan dailies. Almost half Canada's small newspapers, with daily circulations of less than 10,000 copies, use VDTs for writing and editing. Only 25 per cent of medium-sized newspapers, with circulations from 10,000 to 40,000, have computers in their newsrooms, mainly because most of the computer systems on the market in the past decade were inappropriate for papers of this size. These newspapers are expected to catch up with the others in the next five years as the cost of computer equipment continues to decline.
> (Desbarats, 1981:2-3)

Changes in the demographics of Canadian society and competition from other media will also have an impact on newspaper revenues. Circulation is generally decreasing and the

increasing urbanization of the population creates problems for distribution. Because of competition from other media, especially radio and televisicn, advertising revenue, which funds approximately two-thirds of all daily newspaper costs, is declining. For example, in 1950, daily newspapers had 34.5 percent of all advertising revenue; by 1980 this had declined to only 26.2 percent (McPhail,1980:15). There have also been shifts in the proportion of revenues contributed by single types of advertising over the same period. National advertising has declined in importance from 28.8 percent to 18.6 percent of all daily revenues over the last two decades. At the same time classified advertising has increased from 20.5 percent to 26.6 percent of total daily newspaper advertising revenues. In fact, classified advertising is now one of the major revenue blocks in the industry (McPhail,1980:16-18).

There is the possibility that information providers for Telidon may eventually compete with printed newspapers for classified advertising revenues. [9] And, if one considers that Telidon is an electronic medium which can deliver its services directly to individual customers, while newspapers are finding production and distributicn more and more expensive, the competition from Telidon may in the long term be very severe. An obvious solution in this case is for newspaper publishers to

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[9]This eventuality also brings to the foreground many of the issues related to the control over content by Telidon systems providers and other organizations closely affiliated with them. Some of these issues were examined in section 6.2 of this chapter.

become directly involved in content provision for Telidon. In other words, a shift in the perception of Telidon as a competitive medium, to Telidon as the next step in the automation of the newspaper may be occuring.

In Britain, newspapers and publishers generally are faced with many of the same kinds of possibilities due to Prestel. Winsbury has noted some of the motivations for traditional print publishers to become involved with electronic publishing via Prestel. These include:

1. The basic fact that much information is being computerized and that computer-mediated systems are becoming much more common. This means that some kind of impact on printed media is inevitable.
2. Electronic publishing represents a new opportunity for business diversification and the opening of new markets.
3. It offers the opportunity to explore the potential of new technology.
4. It is a chance to explore new relationships between labour and management.
5. There is an opportunity to become expert in many aspects of videotex page creation, indexing and so on.
6. If a publisher becomes involved at an early stage in the development of the service, then there is an opportunity to influence developments in a favorable manner.

(Winsbury, 1981:91-92)

It is evident that there are factors, both economic and political, in both Britain and Canada, which are encouraging traditional print-based publishers to become involved in videotex information provision. It is also possible that the involvement of these organizations on a sufficiently large scale could result in a videotex service that provides content very similar to present-day newspaper content, although with some differences in format and presentation. Because serviceware, at present, is the least developed aspect of videotex, it will be some time before the extent to which this possibility becomes reality can be determined. However, one thing that is clear, it is not likely that many different kinds of content will be available.

VII. Chapter Seven: Summary and Conclusions

7.1 Summary of the Arguments

My examination of Prestel and Telidon has focussed on two areas. First, there was a description of the technical and institutional elements comprising these systems. This description emphasized details of the hardware, both in terms of the terminal design and systems configuration; the access software including the user access procedure and the data structure that is used; and the nature of the serviceware, in particular the nature of the information available and the organizations providing it.

Second, I alsc examined critically four assumptions which I found from the literature to underlie the conception of both Prestel and Telidon as telecommunications services. These were:

1. That Prestel and Telidon are viable, both technically and economically, and can provide a service that is desirable (in the sense that people are willing to pay for it).
2. That there can be a clear separation between the systems provider and the information or content providers.
3. That the level of interactivity provided by the systems will be sufficient to provide access to many distinct informational and communications services.

