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AN ASSESSMENT OF THE MARKET FOR VIDEOTEX, TELETEXT AND SIMILAR SERVICES

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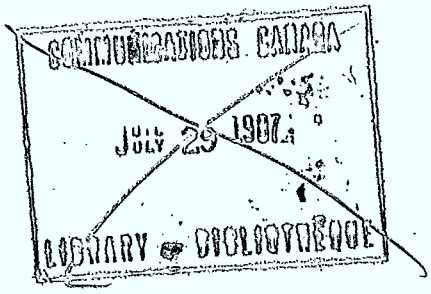
Communications Studies and Research Limited



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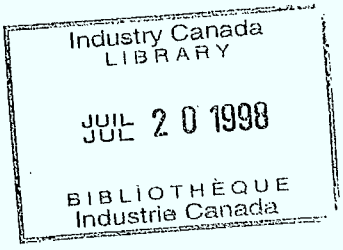

DSS 1ER.36100-4-4211

A Research Proposal

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1.0 INTRODUCTION

This proposal presents the methods, procedures and activities for undertaking an assessment of the market for Videotex, Teletext and related services as specified in DSS's RFP 1ER.36100-4-4211.

The proposal presents the objectives of the study and the associated tasks. Each of the major tasks is then reviewed. This involves a discussion of the proposed activity, a review of issues and a statement of the procedures and methods to be used to satisfy each task requirement. The anticipated problems and expected outputs for each task are also specified. The final parts of the technical proposal present the schedule of activities and manpower allocation for the fixed price contract. The second part of the proposal is the financial statement detailing the labour, materials and cost breakdown for the study.

Over the past four years Wescom has conducted numerous studies of the Videotex/Teletext industry. These have been undertaken on behalf of private clients as well as the federal government. Perhaps the most well known of these and the ones which have had the greatest impact on industry developments to date have been the National Evaluation Studies which Wescom undertook on behalf of the federal government. These evaluated a range of issues stemming from the assessment of the field trials the Department of Communications had funded with industry to provide initial assessments of the acceptance and technological feasibility of Telidon. One of the main limitations which emerged in the assessment of those field trials was the inability to derive precise and accurate market information or market forecasts from the field trial data.

The results of our evaluations recommended very strongly that a detailed market assessment should be made, but that it should be made with reference to the new and emerging directions which this industry had begun to take as early as two years ago. At the same time, we recognized that a major limitation of the federal government's investigation of Telidon (now NAPLPS) was that no systematic

evaluation of Teletext had been attempted (with the exception of the CBC and WETA). This, despite the fact that the Teletext industry was known to be growing more rapidly and to have a higher degree of penetration on a worldwide and North American basis than any Videotex service. We also noted that not only should a market assessment be made, but a re-evaluation of the procedures and methods of the approaches used to provide the market forecasts for Videotex should be examined. It was clear from our examination that the forecasts that had been made were severely limited by methodological problems and by an over-reliance on optimistic judgments about where this industry was going and its likelihood for success. We indicated that the vastly inflated forecasts that were made, projecting upwards of 400,000 users in the 1984/85 period, were more reflective of the positive thinking of those involved in the industry than a pragmatic and realistic appraisal of the opportunities offered by this technology and of the demand which was considered to exist in the residence, business, specialty and international markets.

Since our initial assessments, a number of key developments have taken place in the industry which have affirmed many of our findings and forecasts with respect to technological developments, domestic market thrust, social issues and developments, industry structure and strategy, and international developments.

In the period between the time those studies were conducted and the present, we have been actively investigating and assessing the opportunities in the international, US and domestic markets. We have been collecting data on a regular basis with representatives from a number of countries who are currently using or are likely to use NAPLPS-based Videotex services. These include Switzerland, Singapore, Japan, United States, Australia, Austria and special users throughout Southeast Asia, including Korea and Malaysia. Our involvement, therefore, in assessing and evaluating the Videotex industry is quite significant and on-going. In addition, we have been tracking developments in related technologies, such as satellites, mobile communications, video discs and cable television. We have collected a large amount of data which offers a unique opportunity for undertaking this study within the time frame set out in the RFP and in bringing a significant amount of accumulated knowledge about this technology.

Essentially, we view this study as being composed of four parts:

a. a technology review and forecast
b. a market forecast and assessment
c. industrial and economic evaluation
d. recommendations.

It is our view that these areas are closely linked and our experience has shown that in the assessment of markets and opportunities for new technologies, the various structural, legal, regulatory, policy and economic forces must be taken into account in order to provide a realistic appraisal of not only the likelihood that certain developments will take place, but also the forces which are dictating the rate of industry developments. The interest is therefore not only in where the industry will go and what markets will emerge, but over what time frame these will develop. The problem with past forecasts is not just that the numbers of possible users is wrong, but rather the assumed time frame for development was not based on a sound understanding of what this technology is and where the market was trending. New technologies have also emerged which have altered in fundamental ways the growth pattern for particular market segments.

Our approach, therefore, is based on the need to provide a realistic appraisal of what the market opportunities will be, and this appraisal is based primarily on our knowledge and understanding of the Videotex/Teletext market. This understanding is based on a number of years of experience in tracking, assessing and monitoring developments in this industry in Canada and internationally. Secondly, our approach is based on a fundamental grounding of methodological procedures for how to forecast the development of new technologies. Various other studies have been conducted in addition to Videotex and Teletext work for satellites, office automation, software, etc., in which we have put together models and approaches based on sound economic principles and the knowledge of mechanisms which are at work in the high technology industry. Thirdly, the methods, procedures and forecasts that emerge are set within the context of the prevailing and future environment within which technological developments will take place. Consideration must be made of

the regulatory environment, industry strategies, legal issues, standards development, standards acceptance and the overall prevailing economic climate.

Finally, we base our understanding on the belief that the market, in order to be successful, is not solely a technology-driven market but rather an applications market; a market which will emerge and grow only as required, new, unique and special applications for Videotex and Teletext are developed. This belief stems from a review of the history of the industry and a recognition that simply providing enhanced graphics and a superior protocol for the transmission of information is not going to be the key to the success for those involved in supplying this marketplace. Much more has to take place. Our recommendations made over the last few years, for example, supported the development of the government's content development program and encouraged the support of those companies in the industry which examined new applications, the merging of technologies and the fitting of Videotex and Teletext to specific operations, and procedures in various markets. This approach is based on our understanding that the market is highly segmented; that there are many unique opportunities which exist in the business, residence, institutional and public display markets as well as emerging developments in banking, interactive services, shopping, mapping, remote sensing, on-line transactions, business graphics, public services and education.

Finally, our understanding and knowledge of Videotex and Teletext has been complemented with examinations of the computer and software industries* and developments in artificial intelligence, natural query languages and search procedures. This, combined with our understanding of the technological trends for CATV, on-line services, fibre optics, satellites and mobile communications, lend a high degree of credibility to our ability to provide a realistic and well grounded appraisal of the future opportunities for Videotex, Teletext and related services.

* Wills, R., Booth, P., Globerman, S., "Software Policy Study for Canada," DRIE, Ottawa, 1984.

The preliminary work conducted by Wescom, together with other background studies, suggests quite strongly that there is a steadily evolving, commercially viable Videotex/Teletext industry in Canada. This study is based on the assumption that commercial viability of the industry will be ensured if the proper applications and market development strategies are developed. Videotex and Teletext are complex services to assess because of their various forms and configurations. Assessing the market demand immediately raises questions about what is being sold because Videotex can be marketed as Videotex page creation software, Videotex decoder software, pages of information, minutes of access time, a standalone display system, an embedded software component in an automated office product, etc.

This study is complex and ambitious in its overall goal of:

a. market situation analysis
b. providing a methodology for the costing
c. providing a market forecast
d. assessing commercial viability
e. determining system configurations
f. evaluating industry and economic benefits
g. providing recommendations for future government involvement and future industry development.

Indeed, each of these components represents a major undertaking in its own right if a detailed and methodologically sound study is to be conducted.

The requirement of this study, given its broad and ambitious goals, is to have an effective and readily available set of inputs for the various components. The study must be seen as building on previous work which has provided insights into each of the defined areas. The time frame and resources are too restricted to allow or expect the assembly and assimilation of all of the required background information from anything other than an advanced position in the appraisal and assessment of the Videotex/Teletext industry.

In previous studies Wescom has assembled a wealth of information appraising:

a. commercial viability
b. market situation analysis
c. technology trends and forecasts
d. market forecasts
e. economic and sectoral impacts for:
   - manufacturing hardware
   - transmission
   - software
   - service providers
   - page creation
f. industry benefits and impacts:
   - job requirements
   - revenue stimulation
f. regulatory, policy and stimulative recommendations.

This study presents an extension of the various studies already conducted for the DOC and other government departments. It will allow us to utilize the extensive sources of information and research which have been collected through our previous work. In addition, it offers the possibility to extend our activites into new areas of analysis which we were not able to address under the previous study mandates.

Our approach to this study, therefore, will be to build on the successful implementation and methods developed in our previous Videotex/Teletext work to extend that activity into the required areas and to develop new models where required. In some cases we will be updating, in others revealing totally new areas which have only recently emerged. We will make use of our existing Videotex/Teletext database and the national and international contacts developed in previous and current ongoing Videotex assessments. Much of the new data will come from discussions and interviews with system operators, software developers, existing and planned business users, system designers and industry experts. In addition, extensive use will be made of work conducted for service operators (non-proprietary) in the planning and implementation of commercial and non-commercial services.

We are proposing methods and procedures which fit with our understanding of the complexity of the Videotex market and which are capable of providing the required information. We recognize the limited time span for study conduct and therefore will utilize to the maximum our past experiences and ongoing market intelligence program in addressing the requirements of the study.

2.0 OBJECTIVES

The stated objectives of this study are:

1. To carry out an in-depth market assessment for Videotex and Teletext-type services in Canada, and to provide a non-detailed market assessment for the international market, with a main emphasis on the United States and a minor emphasis to be placed on emerging European, Southeast Asian and other markets. The time frame for this assessment is the short, five year and medium term, i.e. 5-10 year period. This assessment will focus on technology, costs, services, pricing strategies, vendors, customers and ultimately market demand.

2. To forecast the likely new net economic activity which could be generated and to express this in terms of dollars, employment, jobs created and overall industrial impact.

3. To review potential areas for further research and development, for applications programs, and to examine and suggest regulations which should be required in maximizing the industrial and social benefits of Videotex for Canada.

3.0 TASK DEFINITIONS

Related to the objectives that have been set out for this study are a number of tasks which relate to these objectives. These include:

1. The identification of existing market situations. To identify the existing market in terms of different services, system technologies, costs and pricing strategies, market size, penetration, revenues and profits, etc.

2. To forecast services or applications and system technologies. To study market requirements and forecast various services or applications, and to identify different technologies and system concepts that would be used to deliver these.

3. To formulate specific models for various services identified in Task 2. These will include the type of service, hardware used, system and complete service costs, pricing strategies, etc.

4. To formulate a demand methodology to be used in estimating market demand for Videotex, Teletext and related technologies.

5. To forecast demand using the defined methodology to estimate the total market demand in terms of various services or classes of services defined in Tasks 2 and 3. This will attempt to provide the competitive position of Videotex within the overall market environment and focus on market size, costs, revenues, profits, financial viability and new economic activities generated.

6. To estimate the net new economic activity in terms of revenues for employment which will be generated by the new services and estimate the impact on various industries, with specific reference to hardware, software, communications, etc.

7. To provide a set of recommendations to identify services for which applications may be beneficial, to identify certain areas where further R&D would be beneficial, and to identify requirements for regulation and standards that will aid and maximize the social and industrial benefits to Canada.

The following sections examine each of the task definitions in detail and provides a review of key points which should be considered, limitations on attempts to extrapolate developments, and finally discusses the approaches used to satisfy the task requirement.

4.0 TASK 1: EXISTING MARKET SITUATION

This task is designed to assess the current market situation. We review the most important trends and provide an indication of the important questions which must be answered in order to provide a comprehensive and objective situation analysis. This activity relies on secondary research of the industry, discussions with selected industry spokespersons, reviews of trials and commercial services in Canada, the US and internationally. Also included will be discussions with key players in the hardware, software, banking and cable CATV industries. It also utilizes available published and contracted research dealing with the Videotex/Teletext industry and the software, hardware and system provider sectors.

Over the past two years, dramatic changes have occurred in the nature and orientation of the Videotex industry in Canada, the United States and worldwide. This is the case for both Videotex and Teletext, and for a set of emerging technologies which have come about largely through the merging of Videotex with other established electronic communication devices, such as video discs, high definition TV, large screen displays, personal computers, local area networks, and other communication systems such as mobile satellites and FM broadcasting of Videotex signals.

While Canada has been recognized as a leader in Videotex, first with the development of Telidon and then with the successful implementation and adoption of the NAPLPS standards, the situation at the present time sees the major focus for market development occurring in the United States. The market opportunities for Videotex are focused on areas quite different from those originally envisioned even two years ago. No longer, for example, is a mass market for in-home Videotex seen as a likely possibility in the near future. The longer term perspective indicates as the cable CATV industry begins to become more active and attracted to non-programming services, this market may yet develop to the extent which others have already contemplated. In addition to the price of standalone terminals, which has often been perceived as too high, other competing and complementary technologies with significant market penetration are seen to lend themselves very nicely to Videotex applications at much cheaper prices than is currently possible.

Today NAPLPS Videotex is more likely to be seen as an add-on feature of a management workstation, embedded as graphics software in an office automation product, or to be placed on a floppy disc operating on a personal computer with a colour monitor, primarily in the business market than as a standalone in-home terminal. At the same time, specialized applications such as those developed for in-home transaction services, banking and shopping are providing an important impetus in the penetration of selected segments of the consumer market, which it is believed will lead to further developments as more services are added and as penetration begins to take place on a wider scale.

Significant developments in Canada over the last two years are, for example, that Bell Canada and BC Tel, two of the largest telephone companies, have decided not to continue their participation in this venture. One of the largest on-line information retrieval services, Novatex, has been terminated after expenditures of $4 million.

The federal government has provided well over $150 million of subsidy to the industry, and as yet no viable consumer-oriented service exists in Canada. Those which do exist are directed to markets which were not envisioned for these types of advanced telecommunications services. The Grassroots and Teleguide services, operated by Infomart, are two of the most successful. The widely proclaimed forecasts of 40,000 to 400,000 in-home users have been revealed to be widely inaccurate, with at the present time no more than 3,000 terminals in place largely in rural rather than urban areas. While the original players in the industry were telephone companies, newspaper publishers and the federal government, today banks, financial service companies, software and high technology firms represent the key players.

Specialty services for business, education, training and public service are all actively being pursued. Videotex NAPLPS software is playing a major role in these applications, available on a variety of microcomputers acting as display, page creation units and data base systems at prices ranging from $99 to $1,500. Within the hardware sector, the most significant developments are the shift to the

production of VSLI chip sets which can be placed into existing personal computers and decoders, providing both NAPLPS and NABTS capabilities.

Technology developments in transmission has also taken place, providing the capability for telephone, CATV, satellite broadcast, microwave, FM radio and optic fibres. The display technologies now include adapted TVs using set top monitors, decoders, RGB monitors, microcomputer colour terminals, digital television screens, touch screens and video laser discs and monitors.

4.1 Standards

One of the most significant developments related to technological issues in the last few years was the settling of the North American Presentation Level Protocol Syntax, or NAPLPS. In 1983 the AT&T, Bell System, DOC and the Canadian Telidon Agency augmented the picture description instructions which had been published by the Canadian government. This led to the formation of the current standard NAPLPS. Corresponding developments in the Teletext market support NABTS. In the United States work is now underway to develop NAPLPS chip sets by Western Electric, Synotech, Motorola and Intel, and it is expected that by 1985 manufacturers will be producing NAPLPS chip sets at prices close to $100 US. Canadian manufacturers are now using these in their products, with Norpak and Electrohome manufacturing and marketing NAPLPS and NABTS chip sets and decoder boards for Videotex and Teletext.

Computer manufacturers are also examining these chip sets, with a large number showing interest including Apple, IBM and DEC. Related to this is the fact that the European CEPT standard and world standard Teletext incorporate the NAPLPS protocol. Likewise in the Southeast Asian markets, Japanese manufacturers are examining NAPLPS protocol for incorporation into their products and services. There has been gradual adoption of NAPLPS and NABTS in foreign markets such as Japan, Singapore, Korea and other parts of Europe. In North America, AT&T, IBM, CBS, NBC, Keycom and Sears stores are all using NAPLPS systems.

Many observers believe that the settling of the NAPLPS standard was the key to the

ultimate success of the Videotex industry in North America. The setting of this standard has significantly reduced uncertainty in the industry and has encouraged investment in the development and manufacture of VSLI chips and software on floppy discs. The key indicator to look for in terms of the health and vitality of NAPLPS protocol is therefore the likely rate of uptake by the personal computer and software markets as a standard. A significant amount of development is already evidenced with the commitment to the production of VSLI chips and the proliferation in Canada of companies producing micro-based NAPLPS software.

Some of the specific advantages of NAPLPS include its independence of hardware technology; the incorporation of the Unix screen concept; primary use of point, line, arc, rectangle and polygon geometric encoding schemes; the capability of the DRCS character capability; the incorporation of the mosaic code table providing a facility for interworking with the European systems; the use of macro instructions; and the alphanumeric text. Therefore, a Videotex terminal, if equipped with a keyboard, can be used as a normal computer terminal, thus enhancing its utility. Its other capabilities include colour, blink capabilities, text filling, character size scaling, rotation scrolling and the wait command.

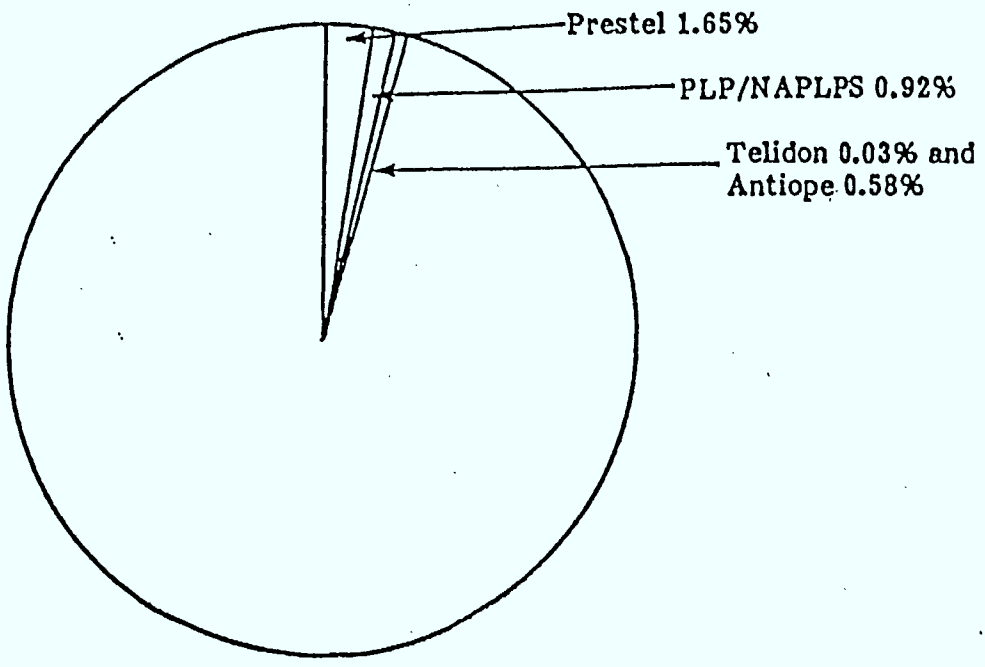
With respect to the NAPLPS standard, an investigation of the market opportunities and an assessment of the technology must also consider what alternatives exist to the end user and to those supplying services. While NAPLPS has certainly advanced the cause for Videotex in North America, a number of issues still remain. Some industry spokespersons have suggested that NAPLPS, or at least full geometric coding, is too advanced for the current state of applications likely to take place in the near future.

There are at the present time in North America approximately 200,000 users of some form of Videotex services (see accompanying chart). The vast majority of these, however, are based on a full ASCII system rather than on NAPLPS or one of the other European standards, such as Prestel or CFPT. There are also an estimated population of more than six million ASCII terminals in North America, 25% of which are already equipped with telecommunications capabilities. It is clear that not all NAPLPS equipped micros will become as widely available in the marketplace until

TABLE 4.1

Current Overview of US Videotex Terminals

TOTAL US VIDEOTEX, TELETEXT, CABLETEXT AND VIDEOTEX-LIKE TERMINALS BY STANDARD (1983)



Total Terminals in US = 278,582

Source: Incontext Update, April 1984, Vol. 4, No. 6.

* Other includes ASCII, proprietary alphamosaic services (e.g. Radio Shack or Virtex) sideband teletext and VBI line 21 services.

the 1990s, and in the short term the main competitor for NAPLPS-based services are going to be ASCII-based services, such as those provided by The Source and Compuserve. One could suggest, therefore, that NAPLPS will be successful only if users and advertisers recognize the net benefit of the enhanced graphics, which would offset the extra cost for producing the data bases relative to those based on ASCII protocol.

Another important situational consideration is the need to examine the penetration of colour monitors in the micro marketplace. It will be important for NAPLPS to be compatible with a variety of microcomputers, since the market is still fragmented despite the early dominance of the IBM PC.

A number of uncertainties exist, therefore, about the relative impact of NAPLPS in the short and longer term, which stem primarily from the cost implications to the user and the cost effectiveness for system operators and terminal manufacturers. Another important concern is the relative merit of NAPLPS vs ASCII-based systems. At the present time ASCII services predominate, although NAPLPS certainly has the capability to grow quite dramatically. It will be important, therefore, to examine these issues prior to settling on the direction that NAPLPS-based Videotex and Teletext services are likely to take.

Since a large amount of activity in the marketplace, particularly in the last few years, has been focused on software and personal computers, it is important as well to examine trends in those marketplaces in order to place some perspective on the likelihood and success capabilities that NAPLPS Videotex and Teletext will have.

