# VIDEODISC STUDY





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Note to Reader

The views expressed in this report are those of the author and do not necessarily represent the views of the Department of Communications or the other Agencies and Departments participating in this Study.

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## PREFACE

When this study was in development in 1980 the initial objective was

> to provide that sufficient knowledge of the topic is available in time to assure that wise and orderly direction is given to the introduction of the new delivery services into Canada.

Need and feasibility studies soon showed that most of the likely participants were well aware of the great impact videodisc technology would have in application to their concerns. While some agencies had already undertaken pilot studies, each participant expressed interest in acquiring greater operational knowledge. However, in the process of canvassing each of the parties to the project it became very obvious that one of the most beneficial aspects of this study would be in linking up the needs of some with the technological developments of others in relation to the requirements and capabilities of the federal government and of the country as a whole.

The federal government's efforts to directly support Canadian content and culture through agencies like the CBC and

the National Film Board and through scientific development such as the Department of Communication's Telidon. In another example, National Research council's development of NATAL 74 authoring languages are limited by difficulties of distribution and general application. This is due to the restrictive mandates of developers and producers, to international competition and economies of scale, and to the protective policies of other nations and multi-national companies in furthering their proprietorial interests. In addition to extensive direct federal support for its own departments and agencies through a variety of mechanisms, considerable subsidy has been given to the private sector -- the cultural industries, the software industries, and the electronic industries.

In various ways the videodisc industry embraces elements of all industries employing content, software, and hardware in systematic applications. While initially the mass consumer market may largely be for a visual phonograph, the videodisc industry is already looking well beyond mass entertainment to interactive in-home instruction, digital audio, and in-home information storage and retrieval, with or without advertising. It would be advantageous if Canadian content and programming becomes a significant part of these systems, possibly in conjunction with other Canadian developments such as Telidon terminals.

In the areas of training and education, whether stand-alone or integrated with computer-assisted learning, there is obvious potential for integrated application of Canadian resources: content producers, software systems and expertise, and, possibly, Canadian hardware.

For information storage and retrieval, the videodisc is still in the field trial stage but may offer radical cost efficiencies in the near future.

Canada may have capabilities and export potential for system design in data processing, statistics, libraries and archives, health and medical records -- areas where the size of the application makes an internal development of the system cost-effective.

The Videodisc Study was born in September of 1980 when a number of federal government departments and agencies recognized a common need to study the impact and implications of the development of videodisc in Canada. The Arts and Culture Branch of the Department of Secretary of State had been following videodisc development since 1975 and had reported on developments in this area in 1976. Similarly, the Education Technology Branch of the Department of Communications had studied the applications of the future technology to education. Interest in the technology as a consumer medium, a teaching tool and a storage device grew in other quarters of the federal government. Most notably, the Public Archives instituted a demonstration project in September 1978 that culminated in production of the first videodisc for Canadian purposes.

The Arts and Culture Branch (of DOC) first organized a seminar on the technology in June of 1980. The present comprehensive study, with its special references to parallel technologies such as home video cassette recorders, was undertaken with the support and involvement of the following departments and agencies: Consumer and Corporate Affairs; Industry, Trade and Commerce; National Defence; the Canadian Broadcasting Corporation; the National Film Board; the National Library; the National Museum of Man; and the National Research Council. The Arts and Culture Branch designed the study, managed the various separate research tasks, and was responsible for the production of the final report. Participating departments and agencies contributed by transferring funds to Arts and Culture in accordance with their varying levels of interest and financial resources. The study, which required more than a year to complete, was directed by an ad hoc, steering committee composed of representatives from contributing departments.

All proposed research contracts and major decisions on the course of the study went before the committee for approval. The research program did not reflect the specific concerns of any one department or agency. This report has attempted to strike balances between concerns, and to reflect accurately the circumstances and potential developments in all areas of videodisc: the consumer market, the education and training area and

its applications for information storage and retrieval. The department and agencies participating in the study were:

- Department of Communications
- Canadian Broadcasting Corporation
- Department of Consumer and Corporate Affairs
- The National Library of Canada
- Department of Industry, Trade and Commerce
- Department of National Defense
- National Film Board
- Public Archives of Canada
- National Museums Corp.
- National Research Council

## METHODOLOGY

In designing the study the committee stressed two things: the need to cover all applications of the technology, and the need to take an industrial analysis approach. There are three main markets for videodisc technology: the consumer market for the playback of pre-recorded content; the industrial

training and education market for interactive instructional programs; and the information storage and retrieval market for high-density/low-cost data or information memory and accessing. The first two markets are now in early development and the latter is about a year or two from significant exploitation. It is intriguing that industry, primarily large multi-national corporations, has spent an estimated excess of a billion dollars in the research and development of all three markets. Hence an analysis of the market and industry seemed the best way to find the reasons for such massive interest.

Ideally, videodisc technology and similar technologies like videotape might have great social utility; however, from the corporate view, all aspects of videodisc development have implications for costs and profits. The videodisc players that reach the market are the result not of the limits of technological capability but of crucial decisions based on corporate assumptions about the potential markets.

For this reason the study commences with an analysis of the companies and their corporate strategies. This is followed by an assessment of the various present and near-term technologies, an economic analysis, and a discussion of the implications for Canadian industrial strategy and national development. The thrust of the report is to gain insight into the problems and

opportunities that may arise and the measures Canadians should be taking to reap the greatest benefit from these developments and to mitigate any adverse consequences.

The research had to compromise between the ideal and the practical. Since at the time of the study there were fewer than 150,000 videodisc players in the world, it was difficult to obtain accurate user information on preferences for content, usage patterns, etc. Also, when the study started, only optical player models were in the marketplace. RCA only began selling consumer players and discs in March of 1981. There was, however, information available on home use of videotape cassette recorders (VCRs) and it was necessary to use this information, especially in respect of pre-recorded content, as a "proxy" to measure or project pre-recorded disc sales.

The problem of compiling Canadian data was compounded by the difficulty of obtaining accurate information on the number of disc players and VCR's in the marketplace. When the research phase got underway, various sources estimated videocassette recorder (VCR) penetration at under 100,000 and videodisc players (VDPs) at a few thousand (primarily in General Motors and Ford dealerships).

Because the Committee decided from the outset not to survey Canadians on their potential use of scarcely available devices, research concentrated on economically viable information

resources. Therefore, to protect the Canadian market, the report relies on combinations of American and European consumer information, and past experience such as sales patterns for color TV. As far as is known, this "proxy" information was the best available, but naturally it would have been preferable (but too costly) to have actual statistics. Another problem is that this field is expanding rapidly and yesterday's data may be obsolete tomorrow: projections which seem valid in September could be suspect in December.

Obviously, there will be a need to monitor developments on a continuing basis to maintain the investment made in this study.

This report cannot include or make available all the research and data collected in the last year and a half. Some of the purchased studies are protected by copyright. However, in a number of cases the report provides aggregate projections and summaries. Because one of the purposes of the study was to assist in informing industry and the public of opportunities arising from videodisc technology, some studies are available upon request from the Department of Communications. In addition to those commission reports listed below, the research program included access to trade periodicals, industry newsletters, and bibliographical listings. Research staff or members of the study group also attended and reported on a number of significant conferences.

| Commissioned Reports | Contractor/Firm |
|---|---|
| ° Canadian Participation in the Videodisc Industry (Report/ Appendices) | Socioscope Inc. |
| ° Videodisc: The Potential for Education and Training | Ryerson Polytechnical Institute |
| ° A Technical Assessment of Present and Near Term Videodisc Technologies | Michael J. Petro |
| ° Videodisc and the Law | Claude Brunet (Grourd et Brunet) |
| ° A Technical Assessment of the Information Storage and Retrieval Capabilities of Videodisc Optical Memory Systems | Robert G. Fannin |
| ° A Report on New Programming Opportunities for the Independent Canadian Television Producer | Larry Shapiro and Associates |
| ° Toward a Canadian Position on Videodisc | Nordicity Group Limited |
| ° An Economic Analysis of the Videodisc Situation in Canada | J.C. Strick |

# CHAPTER I

## CORPORATE ANALYSIS

### INTRODUCTION

The primary purpose of this report is to assess the impact in Canada of videodisc technology. This technology was conceived over fifty years ago and was first marketed in England in 1936. For many reasons, at first technical, then in content and marketing, the "imminent" arrival of the videodisc has been delayed. However, in the last year or so the serious marketing of the technology has commenced. Results to date do not appear to match earlier industry expectations but for the first full year in the consumer marketplace videodisc player sales have exceeded initital year sales of such other electronic products as color TV, videocassette recorders and microwave ovens.