4. That Prestel and Telidon are capable of storing and providing access to all kinds of content.

In the criticism of the first assumption, I began my argument by noting that the validity of this assumption depended on the validity of three premises contained within it. These were: that Prestel and Telidon are technically viable, that Prestel and Telidon are economically viable, in the sense that they are affordable, as a service, for subscribers and third; that a definite subscriber demand for Prestel and Telidon exists. After presenting some discussion on each of these premises, I concluded that althcugh the technology of these systems is in a high state of development, their costs to the subscribers are currently very high. I also indicated with reference to actual user costs on Prestel; that the cost of the user hardware represents 50 percent of the service cost. Furthermore, since it is likely that most Prestel terminals will be rented, it is reasonable to assume that a significant drop in the cost of hardware may not necessarily be passed on the renters. Therefore it is likely that the high cost cf Prestel will remain for some time. I also noted that the situation in Canada in regards to the costs of hardware and the commercial services showed indications that videotex is an expensive proposition. I suggested that in order to lower the price of the hardware to mass ccnsumer levels, additional technical developments particularily the availability of a custom LSI

chip, would be required. [1] Also, the few commercial services now available tend to be very specialized, and are consequently very expensive. And finally, in regards to the third premise, I indicated that the question of consumer demand for videotex service was inconclusive and likely to remain so as long as the focus is on providing services which are convenient for the systems provider rather than identifing and fulfilling actual consumer needs. Therefore, on the basis of this information, I conclude that the assumption that Prestel and Telidon are technically and economically viable and can provide a service that is desirable, must under present circumstances, be considered false.

I began my criticism of the second assumption by presenting briefly the reasons why many writers have advocated a separation of carriage from content in the provision of videotex services. Namely that if the common carrier became involved in content provision, they will be in a position to control content and to deny access to the medium to organizations with alternative content. I then examined the problems inherent in maintaining such a separation which are due to the technological and socio-political influences steming from the complexity, both in technical and institutional terms, of the medium. It was clear from the discussion that the increasing involvement of systems

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[1]It is interesting to note that although one of the major reason for Telidon development and implementation was to help the Canadian electronics industry, continued success now seems to depend on developments in the USA, in particular the development of specialized chips. See Truxal, 1982:53-54.

providers in information provision activity, either for technical reasons or because of institutional arrangements, will enhance the ability of the system provider to control the information product to suit its needs in providing a marketable service. I conclude therefore that the extension of the traditional content/carriage separation into the realm of videotex service is quite doubtful. Therefore the second assumption must, in the light of this information, also be considered false.

In my criticism of the third assumption, I began my discussion by defining the concept of "interactivity" and introducing a model of "levels of interactivity". I then applied this model to determine the appropriate level of interactivity that must be available in a videotex system if it is to be able to provide the types of services which have been suggested. I conclude that an "Informative" level of interactivity is sufficient. Next I examined both the hardware and the software of Prestel and Telidon in order to see how these elements constrain the level of interactivity available in these two systems. I concluded that in the case of Prestel, the level of interactivity only permits selection from a number of alternatives. Prestel therefore, would be able to provide some (information retrieval, telesoftware), but not all (transactional services: banking and messaging) of the suggested services. In regards to Telidon, it is difficult at this time, to determine the level of interactivity that will be available,

since many aspects of the systems configuration still remain uncertain. This also means that my conclusions in regard to the third assumption may not be accurate in the Canadian context since they are primarily based on Prestel data.

In this discussion I also indicated that the limitations on the levels of interactivity available in Prestel are due, in large part, to technical limitations which are the result of economic considerations related to the mass marketing of the service. The analysis also pointed out that there is a link between the interactivity of the software and its ability to inhance or restrict access to content.