The rapid growth of micro-based NAPLPS is based to a large extent on the belief in a burgeoning personal computer market. There is evidence to suggest that while the early stages have been quite rapid and met forecaster's expectations, in the last year or so this growth has slowed somewhat. In 1982 there was an installed base of 4.5 million microcomputers in home and business markets in the United States, and by 1983 the base had grown to approximately 9 million. The 1984 projections were for 15 million units. In Canada this industry is predicted to grow by 20% annually, with personal computers likely to comprise approximately $8 billion of the domestic

computer expenditures. There were an estimated 60,000 microcomputers in 1983 in Canada, with the most rapid growth predicted in the business sector. The capability for Videotex software and NAPLPS VLSI chips to be input into terminals or for the purchase of microcomputer-based software constitutes a very important element in the overall market situation assessment and industry evaluation provided by this study.

4.2 Software

In 1984, manufacturers of microcomputer software stabilized around two standards, those of IBM and Apple computer. In a March 1984 Sofcom software show, more than 80% of all business and educational software was designed to run on the IBM PCs and compatibles, such as the Hyperion. Another major development has been the settling on the MS-DOS operating system.

Other key events of relevance to Videotex include the emphasis by a number of large office automation software producers on Unix-based systems and, correspondingly, the incorporation of a Videotex capability into these integrated software packages (Ref: Emerald City, Manitoba Government, Office Automation Project incorporating Videotex announced by DSS in August 1984).

Another key development is the movement toward and the rapid development of idea processing software, supplanting word processing, which are actually a variant of report generators. One product, for example, called Think Tank of Living Videotex Inc., facilitates the organization and manipulation of outlines in point form before actual text is written.

Still another development is software which incorporates NAPLPS protocol for Videotex decoding and data base development, and finally the shift towards artificial intelligence. A recent study completed by Cognos (1984) examining Canadian opportunities in artificial intelligence noted the possibility of combining Videotex into hardware and software for machine translation. Here, Videotex could operate as a display means and enable a human translator to carry out the final editing of initial machine translation in restricted domains. Related to artificial

intelligence are non-procedural query languages and natural query languages which will help facilitate the design of large data base systems, and also solve one of the critical problems which have developed as large Videotex data bases have been constructed, i.e. the complex and redundant search procedures which often emerge (Ref: Wescom, Content and New Services Study, DOC, 1984).

Any assessment of Videotex and Teletext must consider not only micro-based Videotex systems for encoding and decoders, etc., but rather must view the corresponding trends in artificial intelligence, operating systems, integrated office systems and the capabilities for downloading on CATV for training, entertainment and real time display of transactions, and such things as stock market and commoditites information.

4.3 NAPLPS Software

Most microcomputers equipped with the appropriate software and add-on modules can serve now as decoders, page creation terminals or integrated data base systems for NAPLPS Videotex. A wide variety of microcomputer-based software and hardware products using the NAPLPS standard are now on the market. The software industry is showing a significant amount of confidence in the growth of potential for these services, as demonstrated in their investment and push to bringing these onto the market. Some of the more well known products are those by Lumicon, Tayson, Genesys and the SVS-1 system developed by IBM. Prices range from $100 to $500 for decoder software and from $500 to $2,500 for encoding software. Mitsui Corporation of Japan recently paid $250,000 for the manufacturing and distribution rights in Japan and Southeast Asia of the Canadian Microtaure encoding and decoding system. Software packages are widely available for a number of personal computers including Commodore, Apple II, IBM PC and compatible machines. Page creation and dealer systems have been produced by Cableshare, Tayson, Lumicon, Formic, Async, Microtaure and TV Ontario (see attached table).

Clearly, one of the critical elements in evaluating the market opportunities will be to examine which segments of the established and growing personal computer market are most likely to purchase the various software packages which are now

TABLE 4.2

Microcomputer-Based Telidon/NAPLPS Decoders

Company	Base Micro-Computer	Memory Required	Operating System	Language	Display Resolution	Simultaneous Colors	Extra Hardware Required	Remarks
AVCOR	Commodore 64	64K	C64 Kernal	Assembly	320 x 200	2/ch.cell 16 palette	No	Cartridge based
ASHDUNE	Commodore 64	64K	C64 Kernal 3.2 or 3.3	C and Basic	320 x 200	8 colours or 8 grays	No	
	Apple II, II+, IIe	48K	Apple DOS	C and Basic	180 x 140	6 colours or 8 grays	No	
NORPAK/APPLE	Apple II, II+, IIe	48K	DOS 3.3	Pascal	128 x 96	15	Telidon interface card	
MICROTAURE	IBM PC,XT	128K	PC DOS	Machine	256 x 200	16/512	Real Colour colour card	Features inc.: downloading, slide show printing
MICROSTAR	IBM PC,XT	192K	PC DOS	Basic & Assembly	320 x 200	16	Plantronics colour card	Also available for Hyperion, Compaq, Columbia, etc.
FBN	IBM PC,XT,PCjr	128K	PC DOS 1.1 or 2.1	Forth	320 x 200	16	Techmar or Plantronics colour card	
MICROPIXEL	IBM PC,XT	NIL	PC DOS 2.0	Machine	256 x 200 x4 planes	16 out of 16 million	EGT 100-based Board	Full SRM 16K Telesoftware, 8K Macro Composite video output
MANITOBA TELEPHONE SYSTEM	Commodore 64	64K	C64 Kernal	Machine	160 x 200	13 + 3	No	3 out of 13 colours and 3 gray scales per ch. cell
TORMIC	Apple IIe	64K	DOS 3.3	Machine	256 x 190	16	Taxan card	Also requires a 64K, 80 col. card

Source: Chang, 1984.

being produced. At the present time no acceptable market forecast has been provided as to what opportunities exist and what demand will exist in the established computer market as well as the new and emerging computer market, i.e. new buyers, for systems which incorporate Videotex capabilities. While all of the software packages are priced competitively, each have a number of different capabilities and still each require a number of special features to be added to a standard PC or microcomputer system in order to make them work. The important question which must be answered, therefore, is how likely will users be to spend the extra dollars in order to incorporate these Videotex software systems into their existing software and hardware configurations. Alternatively, what will be the price increase in established computer packages as Videotex capabilities are added. Finally, what are the distribution channels that are available to spread these software packages throughout markets in Canada, the United States and internationally for business, the leading edge home computer user and the more sophisticated small business operator.

At the present time software prices range from $100 to $500 for decoder software and from $500 to $2,500 for encoding software. Hardware encoding units are being produced by Electrohome for $10,000. The price for NAPLPS decoders at the present time is currently in the $700 to $1,000 range, with NAPLPS decoding software packages available for a number of personal computers.

4.4 Banking and Interactive Services

The development over the last two years of interactive and banking services is undoubtedly one of the most significant. The bulk of this activity, however, is taking place in the United States, and a review of that marketplace constitutes an important element in the overall assessment of opportunities for the future of Videotex in North America and ultimately on a worldwide scale. In the assessment of the fertile US marketplace, applications which have been suggested as leading the growth of Videotex include:

1. Banking -- already underway with a considerable amount of development in ASCII-based services and a growing interest in NAPLPS.

2. Securities -- this development is expected to take place following the lead of EF Hutton, Dean Whittier and Merrill Lynch. At the present time ASCII is the leading protocol, but NAPLPS is gaining increased amounts of attention.

3. Travel -- hotel-based systems and tourist data bases are being provided in several markets, and here it is interesting to note that Infomart has recently signed agreements to implement their Teleguide system in Hawaii and California on a model similar to that provided in the Toronto area.

4. In the United States there are now more than 200,000 users of ASCII-based Videotex systems such as Dow Jones, The Source and Compuserve.

5. Advertising -- it is expected that the development of advertising over interactive Videotex will develop dramatically in the next 12-24 months.

At the present time there are over 80 banking and related interactive services, and a growing number of business-related on-line transaction services in the United States. Approximately 85% of the North American Videotex and Teletext trials include some form of home banking or home shopping in their service offering. Many use NAPLPS or some variant of Telidon-compatible presentation level protocol. In the retail business NAPLPS protocol has become popular for the development of on-line advertising, particularly in high traffic pedestrian malls. Shopping and product information is now widely used as a promotional tool to build traffic in stores, with selected retailers using Videotex-based systems to advertise products and services as well as to provide prices and locations where products can be purchased. Systems are in place which use touch screens, cable television, personal computers, video discs and voice synthesis.

In the initial set of Canadian Videotex field trials, attempts to combine service features such as in-home shopping, banking, security alarm and monitoring, as well

TABLE 4.3

Home Banking Services and Trials, 1983

System Operator	Project	# of On-Line Users	Area
ADP Telephone Computing Service	HBI	2,000	Seattle, WA
CBS Venture One	Venture	300	New Jersey
Chemical Bank	Pronto	500	California, New York, Florida
Compuserve, Inc.	-	30,000	All of US
Continental Telecom	Contelvision	100 households	Manassas, Virginia
Financial Interstate Services Corp	Bank-At-Home	500	Knoxville, Memphis, Boston
First Interstate	Day and Night Video Banking	200	Los Angeles
Indax-Cox Cable	Indax	600	San Diego
Infomart	Grassroots	300	Western Canada
JC Penney	Firsthand	200	N. Dakota
Keycom Electronic Publishing	Keycom Videotex Service	3,000	Chicago
Macrotel, Inc.	-	218	US
Shamut	-	100	Boston
The Shuttle Corp.	Shuttle Information Service	-	Redmond, WA
Source Telecomputing Corp.	The Source	36,000	US and Overseas

TABLE 4.3
(continued)

System Operator	Project	# of On-Line Users	Area
Times/Mirror Videotex Service	Gateway	1,000	Misson Viego, Palos Verdes, CA
The Treasurer, Inc.	Venture One	100	Ridgewood, NJ
Tymshare	-	-	International
Videofinancial Services	Viewtron	3,500	South Florida

as information retrieval, were generally not very successful. This was the case for NB Tel, AGT, Manitoba Tel and BC Tel. Constraints on trial conduct, limited resources and time dictated that certain types of applications should be approached first, and in most instances this consisted of some variant of basic information retrieval whereby there would be a large integrated data base with numerous users accessing the service. Critical aspects identified by Wescom for further industry development and growth were:

1. the need to develop interactive services
2. the need to enhance capabilities for electronic banking
3. the need to develop more effective public service
4. the need to reduce the price of hardware for IPs and end users.

Over 50% of the banking trials and commercial services now use personal computers as home terminals. Banks are beginning to design and utilize systems which can be sold to other financial institutions on a franchising system. Organizations including banks, retailers, government departments, newspaper publishing consortia, communication companies, cable operators and broadcasters, as well as telephone companies, have all been examining the potential for transaction services. Their interest in these varies according to the particular area of business. Cable companies, for example, are interested because they offer a profitable add-on feature that could represent a significant source of non-programming revenue. Banks and retailers see the opportunity in increased efficiency with which they provide goods and services. In 1983 home banking revenues in the United States were approximately $1 million accruing from about 5% of all the eligible homes having a PC. Assuming that by the end of the decade over 50% of North Americans will have PCs, it is likely that home banking revenues could exceed $800 million annually. A recent IRD study indicated that between 200,000 and 300,000 micros are capable of providing such services.

Assessment of the number of banking trials in the United States indicates there is a clear preference for home electronic banking using PCs or dedicated terminals in contrast to the more established ATM networks. A recent study by the Banking Marketing Association of Chicago pointed out that diffusion of home computers for

transaction services is likely to destroy the specialty bank and terminal industry. It found that less than 15% actually used ATMs even though they were aware of them.

One of the factors which is assisting the development of the North American market is the change in the regulatory perspective by the appropriate agencies toward service provision. Increasingly the regulator is favouring a competitive market mechanism to define price, demand and supply rather than regulation. As a result banks, financial institutions, brokerage houses, trust companies and lending institutions are all in a position to provide services directly to the customer, which heretofore were only the preserve of established banks.

It is widely recognized that home banking can increase a firm's customer base without the expense of more branches, and facilitate bill paying to a wide range of merchants. There is also a growing base of interactive intelligent terminals for home banking. The critical questions in terms of the short term economics involve how rapidly installed bases develop and to what extent banks have to pay for terminals in the meantime.

Cable companies offer a broad-band capacity for transaction services, which is thousands of times larger than narrow-band telephone capacity. However, the development of digital trunk fibre optics being laid by the telephone companies indicates this relative advantage may be short-lived. At the same time, it is well known that the telephone companies are taking an increasingly critical look at the provision of Videotex-type services, particularly as deregulation and usage sensitive pricing strategies become more prominent. It is anticipated that within the next half decade, cable systems in most major markets in Canada will have two-way interactive capability. Already some form of interactivity is possible, but this is cumbersome since the way the system works requires the downloading of information software over the cable and using a response over the telephone lines. Further investigation of these services will be designed to reveal the various configurations of service offerings, the cost and benefits which institutions are anticipating from their use and the benefits for users. In addition, important questions must be answered about how the systems are presented to the consumers, what opinions exist to ensure the acceptance and who actually pays for hardware,

software and the transaction charges. Ultimately, this appraisal should reveal future trends for transaction services and banking, and identify the emerging opportunities in this application area.

4.5 Shopping Services

The size of the non-traditional shopping market and direct marketing activities in North America is difficult to gauge precisely. However, in 1982, total sales arising from direct marketing in the US were in excess of $120 billion and $13 billion in Canada. The US-based Yankee Group has predicted that teleshopping sales will exceed $5 billion by 1985 and may reach $20 billion by 1990.

Technologies which are being used in addition to the standard 800 telephone number credit card purchase system include Videotex and Teletext, addressable cable TV converters, computerized voice synthesis systems and optical video disc players. All allow direct market retailers to communicate greater quantities and more detailed information to a potential customer.

Videotex for in-home shopping is seen as an efficient substitute for catalogues offered by direct marketers which offers cost advantages, graphic enhancement and a supplement or adjunct to printed media by providing faster and more economical means of placing orders. Some of the more well known teleshopping services include the Sears Department Store, Catalogia, PC Telemart Inc., Cableshare's Videopress System, Viewmart and Viewtron. The Viewtron service, which is being conducted in southern Florida, has a number of interesting teleshopping innovations, one of which is a bartering and auction system whereby users can interact in an auction process for special products and services, with price reductions introduced as no bids are received.

Related to the on-line Videotex-type interactive systems are a number of tech nologies offered by cable companies, such as force tuning and Smart Cards. Related to transactional services and on-line systems, this technology has emerged in the past few years and offers both complementary and competitive opportunities to the more well known Videotex/Teletext network services for transaction services. The

purpose of the Smart Card is to incorporate computer processing power into a small card rather than into a terminal, keeping terminal costs at a rather inexpensive level. The card contains a microchip which gives it memory and intelligence, and each time the card is used a new set of transaction data can be added.

4.6 Cable Industry

In the past few years there has been an increasing amount of activity and interest by cable TV companies toward non-programming and interactive services. This stems from the fact that revenues for programming services, particularly those such as pay TV and all movie channels, have not been as successful as initially anticipated. As a result, the industry is looking at ways to increase its service offerings and to gain a share of the increasing market for interactive and non-programming services in home banking, shopping, downloading of computer software, interactive business graphics, software market information, financial services and commodities exchange.

There are at the present time two thrusts of the industry: one on residence and one on business. Although business networks have not undergone significant developments to date, they comprise the most significant opportunities for future developments in terms of transmission of data and voice services. Two-way cable, however, will be competing with suppliers of local area business networks such as Ethernet and Wangnet. Thus, an assessment of the opportunities in cable will have to be set within the context of competing technologies, particularly within the business market.

Cable has the advantage of providing such features as sound, downloaded software, computer games, teleshopping and banking, with content sent to a specific subscriber via an addressable terminal. Various technologies have been put in place and are being developed to enhance this two-way capability and the downloading facility. A number of cable systems in the US have already begun to experiment with the merging of Videotex technology with video laser discs, using the video disc as a display mechanism for information retrieval. These have also been combined

into a system called force tuning, which allows a user to shop for a brand name subsequently being force tuned or switched to a cable shopping channel, which shows a full video demonstration of the product. Another use involves blending of video images, graphics and text for real estate files, which allows a user to stroll through different rooms at different times of the day to see drawings of the floor space and textual material about specifications. In 1983 there were approximately 1,300 video merchandising systems, which are expected to grow to about 14,000 by 1986.

A recent study of the cable industry in Canada indicated approximately 20% of its revenues are likely to arise from the sale of non-video services by 1990. It is recognized that the industry will develop a wide variety of equipment capabilities to ensure its claim and interest in the future of downloading revenues.

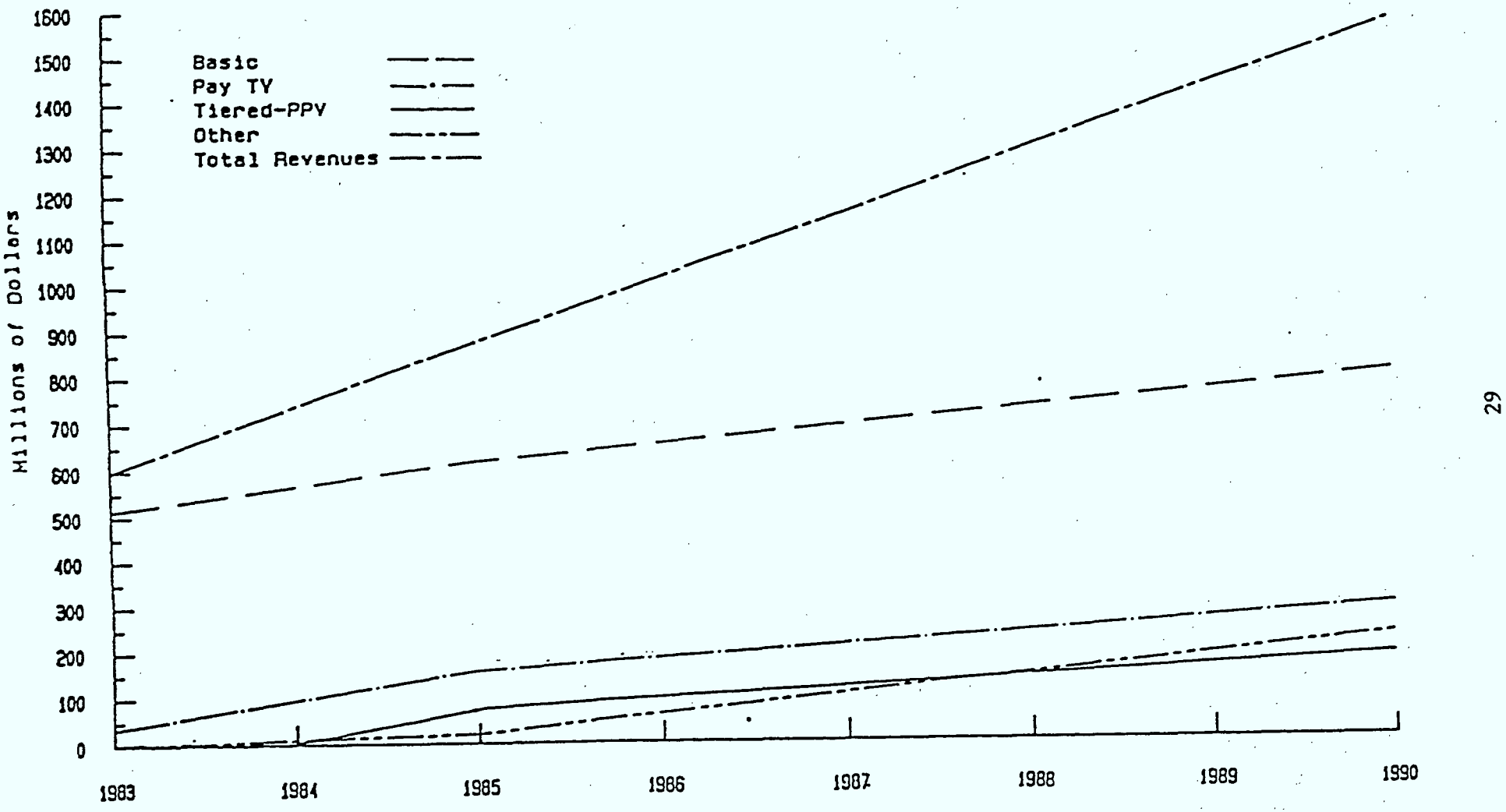
It is anticipated that by 1990 tiered services of Videotex/Teletext plus all transaction services will comprise revenues on the order of $500 million in Canada, and as the growth of new cable systems develops worldwide, most are going to be oriented toward two-way cable systems offering interactive services and such things as downloaded software, similar to that provided by Nabu, which includes a personal computer, cable adapter and head-end computer, and provides software and information service packages. (It should be noted that these services have not enjoyed the degree of success in the marketplace originally anticipated. Penetration in the Ottawa services is estimated at 1% and in the US test, 4% representing a total of 3,000 subscribers.)

The cable industry is a significant part of the overall communications sector, accounting for approximately $1 billion per year in revenues. It is generally acknowledged that this industry is currently aggressively looking at new non-programming services to complement its rather mature stage of development.

Over the next few years, in the short term, the cable industry will be concentrating on making investments in upgrading its cable plant, with a corresponding development of new services to provide commercially viable operations in both the US and Canadian markets. It is likely that non-programming and interactive services

TABLE 4.4

Projected Cable Operator Revenues from New Services



Note: Other services include personal computers, games, Teletext and Videotex, security and telemetry, and interactive and transactional services.

Source: Nordicity Group projections.

TABLE 4.5

Subscriber Projections

	Current (Mid-1983)	1985	1990
		(000)	
Basic Services			
Basic cable subs.	5,345	5,800	6,900
20 plus channel subs.	3,200	3,900	5,200
Subs with converters.	2,100	2,400	4,400
New Television Services			
Pay-TV households	400	1,800	2,760
Addressable scrambling systems	124 (41%)	900 (50%)	1,820 (65%)
Non addressable scrambling systems	266 (59%)	900 (50%)	980 (35%)
Tiered service and pay-per-view households	-	675 (75% of address-able)	1,638 (90% of address-able)
Non-programming Services			
PC software/games (one-way)	-	75	750
Teletext (one-way)	-	25 -	1,000
Security/telemetry (two-way)	5	19 (7.5% of two-way)	75 (7.5% of two-way)
Interactive/transactional (two-way)	-	67 (7.5% of address-able)	273 (15% of address-able)
Institutional Services	minimal	some applications	some market penetration of data/ video networks in in major urban areas

Source: Estimates prepared by Nordicity Group Ltd.

including personal computers, cable adapters, head end computer games, software and information service packages will begin to develop. (Nabu and Videoway of Montreal have developed technology which uses Videotex as an integrated video communication system for cable, with a universal interface as a subscriber terminal and these services will be fully investigated.)