Videodisc players and videodiscs are a part of the rapidly growing consumer electronics industry which is often integrated with the consumer entertainment industry. For Canada, these are major implications in the development of a new entertainment and information delivery system through the mass distribution of

prerecorded content now referred to as home video. Since home video was evidenced first by the rapid proliferation of video-cassette recorders and the use of prerecorded tapes, these aspects of its development are fundamental to this study. Also, home video cannot be addressed in isolation of its relationship to other content delivery systems such as broadcasting, cable and pay-TV. Another area of great interest to Canada is the application of videodisc technologies in the areas of training and education and in information storage and retrieval. There are three main target markets:

**Mass consumer market**

This is the immediate corporate target for sales of videodisc players (VDPs), videocassette recorders (VCRs), pre-recorded content, digital audio and various add-ons and improvements or peripherals to the consumer-owned color TV set, such as large screens, portable VCRs, TV cameras, and video games. The videodisc device designed for this market may be characterized as being without elaborate microprocessor or mini-computer support.

**The industrial and educational market**

Videodisc machines with built-in microprocessors or machines that are readily adaptable to computer interfacing are directed toward this market. Sophisticated spill out videocassette records will also compete for this market to some extent. The industrial and business use of videodisc technology, particularly in its interactive formats, may predominate in the initial marketing efforts.

The information storage and retrieval market

Further development of the digital laser DRAW (direct-read-after-write) optical disc and of systems design, offers inherent advantages in speed, flexibility, cost and efficiency that point to a huge market for videodisc technology.

In time, the impact (favourable and unfavourable) on Canadian industries concerned with content production, program delivery, educational and instructional systems, publishing, information storage and retrieval of hardware and software manufacture could be very great.

The cultural industries and those institutions with a mandate to promote Canadian social and cultural goals could face competition from yet another source of cheaply replicated foreign content presented in a manner likely unamenable to domestic regulation or control. This concern may apply equally to content geared to school or home.

To date, the underlying force for videodisc development arises from multi-national consortia headquartered in the United States, Japan and Europe. This situation is in direct contrast to that of videotex development, which has been fostered by governments, telecommunications common carriers, or both. The multinational companies see greater benefits from a more direct relationship with buyers and users in a relatively unregulated environment. Much of their activity is aimed at securing profit centers in the entertainment industries that have heretofore been the preserve of the delivery system owner, e.g., the broadcaster,

the Cable-TV company or the telecommunications common carrier.

Over the last decade, corporate investment in videodisc for all applications approached one billion dollars.[1]

The first market target to be strongly promoted is the mass consumer. While the fairly expensive Magnavox and LaserDisc machines have been sold for some time in the U.S., RCA's SelectaVision launched in March 1981 was supported by a concerted marketing campaign. The SelectaVision costs about $500.00 in the U.S., $700.00 in Canada, and is not only cheaper than a VCR, but also produces a better picture. The VCR records off-air programs; the VDP does not.

In 1982, at least 23 companies with three different incompatible systems will be competing to capture the multi-million dollar, worldwide consumer entertainment videodisc market. 1985 projections for annual sales of videodisc players in North America vary from 600,000 to 1 million units. Already some 12 to 15 million videocassette recorders have been sold worldwide, with over 3 million of these in the U.S. Worldwide VDP sales are estimated at 200,000 by the end of 1981.[2]

Extrapolating from Media Science Newsletter projections, the "Foster Advertising Study on New Video Technologies" (September 1981) states that while there is no solid Canadian data, they project that 3 per cent of Canadian homes will be

equipped with VDPs in 1985 or about 240,000 units.[3]

Earlier industry and analyst projections assumed a cross-over year would occur in the near future when sales of videodisc players would exceed those of video cassette recorders. More recent information suggests that the ascendancy of videodisc may be delayed or not occur. The relatively small differences in price and the recording capability of the VCR has led to significant consumer acceptance. Sales of 804,663 VCRs in the U.S. in 1980 were 70 per cent above 1979. Strong sales performance continued through 1981 with some weakness in December. Total 1981 VCR sales were 1,360,998, up 69.1 per cent over 1980.[4]

While VCRs and VDPs may appear to be direct competitive substitutes for basic television broadcasting, cable television, and pay-TV (broadcasting/cable or a telecommunications network), there are indications that the market can absorb all of these. VCR's are, for example, found in homes with pay-TV or cable service. According to a recent survey, pay-TV subscribers are the highest users of pre-recorded content.[5]

## THE TARGET MARKET

VCR and VDP marketing plans assume that the consumer will reapportion his disposable income toward more in-home entertainment and information services -- probably at the expense of theatres and cinemas, recreation, travel, and the automobile.

Although there has been a 5 per cent drop in real personal income in the United States over the last 3 years, the total sales of consumer electronics, notably color television, have never been better.

The potential corporate home video markets are by no means solely North American. Projections of growth in Europe and Japan are greater than those for the United States. The so-called "fourth world" (the affluent parts of the third world) is another potentially large market.

Although projections for VDPs in the consumer market are being revised downward, VCR sales are rising phenomenally. Mackintosh International of Great Britain, which in late spring of 1981 estimated a United Kingdom market of 600,000 to 650,000 units, is now saying that Britain alone would import over one million machines in 1981. The boom is attributed in part to the unique hardware rental market system which offsets the bleak economic times. Mackintosh projections for VCRs are summarized in the following table:

TABLE 1

VIDEOCASSETTE RECORDER SALES 1980-82

(Thousands of Units)

| | Japan | United States | Western Europe |
|---|---|---|---|
| 1980 | 900 | 800 | 1,350 |
| 1981* | 1,500 | 1,500 | 2,200 |
| 1982* | 2,000 | 2,300 | 2,800 |

*Estimated

The proportion of portable VCRs sold is rising from 10 per cent to an estimated 25 per cent which may be matched by home video camera sales.

Table 2 summarizes the 1985 Mackintosh sales forecast of the principal types of home video products, including color television receivers:

TABLE 2

1985 Sales Forecasts

| | Europe | | U.S.A. | |
|---|---|---|---|---|
| | Units 1000s | Value $M* | Units 1000s | Value $M |
| Home Video Recorders | 2,065 | 1,545 | 1,470 | 900 |
| Miniature Recorders | 50 | 20 | 70 | 30 |
| Non-recording Video Cameras | 570 | 285 | 520 | 185 |
| Recording Video Cameras | 60 | 72 | 75 | 75 |
| Blank Videocassettes | | 700 | | 560 |
| Videodisc Players | 400 | 188 | 700 | 288 |
| Colour TV Receiver | | 7,800 | | 5,000 |
| Projection TV Receivers | 75 | 190 | 200 | 340 |
| | | 10,800 | | 7,378 |

*1980 Currency Values - U.S.

Mackintosh forecasts that VCR penetration in the United States will amount to more than 10 per cent of households in 1985 and nearly 20 per cent in 1990. The same forecast gives a figure of 3 per cent VDP penetration in the United States for 1985 and 12 per cent in 1990.

It would be unreasonable to expect a greater percentage of household penetration in Canada than in the United States. If we assume that over eight million Canadian households for 1985 translates into about 800,000 VCRs and about 240,000 VDPs, there could be a maximum of 1,800,000 VCRs and 1,000,000 VDPs in Canada by 1990. For various reasons, the minimums may be about half these figures.

## CORPORATE STRATEGIES

The original thrust in VCR and VDP development came from the electronics manufacturers, which were joined by representatives of the entertainment production industries and, to a lesser extent, the computer and software industries. Recognizing that players could not be sold without programs hardware and content, industries formed joint venture companies. Agreements to standardize technology narrowed the field to three incompatible systems in the mass consumer market: Philips/Music Corporation of American/IBM (LaserVision or LV system); RCA (CED system); and Matsushita (VHD system). It appears that corporate strategies are now based on establishing sufficient support at home to sustain the fight for dominance in the world market. Thus, Philips is establishing a base in Europe, RCA in North America and Matsushita in Japan.

Almost the entire spectrum of large corporations is involved in some way in consumer electronics, entertainment production and distribution, publishing and information. Their participation may take one of three fundamental strategies: "hit-and-run", "segmentation" and "long-haul."

A "hit-and-run" strategy is characterized by temporary consumer enthusiasm, intensive promotion, low-to-modest prices, rapid sales, stiff price competition, market saturation or product withdrawal. This is viable for multi-product firms and

in situations where low per unit capital investment is required, as is the case of the CB Radio and video games.

A "segmentation" strategy assumes a product will only survive competition in a market niche with a modest-to-high price based on high specialization and reputation. Such products as stereo audio systems and large screen TV projectors fall into this area.

A "long-haul" strategy entails gradual penetration of the market, an emphasis on reliability and sales support, staying power, consumer confidence and inherent mass appeal.

The prospective competition between VCRs and videodisc players due to incompatibilities of standards will induce some consumer reticence and fragment the market. This could slow the economics of mass production but in the long run, the staying power of the consortia of multinationals should prevail.

Faced with the basic problem that players and content are interdependent, in the last decade the videodisc industry has seen interests coalesce into three main groups: RCA/CBS/GEC, MCA/IBM/Philips, and Matsushita/GE/Thorn-EMI. These groups enter into many relationships with other huge multinationals as partners, distributors, replicators of discs, and holders of production franchises. Each group's strategy is based on the belief that its particular technology is right for the market and right for the time. Each group is strongly represented in all three regions -- Europe, the United States and Japan.