The conclusion to my analysis of the validity of the assumption of sufficient interactivity therefore depends entirely on the initial definition of "transactional services" that is used. If the type of messaging available with Prestel is considered adequate, then the assumption is valid. If however, this type of messaging service is not considered adequate, then the conclusion is that Prestel at least, does not offer sufficient interactivity to provide the services indicated in the literature.

In the criticism of the fourth and last assumption, I noted the technical and institutional constraints which influence the types of content that can or will be provided by Prestel or Telidon. In particular, I noted some of the problems due to the organization of the data-bank and the data-structure which influence the provision of serviceware. I also noted some of the

motivations that some IP's have to become perveyors of content for Telidon and Prestel. Many of these are of an economic or political nature -- being related to attempts to maintain a competitive position in response to perceived implications of Telidon or Prestel on the marketplace. I also noted that since serviceware is the least developed aspect of videotex, there is a somewhat speculative tone to some of the discussion. Nevertheless, considering many of the factors, both technical and socio-economic, which can constrain serviceware provision, it is necessary to conclude that serviceware will reflect an intensive process of modification which will tend to restrict the variety of serviceware that will be available.

As was stated in chapter three these assumptions related to social issues raised by Prestel and Telidon when considered as communications systems. Since I have just shown that these assumptions cannot be considered valid, this implies that present thinking about videotex (as exemplified by Prestel and Telidon) does not address the underlying social issues raised by the technology. Furthermore, much of the thinking ignores the underlying political and economic factors which have a major inluence, both on the development of the technology, and on the uses to which it will eventually be put. What is clear, however, is that Videotex as proposed is an electronic marketing system for information products. But videotex, like any technology, is not static since it is continually being improved in many ways. Some of these recent improvements have been noted in the

description of Prestel and Telidon in chapter five. I now propose to sketch out a brief scenario, based on these technological developments, and to re-examine the validity of the four assumptions in the light of the scenario.

7.2 Videotex in the Near Future: A Scenario

Since 1980 it has become increasingly obvious that the original focus on the domestic (mass) market for videotex services was not going to be successful. Since then there have been substantial shifts in emphasis from the domestic to the business market in many countries (Campbell & Thomas, 1981:111). Concommitantly there have also been several technical developments in hardware and systems configuration which have tended to support a change in thinking as to the nature of videotex services. The emerging view seems to be that videotex, rather than being a descrete service to be offered by a telecommunications carrier, "is just one of a range of ways in which users in both the business and the residential markets can gain access, simply and cheaply, to a variety of data bases" (Campbell & Thomas, 1981:112).

The technical developments which underlie this shift are:

1. There has been a change in the thinking about terminal design. Rather than an emphasis on low cost by modifying television sets to receive videotex, the concept of a multifunction business terminal has emerged. Such terminals

can operate as a standard ASCII terminal or as a videotex terminal.[2] Also, there has been an effort to integrate videotex with home computers. For example, Norpak, the manufacturer of Telidon terminals, has designed and is manufacturing an interface card for the Apple II and III personal computers. This card will allow users to receive Telidon service and create pages, all at relatively low cost (Telidon Reports,Aug 1981:12-13). A more recent software development aimed more at the business market allows IBM personal computers to be used for telidon-related applications. These include acting as a host computer for a small database, being able to drive a telidon user terminal and a display device (Telidcn Reports, June 1982:9).

2. The development of a "gateway" to external databases. The West German videotex system, "Bildschirmtext", and recent develcpments in Canada are both moving in this direction. As well as the gateway capacity there have also been developments in packet switched network technology which can facilitate the transfer of data from one databank to another or permit users to access remote databases. [3]

Based on these changes it is not hard to imagine a scenario of the near future. This takes place in Canada rather than

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[2]Such terminals have been developed in both Britain and Canada. See Campbell & Thomas, 1981. Micrctel's VTX-208 integrated terminal is an example of a Canadian development.

[3] Many of these developments have already been described briefly in chapter five.