Projections for the use of cable for Videotex and Teletext-type services have been made, and it is anticipated that between 1985 and 1990 cable Teletext growth is estimated at between 25,000 to 1,000,000 subscribers. For interactive transactional two-way services, projected growth is from 67,000 in 1985 to over 300,000 in 1990. As well, PC software and downloading of games are expected to be used by between 75,000 users in 1985 rising to almost 750,000 by 1990. By 1985 revenues to CATV operators for downloaded games are expected to total approximately $8 million, for Teletext $1.5 million and for interactive services $8 million. By 1990 these are expected to contribute $81 million for PC games, $60 million for Teletext services and $32 million for interactive services.

This study will provide an in-depth appraisal of these forecasts and will provide an indication of the likelihood that these projections are possible, under what conditions and what technological developments and over what time scale. This will be accomplished through further evaluations of not only the technological developments, but their ability to fit emerging market needs.

4.7 Teletext

Teletext could have a significant amount of growth in the next few years in North America. This is due to the increasing interest of the cable companies in the provision of non-programming services and the results of the implementation of the CBC's Project Iris, which recently received $6 million from the federal government to expand its services. Finally, the regulatory environment in the US and Canada is increasingly taking on a deregulatory flavour, being more receptive to competition, a situation which may encourage new applications for Videotex and Teletext.

At the present time two incompatible standards exist for Teletext. The FCC in the

US has approved broadcasters to launch commercial Teletext services in the US, and at the same time has not chosen between the two standards. One is the UK World Teletext Standard based on the Teletext network of the British, the other is the North American Broadcast Teletext Specification (NABTS) which is becoming the de facto standard in North America and which has evolved out of Telidon and Antiope. The NABTS standard is favoured by the French who are actively marketing a system in the US and worldwide through Videographics Systems of America. The NABTS standard is supported by a number of very large communication companies including AT&T, CBS, NBC, RCA and PBS. All Canadian television networks working with the technology are committed to NABTS.

According to a recent survey, by 1990 it is projected that approximately 50% of all US homes which receive cable TV, or 25% of all televised homes, will have Teletext service.

Several forms of Teletext have emerged, but in most instances the short term will see services similar to those provided by CBS, NBC and CBC, which can be considered as a more limited version of Teletext utilizing the VBI. In such cases only up to about 250 pages of information are being transmitted. This compares, for example, to the ambitious proposals of Time Inc. for providing up to 5,000 pages using cable television. These types of developments will only come into place as the cable industry gathers momentum in providing more advanced and enhanced services.

While on the one hand there are fundamental advantages of CATV over the telephone network for Videotex transmission in the form of Teletext, it should not be forgotten that at the present time there are no low cost, reliable two-way cable converters and much of the physical plant in Canada does not allow for two-way transmission. Therefore, until the cable industry has a major capital expansion and upgrading program, the use of cable for Teletext services is going to be somewhat restrained. A number of companies are working on this problem, however, most notably Electrohome with a new version of its EGT 100 decoder, which is also being sold in the United States.

The major impetus for Teletext in Canada will come from the CBC, which has been conducting its Project Iris trial. However, unfortunately at the present time, very little information is available about the research conducted for that service. In spite of the fact that this was a joint venture between the DOC and CBC, all that is known is that the system has been expanded into Montreal, Toronto and Calgary, but very little other information has been released about the success or preferences that have developed from this service. Other notable Teletext experiments include that conducted by TV Ontario and the WETA trial which was funded in Washington by the Canadian federal government.

On the hardware side, only Norpak and Electrohome are providing Teletext decoders in the appropriate protocol for use in the Canadian market. A number of Japanese firms, however, have promised to mass produce these at a much lower price, with Panasonic currently undertaking development to supply the US market.

Estimates of the number of Teletext decoders for in-home use reveal that the greatest number exist in the United Kingdom, where there are approximately 1.1 million users. Comparatively in Germany 300,000, Austria 300,000, the Netherlands 250,000 and Sweden 250,000. Belgium, Finland and Switzerland also have large numbers at 30,000, 25,000 and 10,000, respectively. At the present time in the United States and Canada there are no commercial Teletext services. However, a number of tests are being conducted and various plans have been announced.

In France mass production of the Antiope NABTS protocol terminal is scheduled to start as early as 1984 and to reach 100,000 by the year 1985-86.

4.8 Summary

A review of the developments outlined for Task 1 emphasize the difficulty and underscore the complexity of attempting to provide detailed market assessments of new technologies such as Videotex and Teletext. Indeed, this overview raises immediate questions of exactly what is being dealt with -- Telidon, NAPLPS, ASCII Videotex or some other foreign standard. No clear distinction is often made

between these, and it frequently becomes a question of which of the various protocols is likely to be more successful than another.

In general, it seems that while the projections in Canada for a mass market had very little basis in fact, there are still a number of very positive developments occurring. At the same time the task of anticipating the direction of these developments is increasingly difficult. First, because the technology itself is so diffuse, one could talk of Videotex in terms of a standalone system, as a network-based system, a microcomputer system, a mainframe-based system or combinations of these. Alternatively one can talk about Videotex or Teletext in terms of applications and focus on such things as information retrieval, specialized data bases, banking and interactive services. Likewise, the hardware and technologies that are being used to provide a Videotex service are also quite diffuse and range from standalone Videotex terminals to PCs with colour enhanced software, touch screens, voice synthesizers and video discs. As well, the network and transmission capabilities are also quite diverse and include optic fibres, paired cable, broadcast satellite, microwaves and FM radio. Consideration of all these factors must be set within the context of a varying regulatory and legal structure which, as yet, has failed to define the role of services such as Videotex. For example, the ability for advertisers to provide information on Videotex and Teletext is still open to question and raises a number of uncertainties which make it difficult for the industry to develop a consistent or coherent thrust.

Numerous factors must be taken into account when developing scenarios, making a market projection or conducting a situation analysis for this industry. At this stage it is possible to identify a number of critical factors which have emerged and which must be examined in more detail and taken into account when developing this market assessment. These include:

1. The issue of standards and the relationship between NAPLPS, NABTS and ASCII-based systems as well as other systems.

2. The impact and extent of the commitment to produce VSLI chips containing NAPLPS and NABTS for computer terminals, microcomputers and decoders.

3. The likely penetration of micro-based Videotex software for a variety of microcomputers.

4. The rapid and dramatic growth in North America of interactive banking and specialized shopping services.

5. The restriction in North America, particularly in Canada, of telephone companies as full service Videotex providers and their growing interest, therefore, in usage-sensitive pricing for local services and network revenues.

6. The increasing interest and realization by cable and network providers that non-programming services are going to be and have to be important components of their program mix as revenues for traditional programming stagnate.

7. The effect the development of new and enhanced ETV and high definition TV (HDTV) along with video laser disc and digital TV will have, and the growing interest for technologies and special applications around which Videotex could be integrated.

8. The optimism towards Videotex and Teletext by large US-based companies such as AT&T, IBM, CBS and Sears.

9. The trend towards the integration of Videotex with a variety of associated technologies for storage and retrieval, and particularly the growing use of artificial intelligence and natural query language for accessing information on a data base.

10. The technological development of a variety of techniques and procedures for carrying Videotex/Teletext signals, such as wide-band, CATV, fibre optics, FM radio, microwaves and satellites.

It is clear that the intial and early advances of Canada in Videotex and NAPLPS

have been overshadowed somewhat by developments in the US and particularly the rapid and tremendous growth in banking and financial service sectors. In many cases it is recognized that NAPLPS Videotex is not the sole or largely preferred protocol, since a majority of active services are ASCII rather than NAPLPS-based.

In business NAPLPS graphics for office automation, on-line information retrieval, interactive services for financing and banking have all been assessed quite positively but still face significant competition from existing technologies offering comparable functionality, often at lower prices and with less need for acquiring peripherals and support services.

In Canada, much of the industry activity to date has been implemented because of government support. This applies to the original field trial activity and to a lesser extent current commercial services. As government programs are now being terminated, the industry must become more innovative in its product development, marketing and operations, with the main focus at the present time being directed toward a US market for Videotex software, VLSI chips and decoder sets, and system implementation for such services as banking transactions and in-home shopping. The main thrust of much of the industry development in the next few years is likely to be the emerging applications resulting from the linking of various technologies and established services. These represent attractive entry points into the marketplace for a variety of businesses.

4.9 Outputs

The outputs of Task 1 will provide an in-depth appraisal of the various issues presented in this overview. The interrelationships which are emerging and the forces directly shaping the industry will be clearly defined and presented in order to direct the efforts for a detailed market assessment and demand forecast provided in the subsequent tasks. This will stem from the specification of the major trends in the Videotex and Teletext industry and an identification of the most prominant service configurations, product areas, market sectors and those applications which seem to have the most likelihood for success in the short and medium term.

5.0 TASK 2: FORECASTING SERVICES, APPLICATIONS AND SYSTEM TECHNOLOGIES

5.1 Purpose

The purpose of this task is to forecast various services or applications and to identify different technologies and system components used to deliver these services. Essentially this task undertakes to forecast the various technological configurations for Videotex and Teletext which will occur within the defined framework of 5-15 years. It therefore relies very heavily on the trends and developments which are identified in Task 1 and seeks to provide an indication of not only what configurations and system components currently are and will be available in the short term, but rather to project what the configurations of the most successful and receptive services will require. Consideration will be given, therefore, to the national and international developments in various technology and sub-system components. Concern in this section will be given to such things as:

a. display technologies, standalone, microcomputers, TVs
b. page creation technologies (encoding)
c. page display technologies (decoding)
d. transmission technology
e. software for data base creation and management
f. software for graphics development and text editing
g. technology for the provision of interactive services using a variety of network mediums such as the telephone, satellite broadcast, CATV, fibre optics, FM stereo, etc.
h. CATV technologies for in-home shopping and banking, including the two-way capability for CATV technology
i. photographic display technology utilizing and linking video discs and laser disc technology with transmission technology, linking of sound to the Videotex/Teletext services, standalone display technologies for the public, commercial and non-commercial markets, enhanced resolution display and digital TV technology for in-home display systems
j. artificial intelligence software and query languages.

All of these constitute part of the relevant set of technologies and system configurations which must be considered within the context of the emerging set of applications for Videotex and Teletext services.

This task is focused on not simply speculating on a range of new technologies which will emerge, but rather to specify the types and market characteristics of the various application areas. To understand which of the application areas are going to have the most success in the short and medium term, and to link the technology configurations to the most feasible and to the most likely emergent new applications.

5.2 Sources of Information

The sources of information for this section will be available service configuration descriptions, published and contracted work describing system technologies, government research reports and documents reviewing, for example, technologies, designs for the IISP program, content development programs or other funded product developments. Reliance will also be placed on discussions with industry service providers, product developers, designers and operators. Of particular interest will be those individuals and companies providing Videotex software for microcomputers and those examining emergent services such as video discs, mobile Videotex and office automation software.

5.3 Service Description

Videotex has a multiplicity of capabilities and characteristics, as already noted. It can be reviewed in the most generic sense as a computer technology that enhances the way, relative to other technologies, in which graphics and textual material can be displayed. It simplifies in most instances the process necessary to accomplish the access, retrieval and exchange of computer-based information. It is predominately a technological advance in software, a way of packaging computerized data which enables one to achieve the dissemination of textual and graphic information by a wholly electronic means through display on a variety of terminals which are usually

under the selective control of the recipient, using control procedures which should be easily understood by the untrained user.

Over the past few years the technology has evolved and it is evident that a number of early views and concepts of the technology have changed quite dramatically. Videotex has become a rather fuzzy, unprecise product -- not in terms of the specific technological functions, i.e. the formation of geometrics, but there has been a blurring of the edges on which one can place the parameters to define the technology.

Since the early developments of Telidon, we have seen a movement to NAPLPS which is a protocol level enhancement of the basic Telidon system. Videotex represents a system not only for information retrieval, but also for transactions, graphics display, etc., which are affected through the interaction with a source computer, e.g. electronic banking and messaging, or dialogues between users and computers, such as those in computer-based instruction. To many, Videotex implies a mass market appeal, widely diffused in homes and businesses. However, Videotex does not necessarily have to be used in a mass market situation or to provide service applications for mass market consumption. It can just as easily be a small scale standalone system.

The following definitions can be used to define Videotex and Teletext in the most generic terms:

a. Teletext: Information consisting of alphanumeric characters or graphic images edited on a keyboard or generated from a computer-stored database. It is encoded in a bit stream of digital data at a transmission rate that is compatible with colour TV systems. This is NTSC with 525 lines in North America. The encoded data is multiplexed onto a video signal and transmitted with a TV signals on the unused lines in the VBI. The period between which the scanning of the TV picture begins again and the data in the TV signal are detected by a decoder attached to the TV set as an accessory connected to the radio frequency antenna socket or directly wired into the RGB beam

circuits of the colour TV. The decoder accepts the digital data, stores one or more pages in a buffer memory and displays these pages on the screen as directed by the user. The viewer can punch the number of the desired page on a keyboard or keypad. The buffer memory containing the page is kept in a hold condition. The page is then transferred to the TV screen via a character and graphic generator that is part of the decoder. The page remains on the screen until the replacement page is requested by the user or the system is switched off. The information may or may not take up the entire TV display. For example, the information may appear as an overlay on an on-going television program. Information is cycled by the broadcast station, with access time delayed between requesting of pages and seeing it on the screen, depending on the number of pages being cycled, the rate of transmission and number of TV lines dedicated to carrying the information to the viewed, the amount of memory in the decoder and the importance of the information. In general 100-250 pages are capable of being broadcast in this manner. Full channel TV used for Teletext transmission allows more pages and more access to be achieved, up to 5,000 in some cases. In addition, other transmission media can be used to send large quantities of data to a dwelling or business for tape or disc storage. This could include cable television CATV, cellular radio, low powered TV, multi-point distribution systems, direct broadcast satellites, etc.

b. Videotex: With Videotex, pages of information are edited on a keyboard which could be a standalone unit or a microcomputer. The database is designed such that it permits the accessing and rapid retrieval of specific items of information on the system. Transmission lines between the user and computer could be the public telephone network, cable CATV or hard-wire LAN type system. Generally a modified TV receiver with a decoder translates the data and builds up the video image on the screen. As with Teletext, the decoder may be plugged into the antenna socket or the RGB circuits. Page transmission is selected by the user utilizing a keypad or keyboard. The

system will have a two-way capability, allowing the user to send messages to a computer, the database or another terminal in the network. When telephone systems are utilized, transmission of data to the user is usually at a higher speed than the transmission from the user to the system. With Videotex the database is not routinely cycled; it is set up and search procedures are developed to access individual pieces of the database or pages. The access time is a function of the processing capacity of the computer and the volume or pattern of usage in the system.

For both Videotex and Teletext the standard which is most common in North America and the one which is most relevant to the Canadian system is NAPLPS. The NAPLPS standard specifies textual and other graphic codes which have the same status in a data network as ASCII codes in systems that deal with alpha-numeric information, and can be used for a wide variety of applications in which graphics are important. In any computer system or communications network where ASCII is used is also the potential for NAPLPS.

With NAPLPS, text and graphics are handled by the protocol. NAPLPS provides five basic geometric forms of which most images are constructed, and these include points, lines, arcs, rectangles and polygons. Text is alphanumerically decoded in ASCII. In addition there are control codes which are used for a variety of functions such as specifying colours, clearing the screen, specifying the degree of precision coordinates shall be defined on, specifying whether an object is outlined or not, defining line and outline textures, defining fill feature textures, specifying the size of text and direction of writing. Other features include:

a. The logical picture element, permitting the creator to vary thickness of lines, curves and outlines.

b. PDIs that allow incremental point, incremental line and incremental polygon constructions.

c. Colour map, which is an electronic palette of colours permitting the

display of many more colours than the basic six colours and eight shades of grey originally implemented for Telidon.

d. The blink process where a number of objects can be blinked at different rates, with each object switching periodically between any two colours of the colour map. In each blinking object the length of time for cycle of each of the two colours is variable.

e. DRCS (dynamically redefinable character sets) which allows the page creator to define up to 96 special characters to supplement the latin alphabet character set resident in the decoder.

f. Macros -- if an object is to be redrawn in several different positions on a page or repeated on successive pages, its PDIs need only be transmitted once and stored as a macro.

g. Mosaics -- NAPLPS includes a mosaic graphic character set to simplify the display of transcoded European standard Videotex pages (CEPT).

5.4 Hardware Configurations

The various technologies associated with the provision of Videotex and Teletext are numerous, and each of the individual pieces of the technology have various configurations. For example, the basic unit for page creation, i.e. page creation technologies, can include standalone page creation devices such as Norpak Mark II and Mark III which range in price from $15,000 to $35,000, or they may simply involve NAPLPS computer software such as the systems developed by Cableshare, Tayson, Lumicon, Formic, Async, TV Ontario, etc. In some cases the page creation system is based on a VLSI chip, as in the Electrohome case. The technology which is used to actually create the software could involve an IBM PC, Dec Rainbow or an Apple II, with memory requirements ranging from 48K to 256K of memory.

Related to these kinds of page creation technologies is the need to have a display

technology; decoders, graphic tablets, disc drives and additional cards, in some cases, to enhance the basic microcomputer capabilties.

Central storage devices include PDP-11, minicomputers, Dec Vax 1178 computers or Spectrix minicomputers. Display and storage technologies could include IBM PCs equipped with the appropriate chips and software for display, Apple II computers with colour monitors, adapted TV sets with set-top decoders provided by companies such as Electrohome or Norpak, Commodore 64 microcomputers, or alternatively use could be made of a standalone Videotex display terminal such as that produced by Microtel (no longer in production) or Norpak. Still other technologies include Display Phones and RGB monitors. Display systems could comprise digital TV and HDTV systems.

5.5 Transmission Technologies

Transmission devices include optic fibre, coaxial cable, satellite broadcast, broadcast VBI for Teletext, CATV for Teletext one-way, and CATV for two-way services, FM radio linkages or full channel broadcast (or variants).

The peripheral devices that can be attached to these systems include colour printers (the type devised by Sony), and as well laser technology for the integration of moving and still pictures in photographic mode with graphics and text provided as Videotex or in some cases using Teletext systems.

As stated previously, the various types of system configurations can vary from standalone business display systems through to linked sets of terminals in a private user group, closed user groups as well as specialty applications in particular market sectors, such as those used for community applications.

With Teletext one can see one-way broadcast Teletext utilizing the VBI, full channel Teletext such as that provided by Time Inc. (now terminated) and open channel Teletext. Various combinations of these have also been considered, and as the introduction of CATV systems with two-way capability comes into the marketplace

along with appropriately priced decoders, new options and capabilities for interactive Teletext services will emerge.

In terms of interactive services and home shopping, at the present time the most common configurations are networks of users linked into a central service provider. For example, banks provide customers with terminals who are then linked for transaction services to the particular branch or bank in question. In some cases gateway capabilities between user groups have been developed, and these will provide new capabilities and new configurations in the provision of interactive services and shopping applications. Transmission systems which have been used for interactive services and for systems linking numerous users into a central computer, either on a gateway mechanism or directly, include dial telephone, in some cases using the Datapac packet-switched network. (Teletext data at 5.73 megabits per second, or VBI as in the TV Ontario case.) Grassroots, for example, uses direct dial telephone at 1200 baud rate, and in the Eli area fibre optics is used. The fibre optics technology generally uses 56 kilobit trunk. Other transmission mechanisms include two-way cable, as is the case in the Videotex America field trial in Mission Viejo, California. Project Inet utilizes the Datapac national packet-switching network. Additional Teletext transmission technology includes, for the CBC trial, a 5.72 megabit per second Teletext data transmission on lines 15 and 16, with the VBI on specific channels in each of the service territories of Montreal, Toronto and Calgary.

These technologies represent some of those currently used by field and commercial service operations. It is expected in the future that alternative transmission technologies, such as mobile satellite, will probably emerge. Likewise, the use of local area networks are likely to become more widespread as cabling of the downtown areas of most cities takes place, and offices and businesses are linked with local area networks.

Other technological configurations are typified, for example, by the hybrid systems currently being developed which integrate sound and moving images on video discs into a Videotex system. These systems make it possible to retrieve high quality moving picture video sequences, still images, graphics, verbal data and sound,

bringing all of the information together with Videotex. The system allows integration of moving images and sound, with a text that can be easily updated and operated on an interactive system. Systems such as this have also been developed which allow use by more than one person at a time based on a networking concept. In one particular case the system known as Medianode 8 makes use of one extended IBM PC computer to operate eight individual terminals simultaneously and independent of each other. This means that up to eight data base presentations or inquiries can take place at the same time.

5.6 Core Technologies and Complementary Services

The purpose of this section has been to review some of the existing and emerging technological configurations and service configurations which are relevant for the assessment of Videotex and Teletext systems. From a technology point of view, one has to consider everything from the page creation technologies through to decoder technologies, storage devices, display technologies, transmission technologies and peripheral devices which can be linked together to create new system configurations. From the perspective of linking the technologies to the applications, it is clear that each set of applications has a unique and special requirement in terms of the technological configuration, e.g. for in-home information retrieval systems a hybrid microcomputer system may be linked into a central database which can serve both as a standalone Videotex display system, as a on-line information retrieval system using gateway technologies into a central processing minicomputer where a large database may be stored, or for switching to some other existing public or non-public database, and a microcomputer.