THE RCA GROUP

This group* is backing the RCA SelectaVision stylus capacitance electronic disc (CED) player, which has limited features -- no freeze frame, limited browsing, no stereo, no interactivity. They believe that the consumer, will forgo such features when offered a high-quality playback machine at a lower price ($500 U.S. or less). RCA Strategists are convinced that stereo sound (which is not available on the TV set in any case) is not essential to sales, especially as the CED player is geared to consumer interest in conventional procured content, such as recent or classic movies.

Price analysis of RCA's player and disc shows that per-viewing cost of a movie would be less than the Philips laser system, more than pay-TV and possibly more than VCR rental. Given a large enough price difference between VCR and VDP machines and between pre-recorded cassettes and discs in addition to other influencial factors such as increased variety in procured content, the corporate strategy presupposes that the videodisc player has a significant sales potential. Such positive assessments have had RCA to pour close to $200 million dollars into development and initial promotion.

The RCA group's launch on March 22, 1981 was based on selling 200,000 players (plus 50,000 under the Zenith label) and 1 million discs within the year. Although they have been very aggressive in securing programming rights on a non-exclusive

*See Appendix, p.43.

basis, RCA fell well short of this goal with only 116,000 players consigned to dealers and 60,000 in the hands of consumers. Some retailers discounted the price of the player as low as $269.00 U.S.

The basic group strategy would appear to be similar to that used by razor blade manufacturers: dominate the market with a simple cheap and reliable instrument, and profit from the continuing sale of consumable items -- in this case, discs. In 1981 their was an unexpected demand for discs. Selling an average 18 discs per player RCA more than double their projections.

It would appear that RCA and CBS will control this aspect of the industry for some time. RCA has announced it will do no custom pressing until at least 1984, and only Sanyo of Japan has been licensed outside of RCA and CBS to replicate discs for them. Should they succeed in becoming the dominant technology, at least in North America, they could set the terms of both content procurement and pattern of distribution. The major profit would then lie in replication and distribution. Sears and J.C. Penney, recognizing RCA potential dominance, established early positions. They are pleased with the sales of discs and recently removed themselves from VCR cassette rentals altogether.

Although VCRs will continue to find a market, RCA believes the disc purchaser is akin to the color TV buyer. "Seventy-five per cent of the pyramid (TV buyers) supports the other 25 per cent. We're aiming at the 75 per cent, not the 25," states

S. Sauter, RCA Vice-President and General Manager. He continues, "The videodisc is a product for everyone."[6] RCA research shows that the VCR is a male-dominated item, whereas the disc player is preferred about equally by men and women.

In answer to rumors of RCA divesting itself of unprofitable operations, its chairman, Thornton Bradshaw, recently reaffirmed that RCA is "committed to probe the potential of videodisc with everything we've got." Toward this goal, disc replicating capacity is being tripled in 1982 and a stereo VDP is forecast for May 1982.[7]

The RCA group has shown little interest in the educational or industrial training field but for some time its R & D operation has been working on the optical-laser digital disc for information storage and retrieval. Eventually, RCA could be strong in this market also. Zenith, a group member, is rapidly diversifying in the home entertainment and home computer field.

## THE PHILIPS GROUP

Europe's largest consumer electronics manufacturer, N.V. Philips, developed an optical-laser videodisc in 1970. Shortly after MCA, Inc., which had also developed a similar technology, agreed to adopt the Philips standard while specializing in replication and software.*

*See Appendix, p.44.

In 1979 MCA and IBM formed DiscoVision Associates, for the production of discs and for entry into the industrial-educational market. DiscoVision Associates in joint venture with Pioneer Electronic Corporation of Japan formed Universal-Pioneer to produce an industrial player which is the basis of the 11,000-unit General Motors Videodisc Network. Pioneer, through U.S. Pioneer, markets the LaserDisc which is comparable to the Philips' Magnavox Magnavision player. Recently Philips, IBM, Pioneer and MCA agreed to market their compatible systems and discs under the LaserVision label to reduce consumer confusion.*

The Sony Corporation, which had developed an optical laser technology, eventually conformed to the Philips/MCA standard and now produces an industrial model under contract with Ford Motor Co. to provide the player for their videodisc dealer network.

The essential strategy of the LV group is that the consumer will prefer a machine that offers stereo sound, near-random access, various speeds of fast forward and reverse, and still frame. The disc does not require a caddy and there is no disc or stylus wear. This strategy seems to be targeted toward the current VCR owner profile and the audiophile -- the middle income to affluent male, frequently single, and in his mid-thirties. It assumes a knowledgeable consumer who demands technical quality and versatility. The LV group certainly has ambitions toward the larger market but believes it will take time to develop consumer awareness and programming.

*Late data - see Note p. 46.

There is, of course, a fundamental division in this group: Philips sells hardware; DVA (MCA/IBM) sells programs. Neither can succeed unless the other makes a total initial commitment in getting the players and the programs into the market. DVA had experienced considerable problems in mass replication. As a result it has been proposed that the mass replication in Costa Mesa, California be closed and all consumer disc replication be turned over to Pioneer Electronics in Japan. DVA would then replicate only interactive and industrial discs in the U.S.*

Philips has felt that the number and variety of programs on disc are insufficient to support heavy marketing of players. Because they retain the ability to licence mastering and replication, Philips is eager to see much more activity in this area. Looking beyond future royalties, they see that greater accessibility to replication by program producers will lead to a more varied available content and therefore to more player sales.

The Philips group is primarily concerned about being overwhelmed by the initial RCA campaign -- especially as the North American mass market is very important in an overall strategy of reduced costs through mass production. Philips and Pioneer, however, could maintain a good per-unit mark-up by selling to a sizeable market which appreciates the extra features. They claim that 80,000 units were in consumer hands as of the end of 1981.

*See Appendix Note, p.46

Some observers predict that Philip's optical laser player will be able to sharply reduce its manufacturing costs with development of the solid-state laser and more highly integrated circuits, whereas RCA's CED system is now at its lower cost limits.

Although Philip's faces stiff competition in North America from RCA, in Europe, they appear to have the edge in timing and dealer structure. The Japanese market however, is already well protected and will be even more difficult to enter if a single standard (VHD) is adopted.

## THE MATSUSHITA GROUP

Matsushita Electric Industrial Company*, the world's largest manufacturer of consumer electronics, first developed a capacitance stylus videodisc player (VISC II) somewhat similar to RCA's. It decided, however, to standardize on a capacitance non-stylus player developed by its majority-owned subsidiary, the Japanese Victor Company. This player, known as the JVC VHD/AHD (video high density/audio high density), fits between the Philips and RCA players in both price and features. With an adapter it can do virtually everything the optical laser player can -- but only at a comparable package price. Its greatest strength probably lies in a protected Japanese market. Marketing of the player in North America is not expected until July 1982 and a few months later in Europe.

* See Appendix, P. 45

Without an adapter, the VHD player has stereo sound (unlike RCA SelectaVision); with a special adapter it can playback true digital audio records. An important problem for marketing is the absence of adequate program content, but it is claimed that this will be solved in time for the launch.

Unlike VCRs, which are almost entirely of Japanese origin (except for Philips-Grundig from Europe), the videodisc player is primarily American in development and origin (again excepting Philips). There is no great faith among analysts that Japan is potentially a strong VDP market: already 7 per cent of Japanese homes have VCRs against 4 per cent in the U.S. and Japanese interest in pre-recorded content is said to be rising.[8]

Pioneer's LaserDisc has not been marked by any great initial marketing success. How the VHD player will fare when introduced in the American market in mid 1982 is unknown. Given the added strength of the Thorn-EMI (a Matsushita group member) player arriving from the United Kingdom at least concurrently with the introduction of RCA's CED, the VHD may be competitive in that market.

Some of the delay in proceeding with the VHD player has been attributed to developing an "international" player. This implies that any VHD disc recorded in PAL, SECAM or NTSC (various TV picture standards) can be played on one machine.

General Electric enters as a partner in Matsushita's shared technology. Through its acquisition of Admiral and together with certain Japanese firms, the group* ranks third in color TV sales, ahead of members in the Philips group and behind both RCA and Zenith. GE sees the disc player and wide screen as a good source of future profits in the mature TV set industry.

Analysis of the Matsushita position indicates some weakness in entering the North American market late. Despite its claims to the contrary, it may be difficult to acquire and replicate sufficient software by June, 1982. These problems are not as great in Europe, particularly in the U.K., where introduction of its VHD player release will probably precede RCA with a better dealer structure, and with software more attuned to the consumer market.

THOMSON-CSF

The Thomson Brandt and Thomson-CSF organization is a huge appliance and electronics manufacturer, 51 per cent of which is owned by the French government. Its combined sales are 36 billion French franks, 42 per cent of which is export. Almost 10 per cent of income goes to Research and development. Three

*See Appendix, p.45.

years ago, Thomson-CSF introduced a transmissive optical laser videodisc designed for the industrial and educational market which found little acceptance in North America. They are, however, developing other lines.