Britain because Canadian developments have been moving in this direction for some time.

There have been substantial developments in the Canadian videotex industry throughout the mid 1980's. These developments have gone in two directions. First there has been much work in the utility of videotex to provide information of use to business. Second, there has been much emphasis in meeting the needs of a domestic market via wideband teletext rather than two-way videotex. The reason for this is that a domestic interactive service is still relatively expensive and that most subscribers can now obtain a cluster of services from their cable companies including teletext. The development of a multi-function "Video Interface Unit" (VIU) which provides a 100 channel converter/tuner, pay-TV descrambler and teletext decoder with keypad, and which can be purchased for under $200 or rented from the cable company, has certainly contributed to the opening up of this market. Furthermore, it has been known for some time that a wideband teletext system can give an illusion of interactivity. This feature (as well as the low price of the service) has helped to make teletext increasingly popular with domestic subscribers.

This does not mean, however, that interactive videotex is entirely excluded from the domestic market. Telidon decoders and software have been available for some time as add-ons to personal computers. At first these were available only on the more expensive personal computers (Apple, IBM) but recently have

become available on many less expensive models (Commodore, Sinclair, Atari). Nevertheless, service costs (telecommunications toll charges, data bases access charges) are still very high. Therefore most domestic subscribers tend to be professionals and executives who see advantages in being able to work at home.

Most of the growth in the videotex industry has been in the provision of serviceware. With the development of some degree of competition between providers of gateway host computer services and competition between the carriers in the provision of packet switched communication services, it has become much cheaper to develop specialized databanks. The growth of umbrella organizations and firms providing page creation services as well as the availability of low cost information provider terminals, has also made it easier for smaller community based organizations to become IPs. Some providers have even found that serviceware, once it has been developed, can in some cases be sold to the cable industry for distribution on the teletext system. Some IPs feel that this development opens the door to electronic magazines and other specialized forms of computerized publishing. Greater efforts in this direction are currently underway.

The penetration of stand alone videotex terminals in to the office environment has not been successful. Much greater success has been achieved by integrating videotex functions with the other functions of the standard ASCII terminal or communicating

word processor workstations (CWP). Although graphics has been emphasized in the more popular serviceware, the business sector has not preferred much graphic embellishment of the serviceware. (In fact, some databases are so designed that they can be accessed by a standard ASCII terminal, as well as the conventional Telidon terminal. In the case of the former the graphics protocols are simply stripped from the data.) Some applications of Telidon graphics, however, has been encouraged in computer aided design (CAD) and in the presentation of data for managers. More developments in this area are underway.

This scenario suggests that the main result of recent technological innovations in videotex (changes in the concept of the terminal, host computer with gateway) means that it will cost less to become an information provider. This also suggests that more organizations may be attracted to use videotex to store, update and distribute information of interest to small groups of subscribers (closed user group services). This implies a major shift towards many smaller, more specialized videotex systems and services rather than a single mass-appeal service provided by a massive telecommunications network. In terms of the four assumptions, it is evident that they are no longer relevant since they related to the model of videctex as a mass-oriented telecommunications service. By appealing to various specialized market sectors, the assumption of price and mass consumer demand is no longer relevant. The issue of content verses carriage is also of less concern since videotex, as a

specialized rather than mass medium, can be seen as a technical means to facilitate information distribution within a particluar social organization. The degree of interactivity available in such specialized systems will then depend only on the requirements of that particular service. And finally, it is obvious that only a select body of information will be available on any particular system. Users will of course have the option to access other systems in order to obtain different serviceware.

As far as a domestic mass market for videotex is concerned, the scenario has suggested that a possible approach may be via wideband teletext rather than interactive videotex. This was suggested because a teletex service offered by a cable company is in a way an extension of present non-broadcasting services and could be marketed to subscribers as another service out of several already available. Anyone who decided to subscribe to teletext would then pay a small additional charge for the service and decoder rental. Such an approach may be economically more acceptable to subscribers.