Alternatively, the standalone systems utilizing microcomputers and microcomputer software can be configured and fit into either the large closed user group applications typical of the large corporation, or alternatively can be set within the context of a public system. Still other technologies fit within the public domain where we often see standalone Videotex systems using such things as touch screens or voice activated terminals linked via a dedicated telephone line. In other cases an optic fibre cable may be used, and still in others CATV. Thus the important point of this task is not to view simply one configuration of Videotex and Teletext, but

TABLE 5.1
Technologies and Configurations

Page Creation System	Standalone, Norpak MK III, IV
	Microcomputer-based software, Program language C, Basic, Pascal, Assembly
	IBM, Apple, Sony, Dec
Decoders	Microcomputer-based software, Assembly, C, Basic, Pascal
	Commodore, IBM XT, Apple II, IIE
	Standalone units, VLSI chips, Norpak, Electrohome
Display Units	RBG monitors, colour TV and adapter, standalone units, touch screens, digital TV/HDTV
Transmission Technology	Direct dial telephone datapac, fibre optics, digital trunks, coaxial cable, CATV, VBI, full channel Teletext, LANS, satellite, microwave
Enhanced Systems	Laser discs, mobile Videotex, ETV, HDTV, two-way CATV

Two-Way Videotex Cable Services

Name	Characteristics	Services	System	Price
Canadian Two-Way Services				
Infocable	Data, audio & video commun. techniques Developed through Cable Telecommunication Research Institute	Games/financial planning/ education & information pkgs Business related services (i.e. credit card validation)	Hard copy printer for accessing information from central database Home micro computers (NABU) Downloading of software	(Low cost)
Infopress	Joint venture, London True Press & Cableshare Ltd. Information & advertising service	Community information/ weather/shopping info/news/ transit schedule/advertising	Telidon based Located in shopping malls/ public places 3 large screens 3 touch terminals tied into smaller screens	Hardware - $3M Service should pay for itself with revenue from advertising
IDA	(Trial completed)			
Manitoba Telephone	Trial: 100 homes - Winnipeg 33 homes also received Telidon terminals Telephone lines were initially used vs cable	Cable TV service Videotex, alarm & metering	Subscriber terminal unit/ basement; external terminal distribution control; channel converters	
Premier Communications	Proposed: Addressable & interactive services Vancouver area/10,000 homes	Interactive community programming, user feedback, interactive education, SFU, BCIT Teleshopping, fire/security alarm monitoring, medic alert, energy management, time shared Telidon, local grants	10 groups of 1,000 homes would 'time share' Telidon units, therefore max waiting time more than 3 mins State-of-the-art terminals	
SID System for Information on Demand	In progress	Trial to include: Telidon services, video games, home monitoring services	Advanced packet-switched, two-way cable transmission network	

(continued)

Name	Characteristics	Services	System	Price
Videotron Communications Ltee.	20 community 'telematique' centres, 250 terminals	Telidion info service Alarm services Stores personal computing info Community programming Demand TV system	To develop: Intelligent cable TV decoder, channel decoder, decodes pay TV	
US Two-Way Services				
Bison (Belo Info System Online Network)	Result of Belo trial 2-way cable trial 200 subscribers	Information supplied from the Dallas Morning News newspaper	Trial: Texas Instrument Computers Sammons Communications Cable Co.	
Comp-U-Card (CUC)	2M members	Teleshopping services		
Comp-U-Star	25,000 subscribers On-line extension, seeks out desired merchandise			Specifically designed video card or Comp-U-Cards
Comp-U-Store	Video pictures of product prior to ordering merchandise	Video demand	Videodisc In-store locations with application for cable TV being developed	
Shopping Channel				
Video Shopping Service	2-hour daily 'shopping by satellite', any cable household can view show Only CUC subscribers can purchase goods	Includes show cases for new discount information	Cable system reception	No charge
Comp-U-Serve		Business/home/hobby	Packet-switched computer networks Local telephone dial-ups Can be accessed by computer terminals	

(continued)

Name	Characteristics	Services	System	Price
Dow Jones			Trial - Apple Computer Sammons Communications System	
INDAX	Pilot - 6 mo project - 300 homes	Banks/retailer/etc. offering home services	Intelligent terminal & unlimited access to a number of services	$6.00/month Cable company receives revenue from stores/banks ($4.00/month Arizona)
QUBE (Warner Amex Cable Communications Inc.)	55,000 subscribers		Cable	
Sammons Communications	Trial: 200 subscribers	Information provided by BELO/Dow Jones/Merrill Lynch	Cable TV, MSU Texas Instrument Micro Computers	
Sourcecable	15,000 source users	Databases: New York Times/travel information/financial & accounting pkgs/classified ads/shopping services/ electronic messaging/games	Local telephone dial-up connecting to Telenet or Tymet packet switching, can be used with computer terminals or Micro Comp	$4.25/hour (non-prime time)
Times Mirror	Trial: Compare telephone & cable delivery of Videotex services 150 homes - 2-way cable 200 homes - lines	Info provider LA Times 20,000 pages database	Alphanumeric keyboard Host computer, front end microprocessor plus 3 external computers, personal accounting/travel/ teleshopping	Pricing introduced after 3 months and subscribers pay to receive services for further 3 months Max approx $34.00/mo

rather to view the diversity and variety of technological configurations, to identify their characteristics, to identify the key aspects of how they are linked together and how they work.

In keeping with the overall approach emphasized in this study, it is important to define core Videotex and Teletext technologies and a set of complementary and "linked" technologies. We investigate not only the core technologies and configurations for Videotex/Teletext, but linked hybrid-type systems and system solutions which are specified to meet particular applications. In some cases these will be hardware-based; in other cases they will represent network-based services such as local area networks being used for electronic messaging or the transmission of large amounts of voice and data systems within a particular defined market area. In others they may be formed through the development of innovative software solutions.

5.7 Outputs

The outputs from this investigation will provide an in-depth assessment of the emerging applications linked with various system technologies. These, of course, will be linked to specific market sectors since there is a close relationship between applications and the various user segments.

6.0 TASK 3: SERVICE MODELS

The third task for this study is to formulate service models. Specifically, to formulate generic models for various services identified in the previous two tasks. These models should include service, hardware used, system and complete service costing pricing strategies, etc.

Based on the information obtained in the first two tasks of this study, we propose to construct a number of service models which will identify key aspects of the Videotex/Teletext market. Specifically, we again have to consider the precise market segments we have identified, the various technology configurations that are in place and are likely to emerge in the future, and putting these two together to define a set of service models which provide an indication of the technology configurations, but as well the scale and scope of the service and associated costs for hardware, software, system operation including manpower allocations, etc. Since we are determining future service options, there will be a requirement to forecast future prices for these systems. As required, this will necessitate converting price and cost for current systems into future prices. All costs and pricing for future services will be made in constant dollars with account taken for the prevailing discount rate.

A complicating factor for this task, however, is consideration of the impact which increased demand for services will have on services, pricing and costs. While it is not difficult to assess current prices and costs, it becomes difficult to predict these as increased demand in the future allows hardware and software costs to decrease. Assuming current prices, even though adjusted for the prevailing discount rate, will therefore cause a distortion in the assumed price and costs for particular configurations. Thus, it will be important to link the demand forecast to this component in order to provide an appropriate price and cost range for the service configurations. An important aspect to this task will be the specification of the trends for pricing and costing of service components. This involves not only assuming the likely trend for component costs, but also consideration of the pricing strategies which are likely to be put in place. These strategies will vary according to particular service configurations and market segments.

In previous Wescom studies assessing pricing for Videotex services, specific market sectors revealed different propensities to purchase or lease hardware components. There were also differences in the desire to purchase on-line services by the page of by minutes of access. Variations also were observed for the options of fixed and variable rate fee structures.

The consideration of these pricing strategies will be included in this task and a review of the available and future possibilities will be provided for each of the sector and service configurations identified.

6.1 Network Commercial Services

The important consideration in formulating service models is to distinguish between those types of systems which can be configured as standalone systems, based mainly on microcomputers, and those systems which are operated as a commercial or public service. For example, in Canada we currently have the Grassroots system operated by Infomart, which is the most successful at the present time. This is essentially a network-based system using telephone lines as the transmission medium, and using specialized decoders for the display of pages of information in the selected 2,000 rural homes which are now participating in the trial. The components of this service model include the information provider structure, i.e. those individuals providing pages, the hardware and software used to develop, edit, store and send pages of information, which in the Grassroots case is based on minicomputer systems. The equipment used includes Dec Vax 1178, the Infomart ITSS software and Norpak decoders or keyboards. This represents the page creation part of the service component. The network component is the telephone lines which are provided on a province-wide telephone access base at a charge of under 5¢ per minute. The receiving equipment is based on Norpak technology and the users of the service have the option to lease or lease to purchase the equipment for their participation in the trial. This represents one service model which will be examined in detail and which would provide case study examples of the kind of service models required.

6.2 Microcomputer-Based Systems

Alternatively, one could look at a totally microcomputer-based system which would utilize software for page creation systems with an IBM PC XT, using either a VLSI chip equipped microcomputer for display technology or alternatively software specifically developed for encoding or decoding on a microcomputer system. Considering this as one model which might, for example, be a standalone single system, one could consider that the cost for such a system would include the cost for the decoder software, the cost for the microcomputer itself, special adapted colour monitor and the costs for the encoding software. These prices range anywhere from the low end of a few hundred dollars to the upper end of a few thousand dollars, with the IBM system itself costing $6,000 to $7,000 in total, such that an IBM XT using Videotex decoder software and Videotex page creation software would cost anywhere between $8,000 and $10,000 as a closed system.

Linking these types of systems together adds cost in terms of the transmission for the local area networks and represents only the total capital outlay that such a system would entail. In addition there would be costs for the time spent creating pages on a system, whether it was an in-house closed system or not, and these types of costs and pricings would have to be considered.

6.3 CATV - In-Home

A third alternative would be some kind of in-home system such as would be provided by a CATV capability, either one or two-way. Assuming a two-way capability one would look at the cost for a decoder, such as the new Electrohome CG 100 being used in the Chicago Keycom trial and the cost for accessing the particular non-programming services. These could either be flat rate or considered in terms of tiered pricing according to the range, type and function of services that would be included, e.g. a full transaction service, a variety of shopping services as well as downloading of software for educational or home management purposes. A typical pricing structure for such systems would be a tiered pricing structure which might start at $5 per month for access to these services and range on upward to $15 per

month, depending on which bundle of services one would require and one would access.

Alternatively, such a system might have no direct user charges and the pricing or costs of the system may be fully borne by the providers of information, advertisers, banks, shopping centres, etc. These extra costs would be spread over the number of individual commercial establishments who would use the CATV network and who are providing the interactive services into the home.

In terms of an in-home service requiring special terminals of one type of another, options there include leasing, flat purchase, etc. All of these have been suggested as a possible configuration in different service tests and commercial services now being offered.

In both the on-line business and on-line residence service models, considerations are immediately raised with respect to pricing and service charges for page accesses and system utilization. At the present time charges are levied on the basis of certain number of minutes per access time, which is typical for most computer systems. Various options could exist for a Videotex service including page access charges, transaction charges, charges for the number of minutes linked onto a network, or a flat charge based on assumed amount of usage over a defined time period, such as a month. Incremental charges could be levied as the base rate is exceeded.

6.4 Teletext

Teletext service configurations include the capability for CATV one-way or two-way using wide band fibre optics. Generally on these types of systems there are no charges to the user aside from the rental of the decoding unit on the television, although as stated previously it would be possible that cable companies could levy a tiered pricing structure much as they do now for pay TV where the non-programming services represent additional revenue generating possibilities. Much of the content creation on such systems would be subsidized through charges to advertisers or

commercial services given space on a database. Extra charges would be levied for database management, system updates, page updates, page editing, etc.

6.5 Specialty System

Another model which one would look at would be standalone specialty systems, e.g. those systems which use video discs in addition to microcomputer systems. These are used primarily for specialty uses, e.g. museums, archival institutions or situations where large amounts of data must be stored and ultimately retrieved. These systems are often composed of a video disc or laser disc application, some type of software for searching the database and NAPLPS for graphics and text presentation. The cost of such systems would entail the pricing of the hardware which might range anywhere from $1,500 for a read-only laser disc to $15,000 for a programmable laser disc. The microcomputer hardware would vary between $3,000 and $6,000, exclusive of the display software. In many cases specialized software is being developed for these systems, including artificial intelligence and natural query language systems. Costs for such software are difficult at this stage to identify, but would probably range anywhere between $5,000 and $10,000 for a simple information retrieval package using a query language.

6.6 Public Network

Finally, another example would be in public network systems where a series of standalone terminals may be in place, either keyboard or touch screen based. A central processing unit would be used for storage of information, with each of the systems linked either by telephone lines or hard-wired within the particular environment. Variants of these could be used for commercial information as well as public non-commercial information. In general, the end user pays nothing for the access charges or pages themselves, which generally are provided by an advertiser or service operator. From an industry perspective, of course, the costs for page creation and development would have to be assessed, but again this represents another configuration of a Videotex service model.

TABLE 6.2
Sample Service Models

Type of Service	Hardware (current and future)	Transmission (current and future)	Software (examples)	Pricing (possibilities)
On-line system - in-home (telco-based), eg Grassroots	Dec VAX 11/70, Sceptre ATT, Electrohome/Norpak	Telephone	ITSS, NAPLPS	Unit charges, lease, rentals
On-line system - business (telco-based), eg Inet	PDP 11 - micros Management workstation	Telephone, cable/LANS	NAPLPS, Unix	Hardware costs, access charge/minute
Standalone micro-based system	Micros - IBM PCs	-	NAPLPS (any of +20 available micro product), Unix	Variable, purchase, rental, leasing
Linked micro-based, LAN Business uses	Micros - IBM PCs, Apple, Commodore, Spectrix	LAN/Optic fibre, CATV, Wangnet, etc.	NAPLPS (any of various micro products), Unix	Purchase, rental, leasing
Broadcast Teletext TV Ontario	Set top - decoder, broadcast, Dec VAX, page creation unit, Mark IV decoders	VBI Open channel Full channel	Downloaded for user, micro or	Price structure, tiered pricing, access charges
Fibre optic wide-band Teletext - two-way Home and business	Switched Star option, tree & branch, utilized CATV	Full channel satellite, CATV, independent full channel	ITSS-2	Tiered pricing, service provider subsidized
Standalone specialty system, micro/video disc	Laser/micro	LANS	Micro-based encoder and decoder software AI - query languages	No direct charge to user, costs fully subsidized by service provider
Public network system Telco-based, CATV-based	Standalone units, Electrohome, Microtel,	Telephone lines CATV - when available, two-wazy independent full channel broadcast	Page creators, Norpak	No direct charge to user, possible pay terminals

6.7 Outputs

We propose, therefore, in this section to review fully the various service models which have emerged and those which will most likely emerge over the forecast period. We propose to develop a set of generic service models to link these with application areas and, using an in-depth analysis of both existing and planned services, to provide a detailed assessment of the hardware, transmission, software, pricing strategies and price levels for each of the service models which we have defined. To prioritize these service models in terms of market opportunities and time frames for penetration, as well as to identify existing market activity for each of the service models in the domestic and North American and, to a lesser degree, the international market. Cost for future services will be adjusted to reflect prevailing discount rate and to reflect the trends which are assumed to occur in component pricing as market demand increases.

Information for this section will be derived from our review and survey of the industry, examination of a variety of planned and existing services. Industry interviews will also be used to supplement information for technical and pricing strategies, particularly for emerging services. We will present the information in relation to emerging applications and define those areas where the most likely new development and directions are expected. it is important to specify what forms are relevant for current technological capabilities and those most relevant to emergent requirements.

7.0 TASKS 4 AND 5: DEMAND FORECASTING, MODEL AND EXECUTION

Tasks 4 and 5 are designed to present a demand methodology and forecast for Videotex and Teletext services. This is presented by first reviewing the past approaches, examining their strength and weakness, and making a recommendation for a future model and executing the proposed model.

The previous studies conducted by Wescom (DOC, Telidon Evaluation - Marketing and Economic Evaluation of Telidon) indicated that, "It was extremely difficult to know what the Videotex/Teletext products will actually comprise." Furthermore, the existing market projections for both hardware and software have been shown to be widely inaccurate. Projections made over the past three years have ranged anywhere between 40,000 terminal installations on upwards of 500,000 by 1984.

Our studies and reviews of the industry have illustrated and suggested quite strongly that a complete reassessment of the demand forecasting methodology is required in order to assess the potential for the Videotex and Teletext markets. As indicated, such a reassessment must be based fundamentally on a totally restructured demand estimation model which takes account of more of the factors of the marketplace than have been done to date.

Furthermore, it has been adequately illustrated that the viability of the Videotex products and market opportunities could not be directly assessed as a result of the response of field trial services. Field trials have been shown to be unable to provide the types of information, or an appropriate framework within which market opportunities could be adequately forecast.

The past two years have seen some movement towards market trials, where a specific set of product attributes (characteristics), price and service configurations have been presented to a specified target group. Inet, for example, is currently in such a phase. There are as well the experiences of Infomart's Grassroots and Teleguide services in Canada and the Keycom and Viewtron services in the US. All of these will be examined and used to provide inputs to the proposed forecast model.

The important issues which emerge focus on:

a. What procedures and methods can be used to develop a market forecast?

b. How can the forecasts be verified and assessed in order to increase the confidence and reliability in a given set of estimates?

c. What data sources exist and are available for use in structuring the demand forecast?

The market situation analysis and technology developments for Videotex, Teletext, etc., highlight the need to approach any market forecast as disaggregated and segmented. The emphasis on applications rather than simply the technology also support this view. Furthermore, it is recognized that there are a number of primary Videotex and Teletext markets, and a large and growing number of very specialized developments in the domestic and North American markets. We have deliberately not separated the Videotex and Teletext sector since it is already evident the future capabilities indicate a significant overlap in the application each will address. In the short term Teletext will be restricted to one-way services. However, this will change as the banking and shopping services emerge. Examples are provided in the accompanying table. The international market must be viewed as well, since this will offer opportunities for sales and licensing of software, hardware and systems development and consulting.

The models and approaches used to forecast the demand for Videotex and Teletext (Ref: Hough, Hielding & Johnston) were based essentially on the belief that a large in-home market would emerge and these were essentially in-home products. This has now been shown to be inaccurate. As we have illustrated in the previous sections, Videotex, Teletext and related services are highly segmented; their nature and use is dictated by a variety of applications, each addressing specific sectors of the market. In most cases markets exist for specialized uses which could be in the business market, the public sector, government services or some variant of these. There is, as noted and as exemplified by the Grassroots services, an in-home market, but this is a highly specialized market, and in the case of Grassroots directed largely to the farming community. Other major markets are expected in banking, interactive services and transactions.

TABLE 7.1
Sample of Selected Market Segments and Technology Configurations for Videotex/Teletext

Market Segment	Technology - Short Term	Technology - Long Term	Users	Market Potential (Sample)
1. Business:				
a. Standalone business display graphics	PC Videotex software On-line minicomputer	VLSI microcomputer equipped (satellite, microwave)	Medium and small business	High --- High
b. On-line services, inventory, sales, etc.	Minicomputer, micros, standalone units	LANS, query language	Medium and large business	Medium --- High
c. Information retrieval	Gateways, telco-based	CATV cable, Teletext, Two-way AI	Large, medium and small business	Low ---- Medium
d. Real-time displays	Micros, Videotex-equipped terminals	Satellite, broadcast management workstations		High
e. Messaging	Minis, micros and modems	Optic fibre, satellite, mobile Videotex cellular radio	Rural/remote business	Medium
2. Promotional & Advertising:				
a. Display systems	Standalone, Videotex	Video discs/lasers	Merchants, store operators	High
b. Shopping guide	Video discs and micros		Merchants, store operators	Medium --- High
c. Restaurants	Micros, on-line systems	Enhanced TV/mobile	Merchants, store operators	Medium --- High
d. Sponsorship	Minis, on-line systems	Large screens/mobile	Merchants, store operators	Low --- Medium
3. Specialty Applications:				
a. Sales and marketing	Micros, standalone	Video disc, laser disc	Stores, expositions, fairs	Medium
b. Presentations	Standalone Videotex	LANS, HDVT, CATV,	Clinics, schools	High
c. Health services	Video discs, Videotex	two-way mobile Videotex,	Museums, archives	Medium
d. Arts and culture	Video discs, Videotex	two-way micros, AI	Fairs, visits (VIPs)	High
e. Special events, VIPs			In-home, informal, industrial	
f. Training				
g. News magazines				

TABLE 7.1
(continued)

Market Segment	Technology - Short Term	Technology - Long Term	Users	Market Potential (Sample)
4. Public Commercial:				
a. Hotels	Standalone dedicated terminals, keypad	HDTV screens Pay Videotex CATV	Business	Low --- Medium
b. Tourism	Standalone micros	Touch screen, voice	Tourists	Medium
c. Restaurants	Terminal in a network	Voice activation	General public	
d. Airline guide	RGB adapted TV, micros	Micros, CATV		High
e. Banks	Standalone, micros			
5. Public Non-Commercial:				
a. Transit services	Network, public units	In-vehicle terminals	Public sectors	High
b. Government services	Network dedicated Videotex	Mobile systems, CATV Two-way Teletext	Public	
6. Community Info:				
a. Community groups	Micros, standalone terminals, Teletext/Videotex	Micros, HDTV, CATV	Special interest groups	High
7. In-Home:				
a. Banking & transactions	Micros, adapted TV	Videodiscs, FM stereo	Upscale - urban populations	High
b. Hobbyist	Teletext, two-way	HDTV/ETV	Youth, upscale demographics	Medium
c. Education & training	Micros, adapted TV Teletext, one-way hybrid	Satellite broadcast, Teletext	Middle & upper income families	Medium --- High
d. Special sectors rural, remote, native)	Downloaded software	Two-way CATV	Special interest groups	Medium --- High

7.1 Modelling Approaches

It has been correctly identified that there is no generally accepted methodology to estimate the demand for new technologies such as Videotex. Generally what is required is the bringing together of a number of methods and procedures to define an approach which can give a reasonable approximation of future demand for new services. To provide some perspective on the various approaches that are available and to give some indication of how the specific approach developed for this study was devised, it is worthwhile first to review some of the more well known approaches which have been used to forecast demand for Videotex services. The various approaches can be classified into three broad categories:

a. Desk top research includes historical analogy, analysis of diffusion of innovations, retrospective surveys, household expenditure approaches, complementary and competitive analysis, and aggregate transaction models.

b. Field research and experiments includes delphi techniques, market forecasting from supplier data and market research.

c. Analysis of historical and experimental data includes disaggregate activity models, elimination by aspects models, and complementary and competitive analysis.