In addition to the industrial model, Thomson-CSF is working on a "professional" model, the VIDEL (video enregistreur-lecteur) -- a record and playback machine of broadcast quality. In effect it is a "video xerox" because the recording can produce copies. This machine is still some time away but has future application to such uses as a video "Hansard" and in archiving video and film content. (Thomson-CSF is working with the Xerox Corporation on development of information storage and retrieval devices.)

It is possible that together with Japanese interests, Thompson-CSF are also preparing a consumer model player. This is probably not based on optical laser technology.

PROGRAMMING INDUSTRIES

As noted, the three main videodisc groups are consortia of hardware and software distributors. CBS, Inc. has joined RCA, MCA has joined Philips, and EMI has joined Matsushita. Whereas virtually every major consumer electronics manufacturer in the world is associated in some way with one of these groups, other program production industries are currently not as well represented. Left out of equity partnership are the major Hollywood producers and distributors with the exception of MCA's Universal Pictures.

All the Hollywood majors, including Paramount, Warner Brothers, United Artists, 20th Century Fox and Universal are all actively seeking ways to increase the revenue potential of existing and future product. Studies indicate that consistent movie-goers are primarily young and single. The majority of the public does not go to the theatres (except to see the "blockbuster" film). Hollywood has to exploit the home market through pay-TV and home video in order to reach their lost audience.

Time-Life Inc., however, through its wholly owned Home Box Office (HBO), distributes 60-65 per cent of all pay-TV content. Showtime distributes half of the rest. Paramount Pictures, in particular, has strongly contested the dominant position of HBO without result. The Hollywood suppliers usually charge a pay-TV operator about 35-50 cents a subscriber for a middle quality feature film and consider their "fair share" about 35 per cent of

the gross pay-TV revenue. HBO is reputed to change less for rights.

Four Hollywood majors (Paramount, United Artists, Universal, 20th Century Fox) in joint venture with Getty Oil tried to form Premiere Theatre -- a satellite delivery of movies to cable systems. Prompt action by the U.S. Department of Justice and the courts struck down the arrangement on anti-trust grounds (undue preference to their own system). Success in appeal is deemed unlikely and the group has virtually conceded defeat.

Funding pay-TV and satellite cable virtually sealed off, the movie industry sought another alternative in hope of a better return. Hollywood distributes its product in a release pattern referred to as "windows". A film is released first via theatres, then pay-TV and tapes, then network TV and 16 mm, and finally syndication, in accordance with total revenue in each category and on total return per individual exposed. Because Hollywood has found a viable market for VCR tapes there are signs that the window on pre-recorded content has been advanced and the release to pay-TV retarded. Home video rights now represent 10-15 per cent of revenue deals.

VCR tapes are a lucrative alternative for three reasons: they bring in greater revenue per viewer; have direct advantage of initial theatrical promotion to which pay-TV makes no contribution; and because the product is out before "pirates" can exploit the market.

Hence, home video is becoming the "second window" for release, ahead of pay-TV.

Although all the major Hollywood producers have set up distribution branches to specialize in tape and disc, the present structure in the videodisc industry is not particularly to thier liking. In their conventional financial wisdom, producers and distributors do not sell a movie outright but lease it for use, retaining all future rights. With the videodisc, however, they do not have the control over replication and distribution they wish. They face stiff competition from RCA/CBS, which does not envisage custom pressing until 1984 and which seems to have a system that could eventually control videodisc marketing if it gains dominance. While the attitude of some of the majors toward disc is lukewarm, they may prefer disc over tape because it does reduce piracy and, at the outset, is more likely to be sold rather than rented. In the VCR area, rental of tapes has created some problems of ensuring honest royalties. The licensing of custom replicators such as 3M by Philips is seen as a positive step and DVA does custom pressing for clients who use their own label.

In September 1981, the 9th U.S. Circuit Court of Appeals declared that home video taping is illegal, thus reversing the earlier decision regarding MCA and Disney versus Sony that off-air taping for private consumption was considered "fair use." MCA will now extend the suit to all VCRs, not just Betamax, but will not go after individual consumers. The outcome will probably be that:

the Supreme Court will permit home taping; or the courts will set a small royalty to be paid by the VCR manufacturer and on blank tapes to a copyright tribunal; or Congress will legislate exemption similar to its action in 1971 permitting audio taping for personal use.

The Motion Picture Association of America favors the European approach of a charge on VCRs and blank cassettes, but as a fixed charge rather than a percentage of the selling price. The funds would be distributed by a copyright royalty tribunal.

It is not expected that the forthcoming action will significantly retard the sales of VCRs, but it may be beneficial for VDPs.

U.S. analysts who earlier cautioned the record production industries to go slow in home video are now saying that it's time to get started. In the U.K. where 7 per cent of homes have VCR, pop video music is pulling established music distribution into handling video, creating pop video music charts and developing a younger video customer.[8] The U.K.'s Music & Video Week, October 10, 1981 had two "Top 20" lists, one for general video and one for music video. The top five on the music list were also on the general list.

## TOP TWENTY HITS

| Cassette | Music Top 20 | General Top 20 |
|---|---|---|
| Pink Floyd Live At Pompeii (Polygram) | #1 | #7 |
| Woodstock (Warner) | #2 | #8 |
| ELO: Live in Concert (VCL) | #3 | #17 |
| Rock Flash Back; Deep Purple (BBC) | #4 | #18 |
| Slip Stream; Jethro Tull (Chrysalis) | #5 | #20 |

The record companies have been slow to enter the tape and disc market with software for several reasons:[9]

- insufficient numbers of players in the mass market to warrant costs
- the cost of VCR players and tapes is at least three times that of audio equipment, tapes and records
- the unsolved question of music rights (In the U.S. the Screen Actors Guild, American Federation of Musicians, the Directors Guild, and the Screen Writers Guild have come to agreement with the producers in terms of "made for pay TV" and "made for home video" content. However, the original music and lyric rights are subject to protracted case-by-case negotiations.)
- some unfamiliarity with video production and what form it should take
- the pointlessness of stereo videodiscs in a market consisting primarily of monaural low-fi sets. There is no stereo in CED at present.

Philips-Polygram, CBS-Columbia Records and EMI-Capitol Records are record companies in the videodisc consortia which are well positioned in the replication queue. If the RCA CED player becomes dominant, CBS, through its equity with RCA will secure priority in winning replication rights. In Canada, major acts like Ann Murray are working with video, and video recording facilities exist.

## MARKET ANALYSIS

### CONSUMER MARKET

The consumer desire for stereo and other features in the videodisc may be an important factor. If there is significant demand for better TV sound and musical programs (visual records, Hollywood or Broadway musicals), RCA will have to introduce its stereo model early -- which will cause considerable consumer confusion over obsolete machines and incompatibility. Basically RCA believes that the consumer cannot be bothered hooking up to extraneous speakers and is satisfied with the monaural TV set and its poor musical performance. However, it will provide for the stereo option, possibly by way of a $100.00 mark-up.

If videodisc does appeal to the mass consumer, then RCA SelectaVision will likely be the most popular player in North America. RCA may find much slower rates of consumer acceptance initially than shown in its own projections. The 5 million disc players projected by 1985 in the U.S. will probably be closer to 2-3 million.[10] Philips/MCA/Pioneer may sell a third of this amount. After 1985, penetration should proceed rapidly because replication costs should drop significantly, music may become a strong factor and Hollywood may emphasize the disc format.

The videodisc and VCR in the home are not seen as parts of an omnibus TV set by the manufacturers. While there is a definite trend toward the home entertainment center, it will probably take the form of optional add-ons to a compatible TV set

which provides easy attachment and reduces redundancies, such as tuners in both VCRs and the set. The major groups are not wedded to the videodisc alone, but are based on strong color TV sets and VCR marketing and therefore are looking to exploit the whole spectrum of TV-related devices.

In Chapter III, "Economic Analysis", a large number of projections concerning future VDP and VCR proliferation are derived from reports of manufacturers, brokerage houses, and proprietorial studies. The chapter also discusses the competition between VDPs and VCRs, and between these video systems and other delivery systems like pay-TV, or conventional broadcasting. While opinions vary, the most recent analysis, reported in "Video Revolution", Part III, comes from Paine Webber Mitchell Hutchins Inc., a New York investment banking and brokerage firm. With some advantage of hindsight they state:

> In the second half of the decade; we believe the superiority and economy of the video disc as a playback medium for pre-recorded material will sharply curtail VCR growth among the less affluent portion of the population . . . In terms of video discs, we believe that this consumer product will eventually become very popular. However, like the black and white television set, the color television set, the video cassette and the personal computer, the product will initially be slow to catch on. This will be due to the newness of the product, its expense and, once again, confusion over the various formats. Hence, unlike some industry and analyst projections, which call for the sale of millions of players and billions of dollars of video discs by mid-decade, we do not see this occuring until about 1990.

The author of the report, Lee S. Isqur, commented in Videodisc News, September 1981:

> It seems to me that this product has been accepted as fast as any new consumer electronic product that's come on the market. My theory is that somewhere between 1983 and 1985 it will be recognized that videodisc is indeed breaking out . . . If rental takes off . . . disc will probably be the superior format (over VCR).

The Paine Webber estimates for Players and Prerecorded Content is shown in Table 3 below.