7.3 Final Conclusions

My goal in this thesis has been to examine and criticize the conceptualization of videotex as a telecommunications service. I have attempted to do this by critically examining four assumptions which underlie the concept or model of videotex

as it is expressed in the literature. Having made this examination I concluded that this model did not address itself adequately to the underlying social and institutional issues which were raised by the potential of the technology. This raises the question of how the discrepancy between the conception of videotex as a service in the literature and videotex as an actual working system, may have developed.

As has been suggested in the literature review, much of the writing about the potential of Prestel or Telidon focussed only on the possibilities inherent in the hardware. These possiblities were simply assumed onto society, or in other words, the hardware was not conceptualized in terms of its institutional context. This fact was made clear when the discussion focussed upon the nature of the decisions that were made by the various interests connected with the development of Prestel and Telidon. Rather than address specific social needs for improved information access and utilize videotex to improve the communication of information, the planning was directed at meeting economic criteria which were seen as essential to ensure a mass market for the service. As has been shown these criteria dictated the requirements for the terminal and system hardware, the access software, and had a major influence on who became involved in the provision of serviceware and on the types of serviceware that have been made available. This suggests that the "driving force" behind Videotex has not been the necessity to apply the technology to enhance information access or other

broad social goals, but to find new, and hopefully -- profitable, uses for the technology.

I also pointed out that there are indications that the concept of videotex seems to be shifting from that of a specific telecommunications service to a more generalized view that videotex is only one of many ways to provide information retrieval services. I examined the implications of this shift in relation to a scenario of possible developments in the near future. (This scenario focussed on Telidon based developments exclusively.) It suggested that the new technical developments will make it more attractive to become an information provider and may open the door to to many distinct vidoetex-based information services. From a business perspective, this is a positive development since the availability of more specialized serviceware geared to the business (or governmental sector) may encourage the additional penetration of videotex into this market. It is also conceivable that once a viable business-oriented service is established future developments, both in hardware and access software as well as a greater variety of serviceware, will make it increasingly likely that larger markets will eventually be served. In other words, it is likely that there may be a gradual evolutionary development of videotex markets.[4]

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[4]See the discussion on this possibility in Campbell & Thomas, 1981 and Carey, 1982.

Finally, as to the possibility for the emergence of a mass market for videotex, my examination of the process of development for Prestel and Teliden suggests that this may be long in coming. I have indicated that videotex technology has been developed by specific institutions for the purpose of marketing information. I have also indicated that other organizations, especially information providers, have become involved in order to deal with the perceived threat of the new technology on their way of doing business. And third, it has been quite obvious that many underlying social considerations have simply not been dealt with. In addition it has been suggested that recent technical developments can permit decentralization of data banks. Putting all this together suggests that videotex is likely to become a medium for the distribution of specialized information to select clients. John Carey (1982) has examined videctex from a historical perspective (based on the early development of the newspaper and the telephone), his conclusion:

> An historical perspective, when applied to videotex, appears to suggest a very slow growth for this new medium as an information utility in the decades ahead. However, such a perspective does not suggest that videotex will disappear. Rather, it may be argued that one of the major intended applications for videotex, that of an information utility for the broad public, is not likely to develop in this century. Videotex is more likely to emerge slowly in the 1980's as a service for businesses and a few professionals. Like the early newspapers and telephone, which served the elite, videotex may grow as a medium for the "powerful" who have access to information that is not available to all.

However, the significance of the advent of the personal computer must not be overlooked. As the prices of these machines continue to drop and as their information manipulation and storage abilities continue to increase, they will find increasing applications in many areas, including videotex-like services. As a foundation on which to build such domestic services, personal computers are without equal. As well as the potential to manipulate, store and display information, they open up the possibility that the average user may also be able to become an information provider. Such a development, if on a large enough scale, could result in an information network far more powerful than any mode of communication yet established.

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