7.2 Historical Analogy

Hough (1980), in forecasting the likely penetration of Videotex, used essentially a historical analogy model. These use the diffusion path for a set of business and household innovations to forecast the diffusion path for Videotex. Examination of Hough's forecast revealed a significant range between the upper and lower bound estimates for the same year which underscored a fundamental weakness of the method. There is a substantial degree of dissimilarity in the diffusion pattern of different innovations. Thus, widely different forecasts for Videotex set adoption were achieved depending on whether or not the set of analogous innovations included

television. Without a careful comparison of the conditions surrounding the adoption of television and the potential adoption of Videotex, there is therefore no firm basis for classifying television as a relevant analogy to Videotex. Indeed, as has happened over the last few years, the market for Videotex and for using the television as a display mechanism for Videotex has been extremely limited, mainly because of the lack of cost competitive decoders and perhaps more importantly the lack of comprehensive and well designed content.

An assessment of the historical analogy approach reveals that the uncertainty regarding the appropriateness of the particular analogy chosen, along with a wide variation in historical growth rates for different innovations, presents a serious limitation to its use as a method for providing reliable demand assessments. However, the approach is useful for providing benchmarks and guidelines within which a forecast under certain conditions can be made.

7.3 Diffusion of Innovations

Diffusion analysis attempts to extract some generalizations about the diffusion processes and are useful in forecasting the adoption path of a specific innovation. Using this approach, however, one suffers from the same weaknesses of the historical analogy method. Specifically, the average diffusion pattern will not necessarily be a reliable guide to the anticipated diffusion pattern for any particular innovation, nor does it provide a reliable insight into the quantitative impacts that external factors can be expected to have on the acceptance of services such as Videotex/Teletext.

7.4 Retrospective Surveys

This approach is closely related to the diffusion analysis. It involves post hoc surveys of how new developments were introduced, the problem with implementing them and so forth. The objective is to identify the general factors thought to determine the use or non-use of the new technology or system. However, once again this approach requires a careful comparative evaluation of surrounding demand and cost conditions, and even then the resulting sample would probably be too small to

provide statistical reliability. Other methods seem to hold more promise than this approach.

7.5 Household Expenditure Approach

The household expenditure approach can be defined as being composed of six steps:

a. determining components of a base year household expenditures vulnerable to diversion to a Videotex/Teletext service

b. project the growth of (a) to the forecast year

c. determine the maximum plausible part of (a) that may be taken by Videotex service and competition with other new or growing expenditure items serving similar purposes

d. identify this value (c) and consider its variation across household groups segmented, for example, by income

e. determine the threshold Videotex expenditure, i.e. the cost per month, for the lease rental or purchase, and services

f. use the distribution of household income or other relevant characteristics to estimate the number of households that could afford Videotex and judge what portion of penetration will actually be achieved.

In 1980, Hough attempted to use the household expenditure approach to forecast the likely penetration and subscriber rates for Videotex. This considered various pricing functions ranging from $6 to $25, the number of households that would actually be able to afford Videotex and the actual number of subscribers. Using a 1976 consumer expenditure survey, Hough estimated that the average dollars available for Videotex could be calculated by the average amount spent per household on items relevant to information retrieval and games, reading, recreation, education

and items relevant to message services: post, telephone and telegraph. This method produced, for example, an estimate that a typical household would need an income of $70,000 to support a $25 per month cost for Telidon. Forecasted households for 1985, based on this approach, were 26,000. Reducing the cost estimate to $13 produced an increase to 650,000. In sum, the model inputs lead to unrealistic and overly optimistic forecasts relative to what actually has happened in the market.

Another study produced by Hickling and Johnston (1979) provided an estimate of Telidon demand also using the income expenditure approach. It was asserted that the services which Telidon is most capable of supporting would compete primarily for disposable income, with products and services which cater to the consumers propensity for recreation, entertainment, education and culture. The estimates produced by Hickling and Johnston suggested approximately 114,000 subscribing Canadian households in 1983, which were projected to rise to 1.9 million by 1991. Since future Telidon service demand depends to a large extent upon its characteristics in relation to competing and complementary technologies, there will obviously be great uncertainty attached to estimates which fail to incorporate competitive and complementary analysis.

The central fault of the Hickling and Johnston study rests on its discussion of serviceware and assumptions of Telidon's usefulness to firms and individuals. it was thought that Telidon would diffuse from the top downwards via high income groups who possess more disposable income for such purposes. However, it is quite possible that expenditures for such immediate consumption will not follow a top down model. More significantly, Telidon will not necessarily compete primarily in the cultural entertainment portions of individual budgets.

It is suggested that Videotex is more attractive, in fact, to persons for whom it offers some kind of economy of convenience, time or access, or alternatively allows increased use of a service or product already purchased.

Since we are essentially talking of economies of time, effort and access to specialized services and information, the kind of configurations for which Telidon

was initial configured will not necessarily diffuse in the way an entertainment luxury good usually does.

Other problems centre on the assumptions about price, and in fact there was no basis in the Hickling study to assume that a $30 figure was realistic. In general, most of the past forecasts have focused on the idea that information retrieval would be the prime application for Videotex and that the home market would be the driving force. Clearly too much emphasis has been placed on this and not enough emphasis on the disaggregated approach to the features and services of Videotex in its numerous formats within a highly segmented marketplace.

7.6 Demographic Attributes Model

This model was used in the US and is based on forecasting a set of demographic attributes in households that will actually subscribe to one or more Videotex or Videotex-like electronic publishing services. This involves disaggregating households into finer and finer categories based on their assumed receptivity to computerized transmission and display media.

In a study conducted by Tyler (1980), he asserted that eligible Videotex households are those whose members are under 35 and therefore presumably are more familiar with computers and therefore willing to adopt computer-based innovations. Tyler asserts that the potential adapters are not likely to be more than one-third of all eligible households. Based on an assumed penetration rate from PCs with modems, Tyler projects the number of US households likely to subscribe to Videotex publishing services.

The most interesting point is that Tyler takes a necessary steps in recognizing that there are other factors besides income that shape the attitudes of potential adopters towards Videotex services. However, the method of making the assessment was somewhat informal and failed to incorporate analysis of competitive advantages and disadvantages of available Videotex protocols relative to alternative technologies usable for the applications of Videotex. It also is extremely generous in its assumptions about the content and services to be provided.

7.7 Competing and Complementary Analysis

A review of the various models and approaches reveals quite clearly that in most cases they are overly simplified, and that assumptions about the various diffusion rates can easily be questioned. One of the underlying and most important aspects that have been reinforced in this critique is the need to consider competitive and complementary analysis in the appraisal of opportunities and potential which Videotex may have. The purpose of this form of analysis is to identify the anticipated net advantages of an innovation in comparison with alternative technologies in order to determine the expenditures that might be made for the innovation in competition with existing or new products or services filling similar needs. Such analysis must acknowledge the availability of complements which enhance the net advantage of the innovation under examination. A prime example of this is the trend toward equipping personal computers with Videotex cards which will expand the means to access Videotex protocols. Likewise, one could examine the cable CATV industry and realize that non-programming services will most likely be added on to programming services utilizing the same cable transmission medium to provide another access point for Videotex.

These types of complementary technological changes should and must be incorporated for any evaluation of Videotex and Teletext's potential. The problems with this approach, however, are numerous and complicated by the fact we are not dealing with one simple technology. We are dealing with a technology that can take many forms which can depend on whatever opportunity area one cares to examine. As a number of researchers have noted, it is quite difficult to implement such an approach in practice given, among other things, the broad number of potential substitutes for any given innovation. In fact, implementation of the technique, while not impossible, does require a substantial amount of information to be known about the attributes of a wide range of products and services, and about the tastes and preferences of potential users. In many cases the requisite data are not available from field trials or market assessment studies. As a result, this restriction limits the extent to which any forecast can be provided which can truly be considered to have taken full account of these aspects.

Some existing studies have employed aspects of the competitive and complementary analysis technique to forecast the future demand for Videotex. Link Resources (1983) forecast the number of dial-up Videotex terminals in households in this way, defined as Videotex devices attached to the public-switched telephone network, exclusive of personal computers enhanced for Videotex capabilities. The forecasts were derived by assessing the ability of Videotex to substitute for existing services. The assessment incorporated a number of demand indicators generated from pilot offerings and market tests from the United Kingdom, along with the comments and views of individuals actually involved in providing Videotex and Teletext services. Butler Cox (1982) employed an assessment of Videotex users' likes and dislikes in relation to the attributes of Videotex to project the number of terminals.

7.8 Delphi

This approach is an opinion consensus technique using experts. An example of this technique is provided by Tydeman (1982) who forecast the number of households likely to use Teletext and Videotex in the US. These forecasts were compounded from responses to a questionnaire distributed to 77 knowledgeable individuals in Videotex and Teletext related industries.

Delphi as a technique has been used rather extensively and has a number of well recognized shortcomings; these include whether so-called experts have indeed provided an unbiased view -- they tend to be somewhat elitist in their examination of a particular issue and they often tend to "oversell". Delphi techniques suffer from the fact that suppliers have a strong incentive to offer upward biased estimates of potential demand, particularly when government assistance for hardware and software may rest on what the potential market is estimated to be.

The Delphi technique, while it has been criticized, does have a number of advantages. These includes its ability to provide initial thought and assessment, the capability to develop scenarios of what may happen, the abilty to focus attention on specific issues, and the consideration of new and innovative products. It has an ability to focus on new and innovative products which would be meaningless to the majority of people if consumer surveys were employed.

7.9 Market Research

Still another approach involves market research which relies usually upon survey methods of buyer preferences. In this approach respondents are led to reveal their attitudes towards a product's attributes including potential prices and the product's attractiveness vis a vis competitive products. The major shortcoming, however, is that expressions of preference are not necessarily equivalent with behaviour. This is particularly the case when new or innovative products are being considered and many individuals would not have had experience, let alone understand exactly what the system or product is capable of doing. In other words, its attributes may not even be known. However, some aspects of market research do give useful insights, particularly when there is a knowledgeable group of individuals or where qualitative group discussions are employed to flush out some of the more important concerns with respect to a service or product feature.

7.10 Field Trials and Laboratory Experiments

These approaches represent alternatives for soliciting information about consumer attitudes toward and perceptions of an innovation. Generally these are obtained after a significant amount of time has passed, allowing users to interact with and use a particular piece of technology.

The results from the field trials conducted for Telidon, as reported by Wescom, indicate in most cases the type of data that was collected and the design of the trials was not very useful for making future market forecasts. There are some uses from this data, however, and they centre primarily on understanding what some of the product features and capabilities are that users like or dislike; specifically screen size, print style, speed of formation of images and graphics on the screen, keyboard layout, and keyboard style and design. All of these types of information and those related to special user groups emerged from the field and market trials that were conducted.

7.11 Forecasting Procedure

When attempting to assess a likely penetration and demand for services, such as those provided by Videotex and Teletext, it is clear that what has to be considered are both the growth and development of competing media, the growth and development of substitute media, and the pricing structures which are developed around these services. As important as the product attributes themselves are such things as pricing and the pricing and positioning strategies which will exist in the marketplace.

Case study examples of pricing and the acceptance of Videotex, its complements and substitutes, however, are very scant, although a number of services are now in operation which will provide opportunities to assess these issues. None of the field trials, for example, conducted in Canada were designed to measure the way Videotex/Teletext was perceived by potential customers relevant to existing media.

In one study conducted by the authors for a major telephone company, participants were offered a number of options of payment for proposed Videotex service. Preferences for particular payment methods were assessed and disaggregated according to whether users were in business, home, public or government agencies. Each had significantly different responses to the price configurations.

The recommended approach to assessing the demand for Videotex, Teletext and related services takes account of a number of factors and features contained in the different approaches already attempted for forecasting the growth of innovations. At the same time, attempts to include the critical aspects of complementary and substitute technologies, and of addressing the issue of specific net benefits which Videotex-type services will provide within the various market sectors, have been identified.

The proposed model is disaggregated and is orientated toward segments of the market and examines Videotex and Teletext services in their different forms. No one form of Videotex is assumed, although it is certain that there are some configurations which are more likely to come into the marketplace than others.

This likelihood is conditioned to a large extent by current activities which are taking place within the marketplace and which have helped on the one hand to diffuse the market, but on the other hand have provided some indications of what will and will not work.

Essentially, the model we propose is composed of:

a. segmenting the market
b. sizing the market segments
c. assessing the market and revenue shares which are likely to occur
d. identify the competitive advantages and disadvantages of Videotex/Teletext
e. specify specific characteristics which Videotex/Teletext services offer in different configurations
f. define the attributes of alternative technologies which could be used
g. link the various aspects to particular market segments.
h. size the growth of sectors and demand with revenues likely to be derived based on assumed price levels and strategies
i. consider emergent standards, regulatory stances and broad economic forces likely to affect product developments, marketing and growth
j. devise forecast scenarios taking account of different assumptions for revenues, costs and broad economic trends.

It is clear from examining the resources and time scale available to conduct this demand assessment that a detailed, in-depth market research project cannot be conducted. Rather, what is required is a carefully thought out and well structured top-down approach to assessing market demand, and to support this approach with a number of activities, including interviews, expert panels and the collection of primary data from existing commercial services where price and demand functions can be assessed. In the absence of in-depth market research, the potential market must be defined on the basis of available literature, existing industry developments, interviews, reports, expert opinion and assessing complementary and related technologies.

The first stage of this assessment will be to identify market segments for the product or services in question. The segments will be identified in a homogeneous manner such that the demand characteristics of the segments are similar and therefore subject to more reliable estimation. It is quite well known, for example, that we can now separate business and residence markets, and further segment each of these into specialized application areas.

The previous tables provided a preliminary breakdown of the key segments in the marketplace. These include:

1. The business market, which can utilize Videotex primarily in the short term as a standalone system for on-line services, information retrieval or real time display (to some extent transactions).

2. The promotional advertising market for display systems, shopping guides, restaurants and sponsorship programs.

3. The specialty applications market, dealing with sales and marketing, presentations, health services, arts and culture, special events, VIP visits, training, news magazines, etc.

4. The public commercial market being used primarily for hotels, tourism, restaurants, airline guides, banks, etc.

5. The public non-commercial sector defined by transit services and government services.

6. The community information sector of special interest community groups.

7. The in-home market consisting of banking and transaction services, the hobbyist market, education and training, and the specialty sectors, rural and remote and native groups.

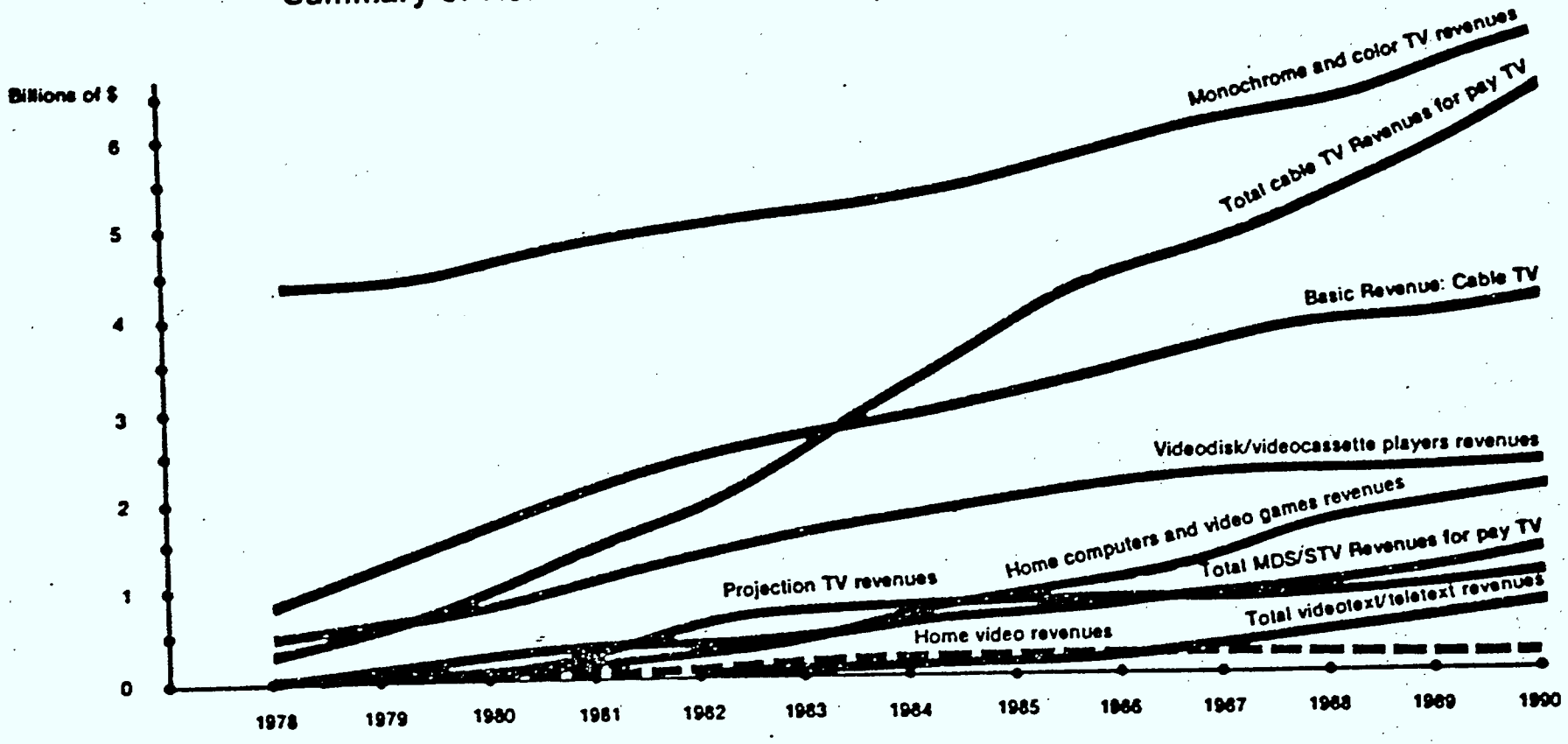
This list, by no means totally comprehensive, does represent a preliminary breakdown of the seven key sectors which have already begun to emerge in the marketplace. Associated with these sectors is a set of technologies which can be broken down in terms of those relevant to the short term and those for the long term. An important point is that what we see today emerging may not necessarily be the feature method of carriage or presentation for either Videotex or Teletext services in any one of these markets. Currently a number of technological trends indicate, for example, that while two-way CATV may not be feasible today it may be feasible in five years. It could be the most preferred technology for carrying a particular application into a particular market segment.

What is also important to consider when we look at the segmented market is not simply that the markets themselves are segmented or that the applications fall into different sectors, but rather that associated with each sector is a set of existing technologies. It is these existing technologies which constitute the prime base for assessing the potential for Videotex, at least in the gross or aggregate sense. The next stage in the process is to examine the growth, development and trends for a set of linking technologies or complementary technologies that have been identified with key sectors and applications. Primarily we can classify these at the present time in terms of microcomputers and micro-based software. Microcomputers can be broken down in terms of business micros and home micros. Associated with these is the penetration of minicomputers which can serve as the basis for a distributed system. Local area networks will serve the business market in competition with the growing CATV penetration into the urban core for business. Video and laser discs, optic fibres, digital trunk lines, microwave transmission, satellite broadcast of Teletext, and FM stereo developments for Videotex and Teletext -- all must be considered.

The forecast of the application sectors is made in terms of related technologies, particularly those for which Videotex and Teletext will be complementary and can be assumed to be linked for their growth. Forecasts for the penetration of these and their market value will be made in 1983 constant dollars (see Table 7.2).

TABLE 7.2

Summary of Home Video Consumer Spending



We propose to present a high, medium and low projection from the base year on through to the projected 1990 period. Typical of the kinds of information which would be used would be the growth and development of microcomputers sold to the home and business markets, and the total installed cumulative base projected to the forecast years. The Videotex forecasts based on microcomputers in the home and business markets will be provided as a high, medium and low estimate in each sector.

In terms of Teletext projections, one must look at low cost decoders and Teletext equipped TV sets and assess the potential number of households who are likely to receive Teletext services, both in the domestic and North American market. These forecasts will be complemented with forecasts of the likelihood that new television technology, particularly HDTV, enhanced television and digital television, will come into the marketplace in the next 15 years, and their assumed growth and penetration.

Since cable has been identified as a key player in this industry, examinations will have to be made of the pay cable TV industry in terms of subscribers, rates, rate increases and percentage of TV households that are projected into the forecast years. We will examine the revenue base for these services, particularly those that have been provided for the non-programming sector, and the fees that have been attached to the proposed services.

Other related technologies which must be examined include capabilities for mobile satellite transmission of Videotex. For these purposes we would look at forecasts that are currently being made for the penetration of such things as mobile satellites, cellular radio and other satellite forms, including microwave transmission in more restricted areas.

With respect to the revenues and the costs that have been associated with Videotex services, it should be noted at the present time in North America, particularly in Canada, there are no well established criteria for determining what price the subscribers are likely to pay. Pricing strategies are complicated by the fact that the role advertisers will play in subsidizing the cost for the end user and the role

that banks will play in terms of seeding the market with terminals and not levying direct charges -- will have an effect in establishing what the pricing and therefore what the revenue generation from the end user might be. As a result, it will be necessary to use surrogate measures for these and to look at the economic cost to the supplier as an indication of the value of services to the user. In this way the cost of service, while not being directly levied on the end user, must be taken account of. It can only be taken account of if one can identify the relative cost of service provision to the end user. These will have to be balanced against the benefits to the supplier of services. Indeed, it has been found in other studies conducted by Wescom that one of the most critical and most difficult items to identify with respect to the Videotex/Teletext technology is the pricing of services. This difficulty arises not simply because this is a new technology, but rather because there are so many options and configurations which one can envision depending on the particular application and market segment that is being dealt with. In some cases it makes sense to levy direct user charges based on the estimated number of minutes of Videotex usage. Flat fees per month with no usage-sensitive pricing, terminal purchasing or terminal leasing are also possible. In fact, in some cases the simple combinations of possible pricing structures composed of fixed prices for terminal rental, system linkage and system utilization based on minutes, page accesses, etc., become exceedingly complex to deal with.

These issues are relevant for both the resident and business markets, and emphasize the difficulties inherent in projecting potential revenues from users. One of the more important areas to examine, however, would be the revenues that are derived from the sales of Videotex services in terms of software, standalone systems or video disc applications. Here again the structure of the services and the structure of the pricing mechanisms will vary considerably across the various segments and sectors. As a result, a number of assumptions will have to be made about the average charges either for services, products, purchase or leasing, and the structure of usage-sensitive pricing either on the basis of number of pages or number of minutes of time used for a particular system. Alternatively this may be expressed in terms of a surrogate for service pricing derived from estimates of cost of the provision of service through the examination of banking institutions, financial institutions or special service providers.