TABLE 3

PRE-RECORDED VIDEO PRODUCT SALES - U.S.

(In thousands)

| | Video Cassette Recorder Sales (Units) | Pre-recorded Video Cassettes (Wholesale) | Video Disc Players (Units) | Video Disc Sales (Wholesale) | Total Pre-recorded Video Products (Wholesale |
|---|---|---|---|---|---|
| 1990E | 4,500 | $1,000,000 | 5,000 | $650,000 | $1,650,000 |
| 1985E | 3,500 | 440,000 | 2,000 | 150,000 | 590,000 |
| 1984E | 3,300 | 325,000 | 1,400 | 90,000 | 415,000 |
| 1983E | 2,800 | 250,000 | 1,000 | 45,000 | 295,000 |
| 1982E | 2,000 | 175,000 | 700 | 25,000 | 200,000 |
| 1981E | 1,400 | 125,000 | 350 | 10,000 | 135,000 |
| 1980E | 780 | 85,000 | 40 | 2,500 | 87,500 |
| 1979 | 470 | 40,000 | 4 | 200 | 40,200 |
| 1978 | 400 | 20,000 | | | 2,000 |

Source: PWMH Estimates.

Note: Pre-recorded video cassette estimates are based on the assumption that unit sales will approximate three units for each VCR in the first year after sale and one unit for each VCR after the first year. Wholesale prices are assumed to be $20 to $30 per unit. Videodisc estimates are based on the assumption that unit sales will approximate five units for each player in the first year after sale and three units for each player after the first year. Wholesale disc prices are assumed to be $7 to $8.

Note: PWMH estimates for 1981 VCRs were wrong by only 39,000 or 2.8 percent. However, this VDP estimates were twice as high as actual sales and their disc-to-player assumption proved to be a third of sales recorded.

Another recent view comes from a San Jose, California think tank. Strategic Business Services Inc., in Vol. III of their report "Optical Storage Media (Videodiscs): New Developments", state:

> The most probable scenario is that, following a decisive success by RCA, which will capture a major portion of the videodisc market in the next two to three years, the solid-state laser optical systems of 1983-84 will stage a comeback, due to their advanced features and possible tie-in to home computers. If, however, the RCA campaign in 1981 flops, the probability is very high that VCRs will dominate the market, effectively eliminating the videodisc as a viable product.

Unfortunately the results for 1981 are not definitive enough to evaluate the extent of RCA's success. Empirical evidence in the marketplace is simply not yet substantial enough to predict with certainty whether videodisc technology will be domestically pervasive by the end of the decade. However, the majority of technological prophets still estimate that up to 30 per cent of American homes will be so equipped by 1990.

## THE TRAINING AND EDUCATION MARKET

This market is primarily the domain of optical laser technology, although the VHD system has commissioned experiments in interactive instruction. The single-frame addressibility and rapid access inherent in the LV system makes it an ideal ETV device, allowing still-frame, slow motion, and branching sequences. In the LV format, both DVA and Sony have produced industrial players incorporating micro processors which permit highly flexible user control of the content delivery. The discs

themselves can hold one or more computer software programs (dumps) governing playback features. In educational applications, a mini-computer is often associated with the VDP to enhance the programming capability and permit alpha-numeric overlays.

General Motors Corporation was the first large client using 11,000 DVA PR-7820 players in its Videodisc Network. Ford Motor Company followed with the Sony player and American Motors Corporation is destined for the DVA player. These machines are used for sales assistance and in service training. Early surveys indicate that dealers significantly prefer VDP to 8mm film or videotape networks.

The potential training market is reputed to exist in any organization or institution with needs in excess of about 150 units for servicing departments or branches. At this number the cost of discs -- including mastering -- equals that of the videotape system. Considered as prime industrial clients are the multi-branch banks, travel agencies, fast food chains, and military and government departments -- all of which carry out either on-going training or communication with the public. Some survey research indicates videodisc is considered premature for corporate communications but for in-house training other studies have shown cost effectiveness.

While there are no market projections in this area, DVA reports steady growth and the recent sale of 27,000 players to a

single client. Forecasting the training market is subjective at best, but given the scope of the audio/visual (A/V) market and the disc's proven advantages, it is reasonably safe to assume its eventual dominance as the delivery system for large corporate users.

The education market is not held in high regard by the videodisc hardware manufacturers. They point to financial austerity, lack of large central purchasing, low profit margins, and purchase resistance due to an unhappy history of technology in the schools.

Numerous educational experiments have involved the Universities of Nebraska, Iowa, Utah, Utah State, and the Masachusettes Institute of Technology. In Canada, through a two-year project funded at $1.2 million, the Ontario Institute for Studies in Education is developing a videodisc system using a unique micro processor and computer-assisted instruction. Most of the experiments include additional computer support for provisions of more sophisticated interactive diagnosis of learner problems and real time evaluation of learner performance.

Probably the most developed formal learning system approach comes from ABC Video Enterprises and the National Education Association (NEA). Their "SCHOOLDISC" collaboration is a long-range instructional project to increase literacy and language comprehension for grades four to six. The NEA terms videodisc the technology of the future.

Some notable applications of videodiscs for training are: Miles (Laboratories) Learning Centers with 350 DVA players in teaching hospitals; Bank of America for teller training; Columbia Savings and Loans with eight programs promoting bank services; Exhibit Technology, Inc., developing videodiscs for exhibit and point of purchase display; and IBM Guided Learning System for in-house and client individualized instruction.

IBM notes six factors influencing its conversion from tape to disc:

- 15 per cent increase in video image quality
- still-frame capability
- random search capability
- accurate addressing
- computer controlled programming
- disc life.[10]

Many applications of videodisc technology (LV) to military training have been studied. Companies actively involved are Coloney Productions, WICAT, Preceptronics, Hughes Aircraft, Grumman, and Sperry. These firms have developed materials on videodisc such as technical manuals, maintenance and repair sequences, recruiting information, and visuals for simulation devices. Given the high cost of new weapon systems, videodisc

sources are ideal low cost simulators for such visuals as the view from the pilot's cockpit or the tank commander's periscope. In Canada, the Department of National Defense is working in these areas.

At present, virtually all videodisc education and training efforts are in the optical-laser format. The VHD system is amenable to interactive programming and may also enter this market; however, DVA and Sony have a good head start. On one hand, the high cost of VHD initial production and mastering is a major drawback . On the other hand, in quantity, the disc, with all its inherent advantages, costs less than tape. While it is not possible to predict the eventual size of this market, the pace of developments to date has not slackened.

## THE INFORMATION STORAGE AND RETRIEVAL MARKET

Videodisc technology may profoundly affect the huge market that embraces such areas as electronic data processing, "the office of the future", digital telecommunications and Telidon-like systems.

At present videodisc is an analog device most easily described as being compatible with the TV set. It produces a TV picture. Within a year or two, the digital videodisc or computer compatible disc is expected to appear on the market. This disc is often referred to as the DRAW (direct- read-after-write) disc. It acts as a data memory: the user can record on a blank disc

and play back data immediately. A huge amount of information can be stored on disc relatively cheaply and accessed more rapidly than magnetic tape. While it is not possible to re-use a disc, one can update to a certain extent.

Both the analog optical laser disc and DRAW disc can be applied to information storage and retrieval. The analog disc is a high-density storage medium in either analog form (TV pictures) or recorded with data (techniques and standards are now being developed). Unlike the DRAW disc, the optical laser disc will probably never be user-recordable but it does compress a great deal of information into a small space. While a breakthrough in the mastering and replication process is possible -- the rumored Quixote Corp. process, for example -- no new developments have been substantiated at this time.

If the present analog disc is recorded in digital (data) techniques, the current consumer LV player with some adaption could provide any one of the following functions from a specially recorded two sided disc.

- mass read-only data archives for home and business computers (3200 megabytes or 3,300 200-page books with a random page access time of 5 seconds)
- interactive computer-aided instruction
- digital audio (59 hours of TV quality or 4 hours of top quality stereo sound per disc)
- intelligent (non-linear), talking encyclopedias
- electronic publishing (88,000 offset-quality pages).

Even in its present analog form the LV disc is the basis for certain information storage and retrieval systems. Pergammon International Information Corporation has developed the Video Patsearch system which since 1971 has stored all U.S. patent applications on eight discs. Users have a set of discs, a player and a terminal. A search is done through a communications link to Bibliographic Retrieval Services Incorporated, which within a typical two-second reply time, tells the player to locate the image. Images include both text and drawings and hard copy print-out is possible. Thus, the mass storage of data is at the user end and the slow-speed telephone link is used only for reference and indexing information.

This system is currently being tested by the Canadian Patent Office, and the National Library and the Public Archives, which are actively exploring videodisc applications for information storage and dissemination. Noted later in this report are many other similar projects.

Other applications of videodisc are more appropriately considered as electronic publishing involving information storage and retrieval. Major reference publishers such as McGraw-Hill, World Book Encyclopedia, and Encyclopedia Britannica are developing videobooks and video adjuncts to printed texts which depend on the huge storage capacity and single frame access of the LV disc. Sears has experimented with placing its catalogue on a

disc for in-store customer reference. It uses both stillframe and motion sequences.