As stated initially, since the detailed market research program is not possible for this study, reliance will have to be made upon other related complementary industry and supplier reports and a small sample of key industry players to assist in establishing what average pricing and revenue opportunities exist in each of the market sectors and application areas. The approach, therefore, will evaluate not only the potential gross revenues which can be derived from service provision over the short and medium term, but assessments will also be made of the cost of service provision in order to provide the net revenues that are likely to emerge in various sectors of the industry over the defined time frame.

The next part of this activity, once the potential market segments are identified, is to size each of the respective segments over the forecast period. This will be done both for Videotex and Teletext services within each of the selected market segments which have been defined. Within each we will examine related technologies in terms of their growth and opportunities for development over the defined time period rather than relying on end user input through the use of a detailed market survey. In general, detailed breakdowns of expenditures by application are not available for business and non-profit institutions, and furthermore expenditure patterns are likely to be much less stable in the non-household sector, as exemplified by the faster adoption, for example, of say personal computers in business rather than households.

We propose, therefore, that available estimates be used as baseline forecasts, and where no forecasts are available the use of a modified aggregate transaction model to forecast the quantity of transactions that Videotex or Teletext is likely to address. Reliance will have to be made on input from the industry itself which would involve a small-scale survey of a number of profit and non-profit organizations and emergent services. We would be relying on the industry to provide us with revenue and cost estimates of service provision for different sized markets and for different application areas. Ideally, we should examine those services which have been in operation or those which are planned for operation in the very near future.

The third step in our process is referred to as the market and revenue share

estimation. A relationship for a capturable market or a market share is defined in the following equation:

$$SI(t) = 1/1+(P_i P_c)^e$$

where SI is the share of the relevant potential market captured by the innovation, in this case Videotex or Teletext, P_i is the price of the innovation, P_c is the price of the conventional technology, and e is the elasticity of the substitution for the particular technology.

The implications of this equation can be seen by assuming the price of an innovation and its conventional substitutes are equal, and that the elasticity of the demand equals 1; in this case SI(t) will equal 1/2. The key, however, becomes the estimation of the price ratio over the forecasting period, and the assigning of values for the elasticity coefficient. In most demand studies forecasts of the price ratio are determined from a detailed market survey. In a top-down analysis, such as the one contemplated here, we would use estimates provided directly or indirectly by industry experts.

The study we are dealing with is complicated by the fact that the price factor is extremely complex, since prices are going to vary across each of the different configurations of Videotex, i.e. whether it is micro-based Videotex, on-line system or standalone in-house minicomputer-based. As a result of the complexity of this problem, a simplifying procedure must be developed and set within the context of our top-down approach. No detailed market assessment using, for example, an econometric approach to elasticity coefficient estimation can be feasibly thought of in this particular study. Our approach must establish aggregates and average proportions of market shares that Videotex/Teletext-type services are likely to capture. This will be set within the context of the likelihood for capturing existing markets for services now provided by competing technologies and, in terms of the markets which Videotex/Teletext will capture by expanding the capabilities of existing technologies, in other words as a marginal add-on to management work-stations, or as an integrated office automation software package. The important question becomes what increment is achieved in the market sales through the

addition of the Videotex capabilities. Thirdly, we will estimate what the new potential applications will be for Videotex and Teletext that are not currently served by complementary or the substitutable technology.

In general then, the basis for this phase of the evaluation is a complementary and competitive analysis. Inherent in this is an understanding of what are the competitive advantages and disadvantages of Videotex and Teletext and related services. Already a large amount of information is beginning to emerge which provides indications of the characteristics of Videotex/Teletext services which users are evaluating positively in terms of accepting the technology to accomplish particular tasks and applications. These examples will help specify precise characteristics that have value and utility to sectors of the marketplace and which provide us with some indication of the relative likelihood of success that Videotex or Teletext will have in penetrating a particular marketplace. Again, in a detailed model, the ideal situation would allow us to develop utility curves and utility values for each set of characteristics of the Videotex/Teletext technology according to each of the particular market sectors and applications which have been identified. However, again limitations on this study prevent such a detailed approach and require that estimates and assumptions about the likely success based on the known characteristics of the current technology and its future capabilities be made. These assumptions will be derived through service assessments, interviews with key industry players and users of existing systems, and input from those who are designing new applications for the Videotex/Teletext technology over the longer term scenario.

This information gathered through literature reviews, structured interviews, assessment of existing services, and evaluation of new and emerging applications help determine the factors which will allow us to estimate potential users who are likely to buy the innovation at various assumed price levels and under various pricing formats. Consideration will be made of the various technological characteristics of competing and substitutable products. In this way an estimation of the so-called "e" parameter can be made. At the same time we identify estimated values of the innovation adoption from other studies. By evaluating their implied market share

results against our preliminary assessment, we are able to provide a somewhat more rigorous appraisal of market opportunities.

Conceptually what we will do is specify the desired characteristics of alternative technologies, identify their perceived attributes, and provide data on the characteristics that determine the competitive position of alternative technologies relative to those held by Videotex and Teletext technology within the various market sectors and application areas.

Secondly, we will attempt to provide gross estimates of the potential revenues derived from service sales. These will be based on knowledge of and estimates of the price characteristics and price elasticity of services, as well as the pricing characteristics which will emerge as the demand curve grows and as the unit sales for Videotex and Teletext systems in the residence and business markets begin to increase. An important point, therefore, is to establish the sensitivity in the marketplace according to the various sectors and applications.

We have already noted that in a number of instances the difficulty of this step in the process, since there are no well established guidelines for either the actual price charged for services or the pricing configurations which may be proposed. Once the particular application areas can be identified and once the linking technologies can be identified, and their growth patterns can be substantiated, the relative proportional gain for Videotex/Teletext relative to these technologies will be used to define the overall aggregate growth curve for the Videotex/Teletext-type services in each of the various sectors.

One further point which should be kept in mind, particularly with respect to emerging applications, is that it will be important not only to consider the direct and primary linking technologies for Videotex, i.e. microcomputers, CATV, optic fibre developments, etc., but also to consider existing complementary and competing products that are already in the marketplace and which provide applications for which Telidon or Videotex services may have to compete, or serve as complements. Some of these include electronic messaging, office automation systems, computer graphics, and on-line data base and transaction services.

The procedure which has been described should give us some reasonable approximation of high, medium and low market projections. These high, medium and low projections will be based on potential revenue generated under various conditions of the marketplace, regulatory environment and general technology trends that we believe will take place over the 15 year forecast period.

The final stage in the analysis is to evaluate the projections, which will be done in two ways. One will be by comparing them to available forecasts, and the second is to compare the implied diffusion rates of related products, such as colour televisions, microcomputers, video discs, etc. We will be relying quite heavily on the estimates which have been provided for CATV and other related technologies, and therefore will have to evaluate the overall outcome of the Videotex forecasts relative to these. As stated previously, we propose to project to at least three basic scenarios to allow a reasonable amount of variation to occur in the marketplace to account for unexplained changes or unaccounted technological, legal or regulatory developments. It is clear that the potential markets over the next 10-15 years will be influenced by various factors, including sales of systems, software, VLSI chips, the capability of manufacturers to introduce digital TV, the marketing capabilities for enhanced display technologies, etc. All of these factors will have to be considered prior to the formalization and finalization of our overall forecast for the various forms of the technology.

In sum, the activities outlined in this task include the development of a model for demand estimation, the identification of complementary and substitute technologies, and what we have referred to as linking technologies, the determination of aggregate values for parameters in the overall structural model proposed, measurement and consideration of interaction of the various competing and substitute technologies, the identification of external factors which are likely to influence the market demand, and finally the development of a feasible market projection considering a high, medium and low forecast over the 5-15 year period.

The outputs of the task will be presented in a written report documenting the procedures, framework and assumptions made to come up with the overall scenarios. In addition to this written report, we will present the results in tabular and graphic form illustrating the kinds of assumptions and calculations that have been made to provide the demand forecast.

8.0 TASK 6: INDUSTRIAL IMPACTS

The purpose of this task is to estimate the industrial and economic impacts likely to emerge from the development of the Videotex and Teletext industry. This will be based on the results of the previous tasks and is designed to estimate the net new economic activity in terms of revenues and employment which will be generated by the new services, and to estimate the impact on various industries such as the hardware, software, communication and service provider, as well as new business and industries that have been created through the development of this industry.

A secondary part of this task is to assess the impact that the increased amount of data transmission may have on the public-switched network for voice and telephone services.

In the most general terms, assessing the economic impact of this industry development concerns the ability to define the allocative and distributive effects on the Canadian economy as a whole. It is related to, though not directly identical to, a detailed cost benefit analysis in that the impacts of a project on those directly and indirectly participating in a relevant set of activities are considered. However, whereas a benefit cost analysis seeks to quantify net social gains or losses through aggregating consumer and producer surpluses, an economic analysis considers readily observable market determined quantities, most specifically, in concept at least, the increment to GNP associated with the development of the industry. What is referred to in the task definition as new economic activity is probably more correctly specified in terms of the increments to the GNP that would be associated with the development of this industry.

The task, then, is to consider the incremental impacts based on various forecast values for assumed diffusion patterns of the technologies through the particular and varied market segments which have been defined. A true economic analysis must consider both the forward and backward linkages of industry development, i.e. it must consider those things that are immediately added to the economic activity, such as the creation of jobs, but as well must consider the effect on existing systems in turns of competing and complementary technologies and in terms of the

replacement of existing economic activity or the reduction in economic activity, particularly loss of jobs which may occur through certain automated processes.

The key component of this task is to define what the economic performance of the industry is likely to be over the forecast period, and specifically to specify such things as number of jobs which are created, amount of revenue which is generated, and new businesses or industry sectors which are formed.

Concern in this task, therefore, must be related to the impact or displacement of conventional technologies by the new and emerging Videotex/Teletext systems and on the mix of job skills which would be demanded currently and in the future. What we are attempting to do is to define the relative labour intensities of the new vs conventional technologies, and to define or at least attempt to define the mix of job skills in the new and old technologies.

Finally, of significance to the Canadian economy as a whole is the international competition that can be expected over the sample period. This relates to possibilities for export and, of course, the foreign exchange revenues that could be derived through the export of software, hardware, consulting and services for the Videotex/Teletext industry.

With respect to direct industrial impacts of the diffusion of Videotex/Teletext systems, we are concerned with the derived demand for forward and backward linked activities in the Canadian economy. Related here would be spin-off areas of activity such as fibre optics, scrambling and decoding, conversion equipment, new and emerging hardware systems such as laser technology, artificial intelligence and software development.

Some groundwork for this activity has already been accomplished by Wescom in an assessment of the industry conducted in our previous evaluation studies. The evaluation was based on an in-depth appraisal of industry participants who are asked to provide estimates of the amount of revenue generated, the number of jobs created, the types of jobs created, the ratio of industry expenditures to government funding, the new businesses that have been created in sectors such as information provision, software, hardware and technology sector jobs.

In assessing the various industry activities among suppliers of services, Wescom has approached various industry operators. With respect to job growth potential, it was felt that a significant amount of optimism exists among industry participants in terms of the demand likely to emerge for services. As a result, there will be new job opportunities and employment prospects being developed over the next two to five years. Typically it has been estimated that for every new job in high technology industries, ten secondary jobs are created. Areas most likely to require increased personnel include marketing, sales, consulting, management and to a lesser extent, development and system application, engineers and designers. At the present time there is a dominance of technical and service personnel in the industry, while the future holds promise in the areas of applications development.

Assessment of the returns likely to accrue from investments in Videotex/Teletext indicate that a period of between three and ten years is a likely scenario to make the industry profitable. This provides the late 1980s and 1990s as the critical period for the industry, and it is felt that the industry growth is likely to be much slower in the short term than originally estimated, and the market will remain relatively small for the next few years. Estimates of market size were set at between $1 million and rising to over $300 million in a five to ten year period.

The most significant prospects for future growth of the industry were viewed as the international market, and the need was identified to place much more emphasis on applications and development of export opportunities in this area. Transactional services such as electronic banking and home shopping were identified as critical to fostering this development. Within the manufacturing and hardware sector a high degree of uncertainty was expressed about the possibilities in this area due to the rapid growth and penetration of micro-based software.

The analysis in this section will attempt to qualify and evaluate relevant factors in a structured manner which looks at the linkage between various components as best as possible within the defined budget and time frame. Essentially, the task relates to the development and evaluation of a simplified input/output model where we define certain relationships between the development of the industry itself and the likely outputs that will occur throughout the economy.

In a detailed analysis of this type, one would construct a matrix showing the input requirements of the backward linked goods and services along with the output levels of related forward linked goods and services associated with the unit output levels of specific goods and services, in this case of Videotex, Teletext and related technologies. The overall level of output in the forward and backward linked sectors for different estimated levels of production for Videotex/Teletext services, hardware, software, etc., would be obtained by multiplying the activity analysis matrix by the assumed output factor for likely adopters of the technology. However, it is not likely that the available information and data that would be readily accessible would permit a vigorous anlaysis of the input/output coefficients. Therefore we propose a more simplified matrix which examines various industry sectors and provides an estimate of the likely magnitude of activity broken down in terms of its relevant components. Specifically, we would look at the industry sectors such as the hardware manufacturing sector, VLSI chip manufacturing, software production, page creation, service operators, CATV and telco activity. Within each of these components, we will estimate the relevant measures of the development of the industry, e.g. the number of jobs that have been created, the number of jobs that may be created. As well, we would look at the revenues that have been generated currently and the projected revenues, and we would look at the cost implications for industry development. In addition, we will include the sectors of banking and retailing since these are known to be prime users of Videotex and ultimately Teletext services.

We propose to develop a series of relationships which can be most simply presented as a series of matrices. One matrix will describe in a comprehensive way the forward and backward linkages in the development of the Videotex/Teletext industry under various assumptions and demand forecasts in terms of the way the technology will emerge in various sectors. Second is a set of estimates in both a qualitative and quantitative nature of the overall levels of activity in the forward and backward linked sectors. Third is a table that lists Canadian companies with capabilities in the forward and backward linked sectors. The matrix developed for the related sectors will be the framework for portraying where various Canadian companies fit into the related sectors of the Videotex/Teletext activities. For example, we would list Canadian companies with capabilities in the area of transmission, e.g. the

various telephone and CATV companies. Accompanying this will be a detailed description of the commercial strengths and weaknesses of the domestic companies, along with an indication of the kinds of policies that might promote the ability of these firms to capitalize on their commercial strengths and thereby contribute more to the forward possibilities as the market services develop.

The main industrial sectors which must be examined for this study and which will serve as the basic framework for the economic assessment will be the hardware manufacturing sector, the broadcast sector, the CATV sector, the computer software sector and the telco sector. Each of these are directly related to the emergent and developmental aspects of the Videotex/Teletext industry. Each, however, has a different role to play in terms of the impact that developments in this industry will have. Related to these of course are the new and emerging industries. These include service providers, typified by such companies as Infomart. There will as well be a series of specialized application development companies who are emerging as providers of Videotex services, although they may not be system operators in the sense of Infomart or TV Ontario. These would include banks, retailers, financial institutions and educational training companies and specialized product developers.

In all cases inputs will be costed and account will be taken of the discount rates to express future expected revenues in constant 1983 dollars. The approach we have proposed recognizes the necessity of a detailed analysis but acknowledges as well the limitations which are likely to be placed on available data and resources to conduct such a study. It must be emphasized, therefore, that to a large extent the approach must be aggregated and presented in a more general way than a detailed input/output economic cost benefit analysis.

The underlying purpose will be to provide tangible expected benefits and economic impacts, as well as some of the intangible social and non-monetary impacts of the technology. Taken together, these provide an estimate of the overall net impacts of an industrial and economic nature.

The results will be presented in a report with the detailing of the methodology, the limitations and any proposals for further investigations.

8.1 Impacts on Telcos and Network Facilities

One of the specific requirements for this task has been to examine the impact that developments in these types of data transmission services may have on the telephone switched network. It is interesting to note that in the last two years, two of the largest trial operators -- Bell Canada and BC Tel -- have indicated that they will not be providing Videotex services, although both will likely carry signals should service providers wish to develop their business opportunities. To a large extent their decision is based on the uncertainty and the regulation of content-based services provided by federally regulated companies. It is likely that until a regulatory stance is made, it is not likely that the telephone companies are going to make large commitments to the implementation of a Videotex-based service. Their interest, however, will lie in network utilization and the potential revenues that can accrue from the carriage of content rather than the development and operation of full scale Videotex.

There is a growing interest among telephone companies in Canada and the US towards usage sensitive pricing, particularly for local services. This means that no longer will charges for calls be based simply on a flat fee, as is currently the practice. If USP becomes universal within each of the operating territories, there are likely to be significant revenue and cost impacts on the end user of any type of network-based service, whether voice or data. Given that customers are known to be quite price sensitive toward tariffed type services, additional user charges are likely to have dramatic effects on the likelihood of market success for transactional or on-line services.

In the business market, the situation is somewhat different than the residence market in that at the present time Inet, which is a business related on-line information retrieval service, is considered a success by most of the telcos that are operating under the umbrella of Telecom Canada in its operation. It is likely that as and when the forecast for interactive service capabilities do in fact take place, increasing pressure will be placed on the telephone switched network. The important considerations, then, in terms of an economic analysis relate not simply to the revenue generation capabilities that are inherent in the development of the

types of services which would utilize the telco network, but more importantly what are the effects on the revenue base of the telephone companies and what is the effect on the overall pricing structures that the telcos will have to implement to fully recover the potential revenues that will likely emerge, particularly in the local area, as the systems are implemented.

At the present time there are very few provisions being made for the measurement of local access services. The capital cost requirements for upgrading systems are thought to be quite significant.

Within the CATV industry sector, these issues are also relevant since, while on the one hand projected revenues and possibilities for the service seem quite positive, on the other hand a significant amount of capital expansion must be implemented, particularly in Canada, to enable a two-way capability to take place. Economic implications of this are quite significant, particularly for an industry which at the present time has a somewhat shaky revenue base due to a number of shortfalls in revenues derived from traditional product offerings.

A recent study estimates that approximately 20% of the cable industry revenues will arise by 1990 from the sale of non-video services. It is anticipated that the cable industry, which in 1983 received most of its revenue from television subscribers and pay TV services, will by 1990 be receiving additional revenue from transactional services such as Teletext and the downloading of software, games and for the use of personal computers. It is also anticipated that by 1990 the tiered services of Teletext plus all other transactional services will comprise revenues of close to $500 million.

Cable services are an important element in the overall Canadian communications industry, where operating revenues for telephone, telecommunications, broadcasting and cable services approached $10 billion in 1981. Of this total, cable operators grossed about $400 million and employed over 5,000 people by reaching approximately 5,000,000 homes.

It is suggested that as the regulatory authorization of new services in Canada is

instituted, cable operators will make large investments in upgrading their cable plant and these new services will prove to be commercially viable in both the US and Canada. This will lead to a greater return per subscriber and, as well, the provision of services in broader areas.

Growth forecasts for Teletext reveal an estimate of between 25,000 and 1,000,000 subscribers between 1985 and 1990, and interactive two-way services are projected to grow from 67,000 subscribers in 1985/86 to 270,000 by the 1990s. Revenues derived from interactive type services are expected to total approximately $8 million by the late 1980s. By 1990 these are expected to contribute $81 million through games and Teletext, and a further $32 million for interactive services.

8.2 Outputs

We propose, therefore, to develop for this task a series of matrices which will identify the key industry sectors for the industry in terms of Videotex and Teletext as well as related services. We propose within each of the sectors to indicate the relative magnitude or size of the market opportunities for each of these sectors and what role each sector will play. Thirdly, for each of the sectors we will identify the revenue opportunities over the short and medium term that are likely to occur given the various forecasts for the industry within each of the application areas that have been specified. Within each sector will be a vector which identifies such things as employment, job opportunities, jobs created, potential job loss, training and skill requirements development, new technological development, etc. Another vector will identify both the forward and backward linkages that we can identify to other sectors of the economy, and specifically this will involve the manufacturing of software, hardware, transmission and financial services sectors.

Thus, our task will be to identify both the future and forward linkages within the overall conceptual model which we are proposing, as well as the backward linkages.

In addition, we have identified the international market as offering a very important and significant opportunity for the industry as a whole. Therefore, assessing the opportunities for market sales and export sales will be critical to this evaluation,

since export sales have a significant impact on overall balance of payments and the generation of foreign reserves. While it is anticipated that the total magnitude of these sales will be somewhat small relative to the overall economy, some attempt should be made to assess what the relevant size of this contribution will be for the short and medium term.

As stated previously, all estimates for dollar terms will be made in constant dollars, with account made of the prevailing discount rate. We recognize in this sector that a rigorous cost benefit analysis of the type done, for example, on other high technology ventures such as the on-going Department of Communications MSAT evaluation, cannot be accomplished within the resources or time frame or budget that have been allocated for this project. However, our approach is to provide a conceptual model which is consistent with these more detailed approaches and, where necessary, to aggregate and to formulate our inputs in a more simplified fashion. The basic structural relationships, however, remain the same in that we are looking at both impacts in terms of job created as well as backward effects in terms of the loss of jobs which may occur in a particular sector. We recognize the limitations of this approach, but suggest that there are very few alternatives.

The basic inputs for this task will be a review of existing commercial and planned services, in-depth interviews with system and service operators, as well as a review of a number of studies that already exist and which have analyzed particular market sectors. Of course, all of this information will be linked back to the demand forecast and assessments that have been made in the previous sectors to provide an overall model for the industry and economic effects which are likely to occur as this industry develops.

9.0 TASK 7: RECOMMENDATIONS

The final task for this study is to provide recommendations which stem from this report. These will relate to the sets of issues which will have a direct impact on the development and future prospects for this industry. The prime requirement for this section will be to address:

a. the identification of services for which application programs may be beneficial for their market stimulation

b. the identification of areas where further R&D may be beneficial and also to identify private and/or public sectors where such R&D may best be carried out

c. the identification of requirements for regulations and standards that will aid in maximizing societal and industrial benefits to Canada.

The inputs for this task will be the results of the overall research program, discussions and interviews with industry experts, government agencies involved in the Videotex/Teletext programs, foreign service operators, research reports, policy papers and economic studies.