Since the optimum technology is still being developed, the draw disc has still not reached the marketplace. Photographic techniques and metal oxide processes are still being assessed. Early work in digital recording was conducted by such consumer electronics corporations as Philips, RCA and Thomson-CSF. They have been joined, however, by a new set of companies with experience in computer peripherals: e.g. Storage Technology, Optimem and Control Data. IBM is, of course, a 50 per cent partner in DiscoVision Associates and intimately involved in the mastering and replication processes.

The DRAW disc will eventually prove itself over tapes and maganetic discs in fast retrieval, compact storage, low cost, and small space requirements.

The following table compares storage costs essentially by the cost of the drives.

TABLE 4
COST COMPARISONS FOR ON-LINE STORAGE

| | | M bytes | $1000/ Drive | $1000 per 10 G bytes* | $1000 per 100 G bytes |
|---|---|---|---|---|---|
| 1973 | IBM 3330-11 | 200 | 28 | 1,430 | 14,300 |
| 1975 | IBM 3350 | 317 | 43 | 1,300 | 13,000 |
| 1978 | CDC 33502 | 635 | 27 | 430 | 4,500 |
| 1979 | IBM 3370 | 571 | 29 | 480 | 4,800 |
| 1981 | IBM 3380 | 2,500 | 98 | 392 | 3,920 |
| 1982** | Philips Disc | 2,000 | 20 | 100 | 1,000 |
| 1983** | Philips Pack | 100,000 | 50** | 51 | 51 |

*Gigabytes or billion characters
**Estimates

Sources: Datapro 70 Industry Reports; U.S. Government Schedules (GSA); Computer World, Jan. 23, 1979; IEEE Spectrum, 1979.[12]

Compared with magnetic tape, optical discs are even more advantageous. It is claimed that the optical disc permits hundredfold reductions in numbers of units of media in storage and in rates of media mounting, and a thousandfold in average access time for archival data. "The data now found on 100 magnetic disc spindles and backed up on 500 or 1,000 reels of tape can be put on 10 optical disc spindles with no backup, reducing capital investment by over 10 times."[13]

It is foreseen that the digital optical disc (DRAW disc) will therefore become an integral part of EDP systems, particularly in "the office of the future." N.V. Philips is structuring a system called "Megadoc" which will cost about $500,000. N.A. Philips is working on a system of much larger capacity. Drexler Technology and OCLI now have discs for sale and Kodak, 3M, Fuji and Agfa are conducting research. Small OEM drives are being developed by Thomson-CSF, N.V. Philips, Xerox (Shutgart, Optimem), Hitachi and Hewlett-Packard. Large PCM and capacitance systems are attributed to Storage Technology, Burroughs, Control Data (Magnetic Peripherals, Inc.); unknown specifications are attributed to Fijitsu, Bell Telephone, IBM and DiscoVision. Toshiba is already marketing a small document-oriented device, the "electronic file cabinet", at about $60,000 U.S.

The advantages of videodisc for accessing and retrieving information may outweigh any unfavorable comparisons with the storage costs of microfiche or microfilm. Since the "next generation" of data storage, the "magnetic bubble" is no longer being

pushed for development, competition from that area may not even materialize.

The scope or extent of this market is impossible to project. Videodisc technology is simply a part of changes in the larger area of information systems. It has the potential, however, to facilitate this revolution through generating further cost efficiencies, and will have profound impact on such questions as centralized or distributed data storage; the degree to which telecommunications links are necessary; and the capability of small home or business computers to stand alone. These questions are perhaps best addressed in political or economic terms as matters of national policy, rather than in technical terms. For example, the decentralization of Telidon pages to local dialing areas, while removing long distance charges and speeding access, could at the same time weaken the support for long-haul communications.

## IMPLICATIONS AND CONCLUSIONS

### MAGNITUDE

It has been necessary for giant multi-nationals to form consortia in order to put together a videodisc development and marketing operation. Research and Development, production capacity, replication, program sources, distribution, marketing and servicing require an initial risk in the order of $200,000,000. A situation of "critical mass" is involved: ultimately huge volumes of production, with attendant economies of scale, will be needed to recover and profit from the investment. These factors mitigate against indigenous developments.

### NON-REGULATION

These consortia represent almost all the significant consumer electronic product manufacturers plus some of the large data handlers and entertainment producers. Neither the publicly nor privately-owned regulated telecommunication carriers are represented. The consortia seek to expand into a field which is not greatly regulated nor dependent on existing carriers or broadcasters. This suggests the development of a delivery system like home video, which would be parallel to existing delivery systems but in many cases, would be vertically integrated with program producers and distributors.

### CONTROL OF PROFIT CENTRE

The corporate strategies are now locked into three systems -- each group believing it has the staying power to secure a

significant share of the market and, therefore, the ability to determine the profit center. This applies not only to manufacturers of the hardware in-house or under license, but also to all aspects of replication and distribution. Even if the producers of content elect to distribute in all standards, the standard which becomes dominant in the marketplace will likely give the controlling group great influence over the whole delivery system. However, if replication and mastering are widely accessible, and if the distribution system is open to all or many content providers, the influence of the controlling group will probably be moderated.

## CONCLUSIONS

On the basis of the evidence presented here and later, only broad conclusions about the consumer market can be made.

The three corporate groups backing videodisc technologies represent a huge act of faith (and risk) that there is a large market on which to recover developmental costs. Their combined corporate strength gives them the resources to create a consumer demand in the long-haul.

Should consumer videodisc fail altogether, all groups are still heavily involved in VCRs, which would then become pervasive. Home video as a significant content delivery system is a fact with or without the disc.

The use of pre-recorded VCR content is growing at a great rate. If videodisc players succeed and discs are rented,

present entertainment delivery systems will acutely effected. The most popular and most immediate content will be made available for home video before all other delivery systems except theatrical.

The newer or more sophisticated videodisc systems have great potential for the instructional and educational markets. The impact on formal education will probably be minimal for some time but the development of industrial "networks" and "learning systems" is already well underway.

Optical data storage technology has matured to the point of being able to offer a type of mass storage capability remarkably better than any other. Computer users will find that available services will improve in range and effectiveness as hardware and appropriate subsystem architectures emerge.

## ENDNOTES

[1]Business Week, July 7, 1980.

[2]The Videoplay Report, Vol. II, No. 23 (Nov. 9, 1981). This figure of 200,000 VDPs is based on RCA's 60,000 in the U.S. in 1981 and Toshiba, Hitachi, Zenith and Radio Shack sales of CED worldwide added to LaserVision's 80,000 VDPs. No accurate figures are available since EIA does not report VDP sales at this time. VCR figures are in part taken from many sources.

[3]"New Video Technology and its Impact on Commercial Communications," Foster Reports, Foster Advertising Limited, (Sept. 1981), p.111.

[4]Video Marketing Newsletter, (Jan. 25, 1982). Reports EIA figures.

[5]Video Week, Vol. 2, No. 51, (Dec. 1981). Information from Video Probe Index - Home Testing Institute 10,000-home survey.

[6]Foster Reports.

[7]"White Paper," Weekly Television Digest, Vol. 21 (Dec. 14, 1981), page 50.

[8]The Videoplay Report - interpretations from figures supplied by Ken Winslow.

[9]These reasons are a summation of points found in the literature and most particularly reflect the views of panelists at the 2nd Annual Billboard Video Music Programming Conference, Los Angeles, (Nov. 1980).

[10]Comments by D. Filter of IBM GLS at Columbia Business School and American Video Institute conference on Interactive Videodiscs and their Corporate Applications, Columbia University, Nov. 3-6, 1981.

[11]Leonard Laub "Laser Disc Technology: Progress and Promise," a seminar paper, Science Council of Canada, Ottawa (Dec. 1981).

[12]Charles M. Goldstein "Telecommunications and Libraries, "The Potential Impact of Optical Disc Technology," (White Plains, N.Y.: Knowledge Industry Publications, 1981), Chapt. 7.

[13]Laub, "Laser Disc Technology," p. 16.

# APPENDIX
# CHAPTER I
# CORPORATE ANALYSIS
# OUTLINE OF VIDEODISC CONSORTIA

## 1. RCA Group

The RCA Group includes:

a) RCA Corp. ($8 billion annual sales) - makes players and discs; owns NBC
b) Zenith Corp. ($1.2 billion annual sales) makes-players, 1983
c) CBS Inc. ($4 billion annual sales)-makes discs, sells programs and records
d) General Electric Co. (U.K. 3.5 billion annual sales) - makes players and sells in U.S.

Brand names of RCA Capacitance Electronic Disc (CED) Selectavision: Elmo, Hitachi, Sansui, Sanyo, Tandy, Toshiba, and Zenith.

The RCA group also has the following arrangements:

Sears & Roebuck Co. - retail players and discs

J. C. Penney - retail players and discs

Sanyo - makes players for U.S., discs in Japan
- major supplier to Sears, Penney

Beta/Taurus - West Germany - software and distribution in Europe

MGM - agreement with CBS for replication and distribution

Gaumont - software in France and francophone Africa.