We propose to develop a panel of industry representatives to review the study recommendations prior to their finalization. Such a panel would be convened toward the end of the research program with input to our recommendations incorporated into the final report.

(Wescom has followed this procedure on other occasions and found it to be a useful mechanism to provide a comprehensive and realistic set of recommendations.)

This has been conducted for:

a. computers and education
b. privacy and Videotex

c. Telidon evaluations
d. software industry economic and policy study.

The main purpose of this section will be to present a series of recommendations stemming from this work which address both industrial policy and broader policy recommendations in the area of standards, regulation and social issues.

The industrial development policies are some of the most critical since if the proper industrial measures are not instigated, the industry represented by Videotex and Teletext is not likely to develop in a realistic and consistent manner with the overall developments for the high technology sector in Canada.

It is likely that as a result of the activities which stem from this work, a number of new directions will emerge, some of which will clearly be open to market development and will require very little in the way of government support or incentives. While it may not be necessary to provide direct government incentives in terms of grants, etc., what will be desirable will be the setting up of the appropriate frameworks and structures within which this industry can operate fairly and competitively on a domestic and international basis. Essentially, then, the goal of this task is to utilize the information from the study to assist in making recommendations which will provide an appropriate structure within which the industry can develop.

Some of the kinds of structures that may be required could be in terms of tax and fiscal policy incentives for industry development, specifically with respect to software and hardware development. Consideration will also be given to developments which encourage export market development for the Videotex/Teletext area and related technologies. It may be that separate policy stances are required given the structure which now exists in the high technology and communications industry, and specifically that Videotex-type services may be presented within the overall microelectronics policy. Teletext services, which are probably going to be more closely aligned with the CATV industry and with the broadcast industry, may have to be considered within the context of an overall broadcast cable industry stance.

This study is treating and evaluating Videotex and Teletext within an overall framework which is fundamentally based on market sectors and segments rather than an appriori separation of the two services. However, it is quite likely that separate policy directions and recommendations will stem in each of these two areas. As well, one will have to consider the directions in associated industries. Specifically, since banking and interactive services are gaining an increased prominence in the area of both Videotex and Teletext, it will be necessary to consider the kinds of recommendations that will help foster development in these areas, i.e. to encourage the development of a more open stance with respect to financial transaction services such that the banks and financial institutions will be able to institute these new types of high technology ventures to take full advantage of their economic and efficiency gains.

Alternatively, while there are enormous benefits to be gained through the development of high technology into some of these areas, policy stances will have to be made which will provide some measure of protection for the consumer and those using and providing services. Important issues include privacy, error resolution and responsibility with respect to transaction of banking services, computer crime, theft of services, distortion of databases, software copyright, access and competition, copyright of electronic data and software. With respect to home banking and transaction services, emergent issues are payment periods, advertising and confirmation of transactions.

It is interesting to note that although the majority of financial and retail transactional services are occurring in the US, it is expected that they will appear soon in Canada as their economic viability is proven in the various trials and services now taking place. There is a special irony, however, that Canada -- an early Videotex pioneer -- has terminated many of the Videotex trials without ever testing any transactional services, and in one case where it was tested the system and software have been sold to an offshore vendor.

If the major market share of transactional services in Canada becomes the domain of US multi-nationals, this activity will be replicated in the service sector and have well known impacts on Canadian manufacturing. Many Canadian industries ranging

from banking to telecommunications and cable are stringently regulated in Canada, and recommendations relating to deregulatory changes are most likely going to be necessary in order to allow Canadian firms to compete more effectively in this area of the service sector. Given the US deregulation of the banking and financial service sectors, the breakup of AT&T and the deregulation of computer and communications industries, with respect to entering each other's turf, Canada can no longer afford a regulatory lag with the US and major decisions must prescribe who is allowed to offer what types of services to whom and under what conditions. Deriving from this single questions is a morass of regulatory issues which range from the principal of separation of carriage and content to laws governing the banking, financial, retail, cable and telephone industries. Thus, important directions will have to be provided such that the appropriate deregulatory measures are likely to occur and will help in determining the potential competitiveness of the industries in this field and the diversity of service offered to consumers.

With respect to the industrial policy issues and the emergent developments of the marketplace, there is a close association between those issues relating to regulatory stances and the operational characteristics that this industry will take in the future. One must attempt to provide answers to questions relating to the way Canada's regulatory traditions for cable, telephone companies and broadcasters should be applied to the Videotex/Teletext industry and to the computer communications systems in general. Already a significant amount of confusion exists with respect to the definition of Videotex data bases and their position relative to more well defined and recognizable computer data networks.

Another important question which should emerge from this study is to consider what effects will regulatory changes have on the relevance of the separation of carriage and content in Canada, and how will this particular issue, given the insights this study will provide, enhance or detract from developments in the industry.

Given the fact that Videotex is essentially a communications protocol and that NAPLPS is gaining wide acceptance, further questions will have to be answered with respect to the concentration of equipment manufacturing, particularly if micro-computer software-based services are viewed as being the most viable and likely to

succeed. The important question, then, becomes what is the overall impact on the manufacturing sector. Likewise, as the production of VLSI chips proceeds, how can these developments be encouraged and what efforts might be made to encourage domestic production of such services.

Related to this is the fact that over the next number of years, personal computers and artificial intelligence are likely to be dominant forces in the provision of various configurations of Videotex. As these types of systems come into place, what are the implications for the home, education and small business markets?

Clearly, specific market sectors and segments, based on our overall framework for this study, will be identified as offering key opportunities for Videotex developments. It is likely, however, that a number of factors will also be identified that will illustrate limitations to achieving the overall potential that may be assumed to exist in these particular sectors. This study will attempt to provide answers to how the potential in these various areas, which may not be readily available or realized, can in fact be developed further and enhanced to assist suppliers and service operators in achieving the penetrations into these markets.

With respect to standards, at the present time NAPLPS has been accepted as the North American de facto standard. On the other hand, it has also been shown in this proposal, and will most likely be verified in the research activities, that competing standards for Videotex-type services still exist. In fact it is well known that many of the banking and transaction services currently in place are ASCII-based rather than NAPLPS-based. The important question, then, which is raised is the extent to which the standards issue is assisting and impeding certain developments, and the extent to which the belief in the settling of the de facto standard leads to a false assumption about the likely success of Videotex and Teletext services based on NAPLPS.

It is possible that through the establishment of certain requirements for manufacturing and the product development, indirect incentives and encouragement can be provided for manufacturers, service operators and content developers to proceed with their developments of Videotex and Teletext products. Again, the important

question which should be raised is what are these inducements and how can they be implemented to achieve the greatest overall effect.

Another important concern related to standards is the fact that until these are firmly settled, foreign manufacturers are not likely to begin to build extensive numbers of Videotex terminals or decoders until a single display standard is established. The adoption of standards gives assurance to the manufacturers and users that the product will not become obsolete in a short period of time. The importance question to a firm is which standards are optimal and at what level should they be applied. It is widely recognized that only through the production of cheap decoders, i.e. below $200, particularly for two-way CATV Teletext, will consumers have any inducement to begin to utilize these services.

With respect to the CATV industry, two-way cable is an important development and one which has been identified as offering a key to the introduction of non-programming services. Important issues, however, are raised with respect to the provision of these services from a regulatory perspective and from the perspective of the standard and quality of services that will be provided. Related to these are a number of consumer issues which may impede the early development of such services as interactive banking and transaction systems.

Considering the access to services, different terms could exist for telephone and CATV cable companies. For example, cable companies might be allowed to exercise selected functions and services offered to subscribers, while telephone companies would operate under a common carriage model. Important questions then are raised about the benefits or restraints which result from either industry if a differential approach is adopted. It is most likely that from an industry perspective, a deregulatory stance would be most preferred.

Teletext offers different conditions of access when compared to Videotex. The idea of unlimited capacity underlies the idea of common carriage is not present, and it is likely that Teletext will occur either in the VBI of an existing off-air broadcaster or over CATV. In the first case the question will regard whether the TV broadcaster or an outside party would program the VBI. With cable Teletext or Cabletext, the

number of channels is limited and access could be governed by a number of different approaches, such as regulatory allocations and priorities which determine content, which only partially determine content, or which simply influence content.

At the present time many of these questions remain unanswered, but as Teletext-type services become more widespread, answers to these questions will set the tone and framework within which the industry must operate. Broad issues are also raised about the nature of competition, and particularly the relationship between domestic and foreign service providers such as those between Canada and the US. The issues focus on regulatory, tax and physical measures which might be instigated to support Canadian content and the development of services and applications in the private and public sectors.

Perhaps the most critical of emergent issues and areas where directions are most immediately required involve the specific forms of development and export support that the government could instigate for the Videotex/Teletext and microelectronics industry in general. The applicability of a microelectronic export support measure is of critical importance to Canada's overall balance of trade in the high technology sector.

Given that a significant amount of input to this study will come from industry spokespersons, it will be important to identify the priorities that these individuals establish with respect to developments for the industry and its future growth and opportunities. Stemming from their inputs, however, will be a set of recommendations which relate specifically to the way the industry operators view requirements to assist and develop this industry, or at least to provide some kind of framework for the future within which it will operate. It is quite likely that their concerns will focus on such things as further development of applications, the position of the Videotex/Teletext industry in the overall high technology plan of the federal government, the nature of fiscal and tax incentives that may be instituted in the future, and the way that Videotex/Teletext-type services can be incorporated within the overall software and microelectronics policy positions of the government.

Other important questions which emerge are:

a. What types of research for content, database development and product development should be undertaken?

b. What kind of financial incentives should be put in place for companies and individuals participating in the industry, or who are willing to invest in the industry?

c. What developments should be specifically directed towards universities, colleges and other educational institutions to encourage the use, research and development of Videotex/Teletext services?

d. What types of write-offs for software development, investments, etc., should be encouraged?

e. What direction should be undertaken in terms of educational applications of the technology and support for the development of services and software addressing this particular sector?

f. What programs and incentives could be developed to address more directly the international marketing of Videotex and Teletext?

One of the critical assumptions that has been made about this industry and which will most likely emerge in this analysis is that the competitive edge of virtually all microelectronics technologies in industrial economies -- Videotex, Teletext, office and switching equipment, artificial intelligence, PCs, educational computing, etc. -- rely increasingly on software and serviceware rather than in the hardware component. Therefore, important developments and questions will be raised, and recommendations will be required, to consider the ways that the software and serviceware sector of the information economy can be encouraged to grow, and that some impact on the overall negative balance of trade in this sector will occur. The important question, of course, is the contribution of services such as Videotex and Teletext to these areas stemming from its future development.

We propose, therefore, to provide a series of recommendations which will relate to

policy initiatives and incentives specifically related to the high technology and microelectronics area, and which specifically relate to the way Videotex/Teletext-type services may impact on the overall strategies and trends for this area in the near future. We propose as well to investigate and consider the relative impact that various government incentive programs may have on the industry and to provide an assessment of the way tax and fiscal incentives may be incorporated into the overall microelectronics policies now being developed.

Another important concern stemming from this set of recommendations will be to consider the regulatory and standards issues, with specific reference to the impacts on the telecommunications, cable, software, hardware and computer industries, and to identify the relative impact that Videotex and Teletext-type services and policies for these services will have on the overall industry developments and their competitive position.

Finally, given the tremendous advances in interactive services and banking that are occurring, it will be important to have a set of recommendations which address the necessity for further developments and evaluations of this area.

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11.0 GLOSSARY OF VIDEOTEX TERMS

Alphageometric: A Videotex technology in which picture description instructions (PDI's) are sent to a microprocessor in the terminal which tell it to draw on the screen. An alphageometric display necessitates a more sophisticated decoder than an alphamosaic display.

Alphamosaic: A Videotex technology in which graphic images are created out of mosaic-type characters. The screen is divided into an invisible grid, and a transferred signal tells the decoder how to fill each individual square, as if literally creating a mosaic.

Antiope: An alphamosaic protocol created by the French government.

Artificial Intelligence: That branch of computer science which attempts to induce computers to act as if they were intelligent.

ASCI II: The American National Standard Code for information exchange.

Baud Rate: The rate at which data flows between computers or between the computer and a Videotex terminal. A baud rate indicates how many bits of information can be transmitted along a communications line.

Embedded Software: Also called firmware, this is software which has been permanently placed into a read-only memory (ROM) chip and placed into a computer.

Force Tuning: With a force tuning ability, any two-way cable system can allow consumers to switch back and forth between video to Videotex for either price or product information.

Gateway: Any electronic link between two or more computers allowing users who access the first computer to have access to the others without having to make a separate linkage.

Information Provider: Any company providing Videotex information to consumers via a system operator. An information provider does not necessarily process transactions and does not necessarily have a direct link to the consumer.

Keyboard: The full alphanumeric keypad, as appears on standard typewriters.

Keypad: A small handheld unit, usually with a limited number of functions, which, when utilized with a television, has been adapted as a Videotex terminal.

Microprocessor Chip: A tiny chip of silicon containing the central processing unit or brain of a large computer. Microprocessor chips, together with memory chips and chips for inputing and outputing data, comprise a computer-on-a-chip.

Modem: A device used to hook computers into a phone system. Modems convert a computer's digital output into audio tones.

NAPLP: North American Presentation Level Protocol. This is an alphageometric protocol of AT&T, which is derived from Telidon.

Packet-Switching: A technique of transmitting data on computer/telecommunications networks in which data from different locations is blended into single packets and sent in bursts. It is almost impossible to trace intruders on packet-switched networks.

Perscom: Personal or home computer.

Presentation Level Protocol: A standard according to which data is presented on a terminal. Examples of presentation level protocols are alphageometric and alphamosaic.

Prestel: The British post office's presentation level protocol (which is alphamosaic).

Protocol: A communication and presentation standard according to which digital signals are transformed to represent designs, colours, numbers, letters, etc. A protocol is important since it may affect the compatability of an information base and a terminal.

ROM: A read-only memory chip, in which information (such as software) is blown in by the manufacturer during production and can't be changed. Data can be read out of a ROM but cannot be written into it.

Service Provider: Any firm providing interactive services. Most service providers have their own computer, and consumers are connected through a system operator's switch.

Smart Card: A credit or debit card containing a built-in chip, so a history of financial/retail transactions can be encoded directly onto the card instead of in a computer.

Software: The instructions which enable computers to perform tasks.

System Operator: Any firm responsible for the operation of the Videotex information or transactional services.

Teletext: One-way broadcast transmission of text and graphic material. Teletext information is normally broadcast in the so-called vertical blanking interval of a television signal, that part of the TV which is black when the picture is rolling.

Telidon: The Canadian Videotex/Teletext protocol, which is alphageometric.

Tiering: A common practice of US cable companies of presenting separately priced services in levels or tiers, e.g. regular cable TV, pay TV channels, continuous rock video and sports channels, transactional services, etc.

Videotex: An interactive, two-way information system which uses either the phone lines or cable to display text and graphics.

Videotex Decoder: A technology which transcribes alphamosaic or alphageometric protocol signals arriving over the telephone lines or cable onto the screen of the terminal.

12.0 MANAGEMENT PLAN AND TEAM

12.1 Personnel and Responsibilities

Project Director

- **Peter J. Booth,** President of Wescom
  Mr. Booth will be the project director responsible for the overall conduct and management of this project. His experience in conducting similar technology assessment studies is referenced in the attached materials. He will be involved in all phases of the work and will be the principal author of the final report and function as the prime liaison with the Department of Communications.

Project Consultants

- **Steven Globerman**
  Dr. Globerman will have prime responsibility for the development of the market and economic components of the study.

- **R. Wills**
  Dr. Wills will have responsibility for assisting in developing the technology forecasting model, bringing his experience with innovation diffusion and policy analysis to the study.

- **T. Plowright**
  Ms. Plowright will be responsible for providing the inputs in CATV industry developments.

Project Assistants

- **Dr. B. Richards and M. McLaughlin**
  These individuals will provide research assistance to the project team.

- **H. Davis**
  Mr. Davis will be responsible for providing technical expertise with respect to the systems, technologies and technology developments.

Word Processing & Administration

- **T. Awram**
  Word processing and administrative support will be provided by T. Awram of Wespro Data Services.

12.2 Wescom's Experience

The proposed team for conducting this study has a significant amount of experience dealing with Technology Assessment, Economic Analysis, Technology Forecasting, Social Impact Analysis, Policy Analysis, Technical Assessment and Communications System Design (see attached materials).

The principals of Wescom have conducted studies of a similar nature dealing with DBS broadcast satellites for the Aspen Institute, MSAT for the Federal Department of Communications (ongoing), Telidon for the Department of Communications, Computer Communications for the OCS Program of the Department of Communications, and enhanced voice and data services for a variety of private sector clients. In most cases requirements were for a systematic appraisal of the developments of a particular technology and the assessment of expected impacts. The Telidon appraisal is perhaps one of the best examples of a comprehensive technology assessment approach. This work, presented in five volumes, has been widely praised for its quality of in-depth discussion and its ability to provide insights into economic, industrial, social policy, institutional, regulatory and standards issues. The success of this work is reflected in the Department's decision to encourage and financially support the publication of a book dealing with its results and content. All of the above mentioned studies are available for review, should this be requested.

Steven Globerman has been recognized for some time as one of Canada's leading experts on the impact of technology and diffusion of innovations. He has recently completed a book dealing with this topic, which is forthcoming in publication. His work has focused on appraising the way industry utilizes technologies and the impact of the information sector on economic performances. He has contributed to the Conference Board of Canada, the Federal Economic Advisory Board and various government departments on the subject.

Technical assistance and knowledge of fibre optics and broadcasting will be provided by H. Davis, President of H.K. Davis Ltd. Mr. Davis is a professional engineer who specializes in design, consultation and assessment of telephony, voice/data, AM/FM/TV broadcasting, cable television, VHF/UHF radio, microwave, satellite, optic fibre and optical transmission systems. Some of the more relevant achievements of relevance to this study are the development of the "KWP Network" cable communications network, connecting universities, hospitals and other institutions together in an extensive television, voice and data network. Another recent project involved the design and implementation of the Province of British Columbia's Fibre Optic ALRT communication system. Mr. Davis has been involved in TV technology consulting and engineering since 1960, and has assisted in the development of broadcast and cable services in several countries over the past twenty years.

A detailed description of the experiences of our project team are provided in the attached materials.

Wescom also has close connections with the Communications Department at Simon Fraser University. (Mr. Booth is a part-time lecturer.) Dr. B. Richards, one of Wescom's associate consultants, represents another of our proposed resources for conducting this study.

THE COMPANY

WESCOM COMMUNICATION STUDIES AND RESEARCH LIMITED is a consulting firm specializing in:

- economic and market analysis of the telecommunications and computer industries
- technology assessment and evaluations of computer-communications technologies and human factors research
- communications and transportation research, including computer and software policy analysis, social impact assessments, market and economic modelling and attitudinal surveys
- research methodology, including evaluations, survey design and execution, qualitative and quantitative research and statistical analysis
- export support of computer-based technologies to the Pacific Rim countries.

Vancouver-based, Wescom personnel includes:

Peter Booth	President
Russel Wills	Principal
William Richards	Senior Research Associate
Steven Globerman	Senior Research Associate
Teresa Plowright	Research Associate
Maureen McLaughlin	Research Associate

Recent projects include a national evaluation of Canada's field trials for Telidon, a microelectronics planning guide for the Province of Ontario, a software policy study for the Science Council of Canada, planning for Canada's mobile satellite program, work in office automation and telecommunications marketing, and industrial planning for several national governments.

AREAS OF CONSULTING AND RESEARCH

The types of work conducted by Wescom are varied and include both secondary desk top studies as well as primary data gathering and survey research. Some recent and current activities include:

1. Field trial design and evaluation for Telidon services across Canada.

2. Economic and market assessment for new technologies.

3. Social and technological impacts of emerging office automation services and products.

4. Evaluations of office automation field trials.

5. Office automation
   (a) Market trends
   (b) Impacts

6. Social impacts of mobile satellite communications.

7. Transportation and communication research: attitudes toward Public Transit in Vancouver.

8. Telecommunications studies dealing with attitudes, images, responses to rate and service alterations, quality of service measurements.

9. Attitude and image studies on behalf of BCRIC, Bell Canada and New Brunswick Telephone Co.

10. Advertising and design evaluation studies along with Corporate image assessment.

11. Retail location modelling studies and attitude and psychographic studies.

12. Development of on-going information systems for the monitoring of service provision and service performance in selected companies.

13. Consumer product studies on liquor, wines and foods on behalf of selected suppliers.

14. Qualitative research and control groups testing.

15. Focus group room rentals and recruiting.

Peter Booth: President

Education:	M.A. and Hon. B.A. in Social Sciences from University of Western Ontario and Ph.D. studies at McGill University.
Background:	Mr. Booth has been active in the field of communications research for the past seven years, and has been the principal investigator of more than fifty research projects. Before forming Wescom, he was Vice-President of a major research company in Toronto and more recently Partner and Director of Research at Group West Ltd. in Vancouver. Previous to that he was a researcher with Bell Canada in Montreal. Recent projects include Economic Studies for new and emerging communications services.
Area of Specialization:	Quantitative models, technology and social impact assessment, economic forecasting, attitude research.

In the area of transit research, studies have been conducted on "The Location of Public Facilities in the Urban Areas", "Models for the Efficient Routing of Transit Services", "Public Attitudes Toward Transit Services", and "Response to Transit Incentives".

In addition, he has conducted market research studies dealing with corporate attitudes, retail location and market segmentation, and the development of corporate-based market research information systems.

Current activities involve satellite research and the conduct of a major field trial evaluation of office automation equipment in the federal government.

Recent publications and studies include: "On-line Information and Videotex", "Automated Offices, Graphics and Videotex", "Cable Industry and Private Videotex Systems". In addition, studies have been conducted on "Public Information and Public Access for Videotex", "The Impact of Advanced Communications on Transportation and Transit Services" and "Telidon Field Trial Evaluations". New works include, "Social Impacts of Office Automation", conducted for the Department of Communications and scheduled for publication in 1983. In addition, Mr. Booth was the author of a five-volume study assessing Telidon services for the B.C. Telephone Co., four major background studies dealing with broader Telidon issues, including development and market opportunities. The studies evaluating Telidon field trials in Canada for the Department of Communications were composed of four volumes dealing with: 1) policy and regulation; 2) social issues; 3) marketing and economics; and 4) content and new services.