This group includes a huge hardware manufacturing, distribution and servicing network: RCA - 5,000 dealers - one of the world's largest record companies; CBS-Columbia Records - a major color TV manufacturer; Zenith - a huge U.K. organization; and two of the three largest U.S. retailers - Sears and J.C. Penney. The notable strengths are that this group represents close to 60 per cent of all color TV sales in the U.S. and has marketing and distribution resources well in excess of the other groups in respect to the U.S. market. Its link with Sanyo includes replication of discs at Kofu. The European connection may be frustrated through weak representation of RCA dealers and technical difficulties in producing players for PAL/SECAM standards.

2. Philips Group

The Philips Group consists of:

a) Core

- N.V. Philips ($18 billion annual sales) - with affiliation to N.A. Philips (North America)
- MCA Inc. ($1.5 billion annual sales) - (Universal Pictures)
- IBM ($25 billion annual sales and rentals)
- Pioneer Electronic Corp. ($1 billion) - (U.S. Pioneer)

b) Joint Ventures:

- DiscoVision Associates - 50/50 MCA & IBM (See Note p. 49)
- Universal Pioneer - 50/50 DiscoVision & Pioneer
  Optical Programming Associates - Philips, MCA and Pioneer - has the task of developing non-linear programming, eg. "How To Watch Pro-Football" and "The National Kid's Disc."
- Pioneer Artists - a program development company, especially musical programs, wholly owned by U.S. Pioneer.

c) Marketing and Manufacturing

- Magnavox - wholly owned by N.A. Philips
- Philco and Sylvania - purchased recently by N.A. Philips as part of GTE Consumer Electronics.
- These three brands represent the fourth largest group of color TV marketeers with about 15 per cent of U.S. sales.
- Sony ($3 billion annual sales) - industrial videodisc
- Trio-Kenwood - disc players.
- Grundig - disc players
- Sharp - disc players
- Sanyo - optical disc players for Europe and Japan but possible also Sears under its label.
- Pye (in Europe), Philips (in Europe) - other brand names include Advent and Gold Star.

d) Replication

- 3M - licensed by Philips for replication using photopolymerization techniques.

- Sony - replication - conventional stamping
- Magnetic Video (20th Century Fox) - replication in U.K. and possibly U.S.
- Blackburn U.K. - Philips photopolymerization techniques - See Chapter II.
- DiscoVision Associates - U.S. - thermal injection - See Chapter II.

- Discodar Associates of Montreal has a formal agreement with N.V. Philips for replication first in Blackburn and subsequently in a Montreal plant.

e) Software

- Primarily this has been developed by MCA using Universal's library. Philips has agreements with MCA and Paramount for U.K. market using CBS distribution (CBS indicates it is free and willing to distribute in any format.)
- ABC Video Enterprises - educational disc based learning systems.
- Warner Communications - there seems to be some connection particularly through existing alliance with Pioneer for audio records in Japan. DiscoVision Associates provides Warner, Columbia, United Artists, Paramount and others with discs bearing their own video labels.
- PolyGram Pictures (part owned by N.V. Philips and Siemens A.G.) has mutual agreements with MCA and ties to Casablanca Record and Filmworks. PolyGram has long been associated with N.V. Philips in the development and specifications of the "Compact Audio Disc," a true digital audio record of very superior quality which might revolutionize the audio record industry. The Pioneer Laserdisc in particular can be made compatible with this PCM disc with the addition of an adapter.

3. Matsushita Group

The Matsushita Group includes:

a) Matsushita Electric Industrial Co. ($10 billion annual sales) has $4.5 billion in consumer electronic sales through its various subsidiary companies. Listed as producers of the VHD are:

Quasar (formerly Motorola, Inc.)

Panasonic

Japan Victor Co.

Other companies which are noted as potential suppliers of players are:

Sanyo

Toshiba (in Japan)

Hitachi

Other brand names include: GE, National (in Japan); NEC (in Japan); Sansui, Sharp, Yamaha (in Japan). Obviously this line-up has immense production capacity but most notably it represents almost the same structure which together with RCA is marketing the VHS VCR.

b) Thorn-EMI (U.K.) - the huge group is in partnership with Matsushita. Thorn would produce players for Europe and EMI the software generally (EMI owns Capital Records).

c) General Electric ($25 billion annual sales with $6 billion in consumer products).

Note: At the time of publishing, there were strong rumours in the trade press but no formal announcement that IBM/MCA had withdrawn from DiscoVision Associates by selling their combined 50 per cent of Universal-Pioneer to Pioneer. DVA in future would simply manage the patents and Pioneer would take over the entire business. The Costa Mesa plant would handle only premastering; all replication would be done at Kofu in Japan.

# CHAPTER II

## TECHNICAL PERSPECTIVES

### INTRODUCTION

This chapter is organized under three headings: "Technical Characteristics," "Technical Descriptions" and "Programming the Videodisc." The purpose of the section on technical characteristics is to first briefly discuss some of the earlier developments of videodisc technology, and then to provide a clear, simplified description of the basics of the technology and the implications of its various applications.

The second and third sections provide more detailed technical information. Both Part One and Part Two examine video technology in relation to the consumer mass market, the education training market and the information storage and retrieval market.

Finally, various manufacturers' or developers' products will be examined from their present stages of development through near-future to long-term expectations.

# PART ONE

# TECHNICAL CHARACTERISTICS

## VIDEODISC TECHNOLOGY

As early as 1928 John Baird, the British television pioneer, experimented with the recording of video signals on a wax disc but it was not until the 1960s that Westinghouse and the 3M Company developed a way to record a single frame of video on an audio-type disc. Now, "video disk", (or "videodisk", "VideoDisc", "videodisc" or "video disc") has become a new word in the English language.

Five years ago, an unpublished Secretary of State research paper calculated that throughout the world, there were some 40 video disc systems in various levels of development. By that time, Thomson-CFS had demonstrated a system; Philips and MCA had agreed on a disc format; and RCA had demonstrated Selectavision in New York. Since then, RCA, Robert Bosh, SRI, Harris, Xerox EOS, Philips Labs, and Hitachi had either demonstrated or announced plans for digital optical disc players as either stand alone systems or as part of a full information storage and retrieval system.

Few of these systems have advanced from the drawing board and "bread board" stage to prototype, and fewer still have tested the waters of the various markets. Fear of market fragmentation through lack of standardization has led many companies to abandon

promising research and, as an alternative, to obtain patent licences from another corporation.

Additionally, the development of numerous concepts and systems has been inhibited or arrested because of a lack of development capital. For example, TelDec, a phonograph-based disc system, jointly sponsored by Telefunken of Germany and Decca of Britain, came out in 1975. By 1979 it had failed in the marketplace due to lack of software and a limited (10 to 12 minute) playing time. The reportably erasable disc developed at the University of Toronto by John Locke and Craig Willis failed to attract adequate financial support. Matsushita VISC, a phonograph-type system somewhat similar to RCA, was dropped in favour of a VHD system developed by JVC (a Matsushita subsidiary).

Only the largest of companies have been able to support the sustained R & D effort necessary and most of these organizations have found it desirable to have associations or special agreements with companies that would otherwise by rivals.

## CHARACTERISTICS OF THE TECHNOLOGY BY MARKET APPLICATIONS

### GENERAL DESCRIPTION

The videodisc earned its name because its appearance resembles the conventional phonograph (audio) record or disc, it is played on a spinning turntable, and it can reproduce material for video or TV screen presentation. The videodisc can hold and reproduce a great variety of "information" including data for computer usage, bank records, encyclopedias, insurance policies, educational or institutional programs, and of course motion pictures and other entertainment material. An audio disc contains 6 grooves per millimeter, while a videodisc may contain 100 times that: 50 to 75 videodisc grooves take up the same width as a single human hair.

In fact, the comparison goes beyond physical properties.

For a videodisc system to succeed, it must also have the potential which helped to make the audio disc a universally accepted technical device: the software or content must be widely available, cheap and varied; the quality of reproduction must be good and competitive with alternative technologies; the playback equipment must be reliable, easy to use and relatively inexpensive; and machines and discs of different manufacture should be compatible.

The similarity between video and audio discs ends with the key factor of compatiblity. Phonograph records or audio discs

are universally playable on all makes of record players. This is so with videodiscs. It is in this area that the marketplace may assert a decisive influence on the success or failure of this emerging industry or on the long-term future of some systems now at advanced stages of development.

Currently there are many videodisc systems, mostly falling into two categories -- capacitance systems and optical systems. The former operate with a stylus not unlike a conventional record player. The latter uses a laser to "read" the disc; there is no physical contact between the optical reader and the disc.

A glance at Figure I, which follows, will provide an overview of the varieties of approach and the companies involved. There are grooved and grooveless contact, or capacitance type systems; and reflective, refractive and photographic optical systems.