Russel M. Wills: Principal

Education: B.A., University of California (Berkeley), Ph.D., University of Washington

Background: Economist and communications researcher, Stanford University, Rand Corporation, Ministry of State for Science and Technology, senior economist, Economic Council of Canada, Consultant, The International Development Research Centre, the Aspen Institute, NASA-Ames, the Departments of Labour, Communications, Industry, Trade and Commerce, and the Science Council of Canada.

Area of Specialization: Economics, technology assessment, policy research, the diffusion of innovations.

Mr. Wills has worked as a research associate at Stanford University in the economics of information and later as research scientist for the Exxon Corporation. He has also done extensive consulting on subjects ranging from the design and evaluation of new communication technologies to the diffusion of innovations. In 1977 he was a research director for the federal Ministry of Science and Technology and later was a senior economist for the Economic Council of Canada. At MOSST he was manager of studies of Canadian R&D facilities, industrial policy research and was involved in export promotion of computer and software firms. At the Economic Council he designed and conducted a national survey of technological change and innovation in Canadian manufacturing industries. His Canadian consultancies have included, The Department of Labour's Task Force on Microelectronics and Ontario's Ministry of Industry and Trade.

Mr. Wills' recent work is represented by a four volume evaluation of Canada's field trials for Videotex 1983 (Department of Communications), "The Social Impacts of MSAT," 1983 (Department of Communications), "Software Policies for the Developing World," 1983 (International Development Research Centre), "Canadian Technological Dependance," 1983 (an industrial policy study for the Science Council of Canada), "Innovation and Technological Change in Five Canadian Industries --Telecommunications, Crude Petroleum, Plastics and Resins, Smelting and Refining, and Electrical Industrial Equipment," 1981, (the Economic Council of Canada); "The Transfer and Licensing of Technology to Canada," 1982 (the Department of Industry, Trade and Commerce); Softech: A Microelectronic Guide, 1982, (Ministry of Industry and Trade, Queen's Park), and Microprocessor-Based Media, 1982, for the International Development Research Centre. This latter work describes the technologies, software, markets, and Third World diffusion of chip-based communications media --videotex/teletext, speech synthesis and recognition, personal computers, satellite earth terminals, and integrated office equipment.

Steven Globerman: Senior Research Associate

Education:	Ph. D., New York University
Background:	Mr. Globerman has been active in the area of the economics of information for the past five years. As consulting economist he has worked in the fields of telecommunications, economics, effects of governmental regulation, industrial organization, international financial management and the diffusion of innovations. He is the author of more than a hundred economic publications and recent clients have included the Economic Council of Canada, Imperial Oil and the Ontario government.
Areas of Specialization	Economic modelling, policy and market research, the diffusion of computer innovations.

Recent studies conducted in the areas of economics and communications include The Adoption of Computer Technology in Selected Canadian Service Industries, Economic Council of Canada, 1981, "R & D and Productivity at the Firm Level", National Bureau of Economic Research Studies in Income and Wealth, Vol. 44, the University of Chicago Press, Chicago, 1980, "Recent Changes in Export Performances of U.S. Manufacturing Industries", The American Economist, Vol. XXIV, No. 2, 1980, "Market Structure, Internal Organization and R & D Performance in the Telecommunication Industry", Quarterly Review of Economics and Business, Vol. 4, 1980. Mr. Globerman's most recent work includes the creation of an economic model to predict market demands for Videotex/teletext.

Mr. Globerman is a referee for the Canadian Journal of Economics, Quarterly Review of Economics and Business, the Journal of Political Economy, Canadian Public Policy, the Ontario Economic Council, and the Economic Council of Canada.

Teresa Plowright: Research Associate

Education:	M.A., Communications, McGill University.
Background:	Prior to joining Wescom, Ms. Plowright was a Policy Analyst in the Social Broadcasting Policy Branch at the Federal Department of Communications in Ottawa.
Area of Specialization:	Communications policy and regulation, social impact assessment.

After receiving an M.A. in telecommunications research from McGill, Ms. Plowright worked as policy analyst for the Department of Communications in Ottawa in the areas of cable TV and Videotex/teletext services. She has also worked as a consultant to the Royal Commission on Newspapers, the C.D. Howe Research Institute (border broadcasting, evolution of the cable industry, and common carrier issues in local non-broadcasting services), Carleton University's Computing Centre (redesign of computer documentation practices), and the Ministry of State for Science and Technology (study of STI needs of Canadian firms).

Her recent reports and publications include "Computer-Based Instruction and Videotex," (1981); "The Automated Office and Videotex," (1982); and "The Cable Industry and Two-Way Services," (1982) -- three linked marketing studies done for private clients; "The Cable Industry and Telecommunications in Canada," (1980), for a Canadian cable company, "Social Aspects of Videotex Services: Proposed Research Directions," (1980) for the federal Department of Communications, and "Computer-learning: The Policy Imbroglio," for the Institute for Research in Public Policy.

CURRICULUM VITAE

William Donald Richards, Jr.
Department of Communication
Simon Fraser University
Burnaby, British Columbia

Citizenship: USA
Status in Canada: Landed Immigrant
Birthdate: December 17, 1948

Education

B.A. Communication, Michigan State University, 1971

M.A. Communication Research, Stanford University, 1973

Ph.D. Communication Research, Stanford University, 1976

Academic Appointments

9/73 - 12/72	Assistant Instructor of Communication and Computer Consultant, Department of Communication, Michigan State University
1/76 - 7/76	Instructor of Communication, Institute for Communication Research, Stanford University
8/76 -	Assistant Professor of Communication, Department of Communication, Simon Fraser University
9/80 - 12/80	Visiting Researcher, Social Networks Program, School of Social Science, University of California at Irvine

Refereed Journal Publications

Lesniak, R., Goldhaber, G., Yates, M., & Richards, W.D.	NETPLOT: An Original Computer Program for Interpreting NEGOPY. Connections (the Bulletin of the Internationa Network for Social Network Analysis, Winter, 1978, pp. 26
Weinberg, A., Ullian, L., Richards, W.D., &Cooper, P.	Informal Advice- and Information-Seeking Between Physicians. Journal of Medical Education, March, 1981, pp. 174-180.
Richards, W.D. & Rice, R.	The NEGOPY Network Analysis Program. Social Networks, 1981, 3:3, 215-224.
Richards, W.D.	Getting Data for Network Analysis: What's REALLY Happening Here? Social Networks, in process.

Book-Chapters

Richards, W. D. "Computers and Communication Research". In Hanneman and McEwan (eds) Communication and Behavior, 1975, Addison-Wesley, pp 401-420.

Richards, W.D. "Communication Networks in Organizations". In Viestinnan Virtauksia (The Flows of Communication), Erhalm and Aberg (eds). Helsinki, 1977, pp 164-190.

Richards, W.D. & Lindsey, G. "Social Network Analysis: An Overview of Recent Developments." In Communication and Control in Society, K. Krippendorff (ed). Gordon and Breach, 1979, pp 59-72.

Richards, W.D. "Simulation". In Multivariate Techniques in Human Communication Research, Monge and Cappella (eds). Academic Press, 1980, pp 455-489.

Richards, W. D. & Rice, Ronald "Communication Network Analysis Methods". In Progress in Communication Sciences, Vol. 6, (eds.) Brenda Dervin and Melvin Voigt. Norwood, N.J.: Ablex, 1983.

Other Publications

Richards, W.D. A Manual for Network Analysis using the NEGOPY Network Analysis Program. A Report of the Institute for Communication Research, Stanford, California. August, 1975. 88 pp.

Richards, W.D. A Coherent Systems Methodology for the Analysis of Human Communication Systems. Eric Clearinghouse on Information Resources, ERIC # IR 005 982. Also published as Report #25, Program in Information Technology and Telecommunication (PITT), Center for Interdisciplinary Research, Stanford, California. 266 pp.

Computer Programs

Richards, W.D. NEGOPY. A computer program for the analysis of large communication networks. Accepts data for networks of up to 4095 nodes and 64000 links. Written in CDC FORTRAN EXtended. Stanford, California, 1975.

Richards, W.D. NEGOPY II Second edition of NEGOPY Network Analysis Program. Written in standard IBM FORTRAN. Available for IBM, AMDAHL, etc. Simon Fraser University, Department of Communication, 1982.

Refereed Conference papers

Richards, W.D. "An Improved, Conceptually Based Method for the Analysis of Communication Networks in Large Complex Systems", paper presented to Information Systems Division of International Communication Association, Phoenix, 1971, 26 pp.

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EDUCATION:

Graduate - B. Sc. Electrical Engineering (Communications)
Queens University, 1955

Post Graduate Courses with:

- Canadian General Electric
- IBM Canada
- Intel

PROFESSIONAL ASSOCIATIONS

- Member of Association of Professional Engineers of Ontario, 1955
- Member of Association of Professional Engineers, Geologists and Geophysicists of Alberta
- Member of Association of Professional Engineers of British Columbia
- Designated Consulting Engineer - Ontario
- Recognized Consultant for DOC Submissions - audio, acoustic, AM, FM, TV, Cable Television, VHF & UHF Radio, Microwave, Satellite TVRO and Data Communications, and Fibre Optic Systems.

ENGINEERING AWARD

- "Award of Merit" by the Canadian Consulting Engineers for the Design of the OECA Television Network in Southern Ontario, completed in 1976.

INDUSTRY POSITIONS

- Member of Technical Executive - CCTA Canada
- Chairman of two Technical Subcommittees - CCTA Canada

EXPERIENCE SYNOPSIS

- Twenty-nine years in the communications field with the emphasis on video, audio and data communications using cable, radio, microwave, satellite and broadcast and light optic technologies.

I. Major Security

Institute Philipe Pinel - Montreal, Quebec
(Psychiatric Prison)

J. Broadcasting and Cable Clients

Channel 79 Limited - Toronto, Ontario
C.C. Forster & Associates - Brampton, Ontario
CFCN-TV Limited - Calgary, Alberta
I.W.C. Communications Limited - Toronto, Ontario
Niagara Cablevision Limited - Niagara Falls, Ontario
Alberta Broadcasting Limited - Calgary, Alberta
Nickel Belt Cable TV Limited - Sudbury, Ontario
Western Approaches Limited - Vancouver, B.C.
Western Manitoba Broadcasters Limited - Brandon, Manitoba
T.V. Ontario Broadcasting Network - Toronto, Ontario
Rogers Communications Inc. - Toronto, Ontario
Premier Cablesystems Limited - Vancouver, B.C.
Cablesystems Engineering - Vancouver, B.C.
Knowledge-West Partnership - Vancouver, B.C.
Saskatoon Telecable - Saskatoon, Sask.
Western Cablevision - Surrey, B.C.
Delta Cablevision - Delta, B.C.

CURRICULUM VITAE

Peter J. Booth
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North Vancouver, B.C.

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(604) 985-0732 (res)

Biographical

Born - London, England on November 12, 1950.
Citizenship - Landed Immigrant.
Married, two children.

Education

Hons. B.A., University of Western Ontario, 1973
M.A. (with distinction), University of Western Ontario, 1975
Ph.D. studies, McGill University, 1978

Academic Awards

1973 McIntosh Graduate Student Award
1973 Ontario Graduate Fellowship
1975 Ontario Graduate Scholarship
1975 McGill University Scholarship
1978 TDA Ph.D. Fellowship

Professional Experience

President, Wescom Communications Studies & Research Ltd.,
Vancouver, B.C., 1982 to present

Wescom Ltd. is a research and consulting company specializing in the computer and telecommunications industries. Projects are conducted on behalf of government and private sector clients.

Director, Research Studies, Group West, Vancouver, 1979-1982

Group West is a computer software and consulting company specializing in business applications for mini and micro computers.

Research Manager, Bell Canada, Montreal, 1977-1979

Bell Canada is one of Canada's leading telecommunications companies and is a recognized leader in the development of new and innovative voice and data services. Research work was conducted in new product development and service evaluation.

Professional Experience: (cont'd)

Lecturer, Dept. of Communications, Simon Fraser University, Vancouver, 1984
Lecturer, Department of Geography, St. Mary's University, Halifax, 1977
Lecturer, McGill University, 1976
Lecturer, Summer Session, University of Western Ontario, 1975
Lecturer, Breccia College, University of Western Ontario, 1974-75

Papers, Publications and Books

Booth, Peter J., "The Evolution of Videotex, New Directions," Videotex 84 Proceedings, Basel, Switzerland, September 1984.

Booth, Peter J. and R. Wills, Telidon in Canada, (Four Volume Telidon Evaluation for Canada), forthcoming book in press.

Booth, Peter J., "Social Impacts of MSAT on Users and Canadian Society," MSAT Space Program, Department of Communications, Ottawa, Ontario, 1984.

Booth, Peter J., B. Richards and R. Wills, "The Evaluation of Office Automation in Government Departments," OCS Program, Department of Communications (forthcoming), Ottawa, Ontario, 1984.

Booth, Peter J., "Looking Back to the Future - Canada's Telidon Experience," VT 83 Videotex Kongress Proceedings, Basel, Switzerland, August 1983.

Booth, Peter J. and R. Wills, "Telidon Evaluation Report," Industry Seminar on Telidon, Department of Communications, Ottawa, Ontario, July 1983.

Booth, Peter J., R. Wills and T. Plowright, "Telidon Industry Evaluation Report," Telidon Industry Seminar, Department of Communications, Ottawa, Ontario, November 1983.

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Booth, Peter J. and L. Saunders, "Public Interest Databases in Canada," Department of Communications, Ottawa, Ontario, 1982.

Booth, Peter J. and R. Wills, "Computer-based Scheduling and Billing in the Canadian Transportation Industry," Department of Labour, Ottawa, Ontario, 1982.

Booth, Peter J., "New Approaches to Model-Based Decisions," Professional Market Research Society Annual Meeting Proceedings, Toronto, Ontario, June 1981.

Booth, Peter J., "Telidon Field Trials in Canada," DPMA Association, Annual Meeting, Vancouver, B.C., November 1981.

Booth, Peter J. and M.F. Goodchild, "Location and Allocation of Recreation Facilities: Public Swimming Pools in London Ontario," Ontario Geography, Vol. 15, 1980.

Booth, Peter J. and R.W. Butler, "Use and Awareness of Urban Recreation Facilities: The Value of Telephone Surveys," Proceedings II, Canadian Congress on Leisure, Contemporary Leisure Research, Toronto, Ontario, 1979.

Booth, Peter J., "Modelling Human Spatial Behaviour in Recreation Facility Site Locations," Department of Economics, Discussion Paper Series, Discussion Paper No. 9, University of Western Ontario, London, Ontario, 1978.

Booth, Peter J., "Multiattribute Models for Understanding Response to Park Environments," American Association of Geographers Annual Meeting, New Orleans, April 1977.

Booth, Peter J., "Modelling Human Spatial Behavior," Canadian Association of Geographers, Annual Meeting, June 1975.

Booth, Peter J., "CORD Technical Note 35 Theoretical and Behavioral Significance of the Generalized Cesario Model for Park Visitation," CORD Technical Papers, Parks Canada, Ottawa, Ontario, 1975.

Booth, Peter J., "Optimal Site Selection in Recreation Facility Planning," Ontario Division, Canadian Association of Geographers, Annual Meeting, London, Ontario, 1974.

Booth, Peter J. and R.W. Butler, "Planning Urban Recreation Facilities," American Association of Geographers, Annual Meeting, Seattle, Washington, April 1974.

Consulting Studies and Research Reports
(Computer Telecommunications and High Technology)

Booth, Peter J., "Customers' Perception of the Quality of Service," BC Telephone Co., Burnaby, B.C., April 1983.

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Booth, Peter J., "Workshop on Privacy and Videotex Proceedings," Vancouver, B.C., Department of Communications, Ottawa, Ontario, 1982.

Booth, Peter J., "Community Information in Project Mercury," NB Tel Telidon Evaluation, NB Telephone Co. Headquarters, St. John, New Brunswick, 1981.

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Booth, Peter J. and P. Wilson, "Development of an Integrated MIS System for New Brunswick Telephone Co.," NB Tel, St. John, New Brunswick, 1980.

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Booth, Peter J., "Vista Impact Assessment," Bell Canada Headquarters, Montreal, Quebec, 1980.

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Booth, Peter J., "Small Business Communications Market and Evaluation Study," TCTS, Ottawa, Ontario, 1979.

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Booth, Peter J., "Videotex Technology Assessment, Social Impact Assessment, Report No. 2," Bell Canada, Montreal, Quebec, 1979.

Booth, Peter J., "Bell Canada Rates Subcomponent Evaluation Study," Bell Canada Management Sciences, Montreal, Quebec, 1978.

Booth, Peter J., "Hospital Users Evaluation Study," Bell Canada Regional Headquarters, Toronto, Ontario, 1978.

Booth, Peter J., "Employees' Perception of a Satisfactory Teleboutique/Phone Centre," Bell Canada, Toronto, Ontario, 1978.

Booth, Peter J., "TCTS Long Distance Business Study Review and Assessment," TCTS, Ottawa, Ontario, 1979.

Booth, Peter J., "Analysis of Customers' Response to Directory Alterations, Montreal Area," Research Report, Bell Canada Headquarters, Montreal, Quebec, 1978.

Booth, Peter J., "Location Study Among Toronto Bell Canada Employees," Bell Canada Headquarters, Toronto, Ontario, 1978.

Booth, Peter J., "Bell Canada Message Research Phase 1," Bell Canada Public Affairs, Montreal, Quebec, 1978.

Booth, Peter J. and L. Gondin, "CP Network Connection Impact Study," Bell Canada, Montreal, Quebec, 1978.

Booth, Peter J., "Evaluation of 1977 Planner and Intercontinental Dialer," Bell Canada TCTS, Ottawa, Ontario, 1977.

Booth, Peter J. and T.B. Kulka, "New Residence Features Study," Project No. 67223, Bell Canada, Montreal, Quebec, 1977.

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Booth, Peter J., "Social Impact Assessment of Bell Canada's Budget Lifeline Services," Bell Canada, Montreal, Quebec, 1977.

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Booth, Peter J., "Farecard User Study, A Study of the Greater Vancouver Transit System Bus Pass Program," GVRD Transit Planning, Province of B.C., Vancouver, 1982.

PARTIAL CLIENT LIST

Wescom clients from the public and private sectors include:

Federal Department of Communications

BC Telephone Company

Bell Canada

Trans Canada Telephone System

BCRIC

PWA

BC Government

Workers' Compensation Board of British Columbia

A&W Foods

Dominion Directory Co.

New Brunswick Telephone Co.

GVRD Transit Planning Department

Horner Drugs

RT Kelley

Foster Advertising

The Science Council of Canada

The International Development Research Centre

Ministry of Industry and Trade, Province of Ontario

The Economic Council of Canada

Federal Department of Labour

Federal Department of Industry, Trade and Commerce

The Institute for Research on Public Policy

DATA PROCESSING AND INFORMATION RETRIEVAL

Wescom utilizes several services for the analysis of data and for the retrieval of computerized information.

Access to over 640 data bases can be made using our modem-equipped personal computers or through one of the two time-share companies we are linked to.

Data processing can be done in-house using a remote linkage to central computers or using our IBM personal computer. Analysis is performed using one of several packages including:

APL Stats pak

SPSS

Comshares Tactics

BMD

In addition, programming can be developed for special projects and applications.

Word processing utilizes both personal computers and a Xerox 850 for report production and development. These systems offer a high degree of flexibility and excellent quality of output.

13.0 TASK/ACTIVITY OUTLINE

Tasks/Activity		Activity/Timing (weeks)
1.	Meeting at Contractor's premises - Vancouver	1
2.	Study plan, methodology finalization and outline of work activity	2
3.	Development of study, detailed table of contents and report structure	2
4.	Submission of table of contents to DOC, detailed study structure (meeting with DOC as required in Ottawa)	4
5.	Task 1: Market Situational Analysis Data collection/ reviews of reports, discussions with industry, users groups and service providers	5
	Interim report and outline to DOC	6
6.	Task 2: Develop and Forecast Services on Applications and System Technologies Application/technologies matrix, review of framework, development and specification of applications and technologies for input to Task 3 (Videotex and Teletext)	7
	Interim report and outline to DOC	8
7.	Task 3: Development of Service Models Linking of market sectors, applications and service technologies, collection of pricing information and costing data for service configurations, discussions with service providers and operators, review of service models	8
8.	Task 4: Formulation of Demand Methodology Structural and process model outline and design, review of past approaches, definition of model assumptions, framework for data inputs, identification of sectors, applications, pricing and revenue components, specification of discount rates, appraisal of data for input to sectoral model, assessment of competing and complementary analysis and specification of assumptions for model execution, collect information from sources, interviews, reports, government studies, etc.	8-9
	Meeting at Contractor's premises	10

Tasks/Activity	Activity/Timing
9. Task 5: Execution of Demand Forecast Input of available data into demand forecast, provide sector and segment forecasts for Videotex and Teletext services, competing and complementary service analysis, make adjustments for forecasts to allow high, medium and low scenarios to develop under different assumptions about market structures and emergent technologies, review forecasts with selected industry and economic experts, present forecast results for Videotex and Teletext services, present estimates of export opportunities	11
Present forecast results to DOC	11
10. Task 6: Industry Evaluation Collect industry inputs for jobs, employment and revenues (small scale survey), etc., review existing reports, documents, IISP, content development and evaluation studies to provide further evidence for estimates, link market and demand forecasts to industry, economic analysis, export opportunities identified, assess sales and market opportunities, consider legal, regulatory and social issues and developments, develop impact forecasts, assess cross-impacts on telcos, broadcast and cable industry	12
Interim report to DOC	12
11. Task 7: Recommendations Develop initial study results and recommendations, conduct panel to assess recommendations, revise and finalize recommendations	13
Interim report to DOC	13
12. Draft final report and executive summary	13
13. Receive revised draft report from DOC	15
14. Finalize report to DOC	16
Presentation to DOC	16
15. Return documents, etc., to DOC	-

Note: In many instances, due to the extremely brief time frame for this study, activities will have to proceed simultaneously and in parallel. Thus, while the procedure we propose is essentially linear in its development, a number of the activities in Tasks 1, 2, 3 and 4 will be undertaken together in order to allow appropriate inputs and time for the definition of a market forecast and impact analysis.

--AN ASSESSMENT OF THE MARKET FOR VIDEOTEX, TELETEXT AND SIMILAR SERVICES.