It is important to note that while there are capacitance or contact systems designed for the consumer, all of the industrial applications use the optical approach. There is the natural expectation, whether by the ordinary citizen or by officials of large corporations, that discs should be interchangeable or compatible with all players. Business and industrial use however, may not demand standardization or compatibility because of special needs and conditions -- a situation similar to that of the word processing equipment industry.

In the case of the mass consumer market, the system that can become popular quickly may, over time, dominate the market. Consumers, however, may reject the videodisc simply because of a lack of standardization. How companies seek to exploit and dominate the market is discussed in Chapter I on Corporate Strategy.

Figure 1

VIDEODISC SYSTEMS

| | contact | | optical (non-contact) | | |
|---|---|---|---|---|---|
| | grooved | grooveless | reflective | refractive | photographic |
| Industrial | | | Sony – DiscoVision | Thomson-CSF | McDonnell-Douglas |
| Consumer | RCA | JVC/ Matsushita | Magnavox (Philips) Pioneer | | |

The varied approaches in the development of the technology are relected in the fact that more than 30 companies are reported to be working on optical memory systems based on the videodisc. In addition to those described later in this section, Control Data, Hewlett Packard, Storage Technology Corporation, Burroughs, IBM (outside its interest in DiscoVision Associates) and Honeywell are involved. However, none of these companies as of writing have released significant information about their plans.[1]

Videodisc systems are not direct substitutes for video-cassette recording (VCR) systems. Both play pre-recorded programmes, but videodiscs, which average between $20 and $30, are less expensive than their tape counterparts, whose price ranges from $60 to $90. However, a household-type videodisc player (VDP) cannot record a program for later viewing and discs are not erasable for new use. (In some cases, this can be advantageous, as the consumer will not accidentally erase a pre-recorded program from a videodisc). The main advantage of the videodisc is an information storage device of unsurpassed capability that can be linked to and "read" directly by computers.

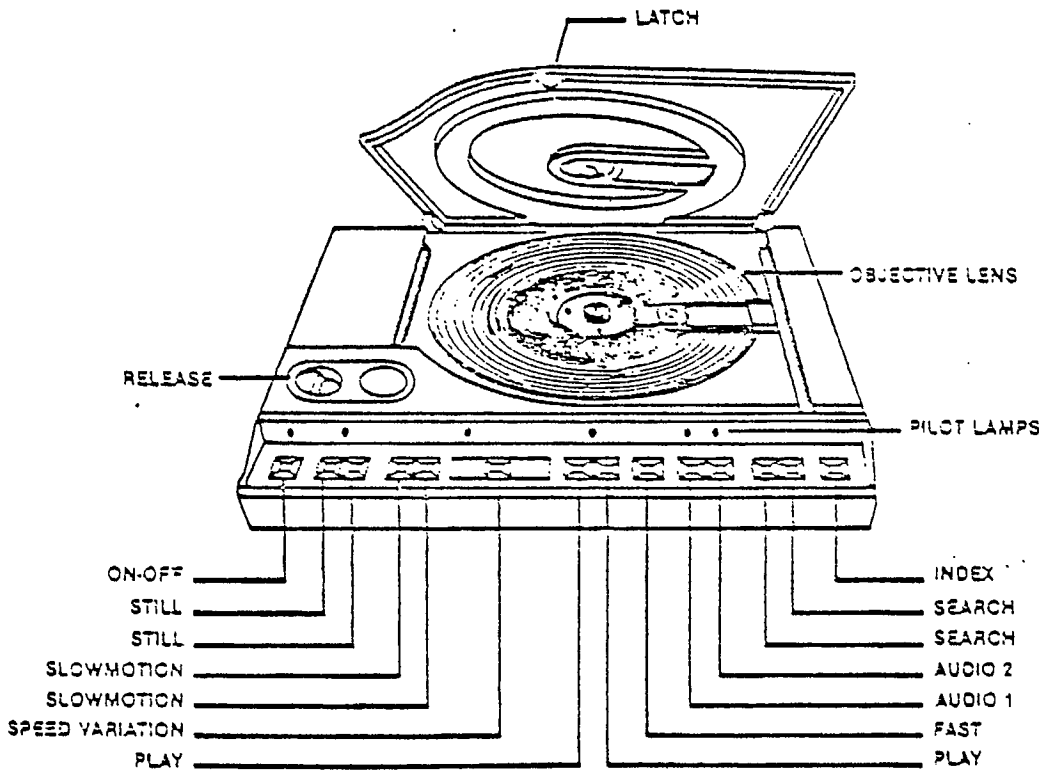
The use of magnetic tape, which must be carfully stored, requires contact between the tape and a contact head, causing wear of both tape and the head. The optical disc has no contact with its reading head and consequently there is virtually no wear to either disc or reading head as a result of use. One RCA

technical manager expects that the optical disc will offer one to two orders of magnitude improvement in price over tape and several orders of magnitude improvement in volume storage costs.[2]

Thus, lower operational costs, lower storage costs and longevity of storage led U.S. Library of Congress to contract Xerox- OES to supply an optical-disc system for storing and printing 5.5 million library cards. Similarly, Philips has provided a large optically based data storage unit to the U.S. security agency at Fort Meade.

**Figure 2**

MAGNAVISION VIDEODISC PLAYER CONTROLS




Typical Video Disc Player Controls

Another important feature is the capacity to record data quickly. U.S. government agencies have a strong interest in using videodisc storage systems for recording satellite information. Currently, as much as 90 per cent of the data from satellites is lost because the present equipment is incapable of recording data or storing it at the very high rates and volume required. Thus videodisc systems such as the RCA optical system, which can record at rates of 50 megabits per second, on their system now under development which will operate at 320 megabits per second and offer attractive alternatives to current technology.

ANALYSIS OF DISC TECHNOLOGY

Disc technology, however, is not free from problems. These arise in the following areas:

- compatibility between systems
- problems with mastering and replication, which must be carried out in factories or laboratories and, for Canadians, outside the country
- the cost of lasers in optical systems, and possible wear in capacitance systems
- problems of achieving broadcast quality in program or film reproduction
- the ability to erase and update.

Compatibility

Because of large technical differences, discs from one system are not playable on another. While there are reports of laboratory demonstrations that Thomson discs can be played on a

Philips system, and that TelDec and RCA discs can be played on optical players, for practical purposes, each system is entirely distinct and uses incompatible discs and players.

Mastering and Replication

Consumer .market discs, unlike tapes, require in-plant production techniques for their programs. However, businesses and institutions require a system which can produce one disc, perhaps with a few duplicates, on which they can "write" as well as "read" their material and other stored information. To meet this need, some companies are developing or have developed a direct- read-after-write or DRAW system for the economic production of single discs.

Laser Technology

Expensive gas lasers are used in optical systems and account for the significant price differential between optical and capacitance systems. Solid state lasers may replace gas-lasers in the longer term and at greatly reduced cost.

Capacitance or contact systems may have the drawback of disc and head deterioration because of contact between the stylus and the disc. However, RCA claims to have demonstrated more than 200 plays without any noticeable wear. For many purposes, that is probably quite sufficient, but in certain applications a potentially frequent rate of play may be a significant factor in the decision to choose between capacitance and optical systems.

Broadcast Quality

Various videodisc (and videotape) systems do not achieve broadcast quality in picture resolution nor high enough resolution for text purposes. However, this may be a problem only in institutional or remote broadcast applications. Although studio high-resolution monitors may alleviate some of these problems, a good text display system will require more work on high-resolution encoding on the disc, a process which requires redesigning the present commercial, and probably prototype digital storage systems.

Erasure/Revision

Current commercial disc systems are set when pressed at the factory. By using an integrated micro processor in the player, material can be "jumped over" (not played) and thereby be considered deleted. It is not possible to erase or update these discs.

The prototype industrial storage systems can "write" on discs but not erase them. By leaving spaces in the disc material it is possible to add more material -- a form of updating -- until the disc is full.

It is reported that Energy Conversion Devices and Corning Glass have each announced development of erasable materials, probably based on thermo-magnetic phenomena, but industry-expert opinion[3] is that it will be some time before this development capacity is practical.

CONSUMER MARKET APPLICATIONS

For the consumer, videodiscs represent a substitute for or alternative to conventional "free" TV, pay-TV, movie theatres, videocassette players, and to a lesser extent, phonograph records and audio tapes.

Videodiscs are cheaper than pre-recorded videotape cassettes and provide a better quality picture and sound. Optical-type systems, offer a stereo option and this feature could form the basis for a new kind of home video music programming for (operas, musical comedies, rock concerts, documentaries, and so on).

If discs of first-run movies sell for $20 to $30, the film industry would gain from the additional distribution system. Such an option may be more attractive with increased home penetration of large-screen TV projection systems.

EDUCATION/TRAINING MARKET APPLICATIONS

Videodisc systems, depending on their sophistication, have the capability to replace or augment films, film strips, tapes and certain kinds of manuals and "how-to" books. (Videodiscs can also be the basis of Telidon-type reference systems in education settings. That capability is the subject of this report's section on information storage and retrieval application.)

In the simplest form of videodisc information systems, users draw out information sequentially; their only input is to push the start and stop buttons. However, it is possible to

structure the information to involve the user. For example, a "how-to" lesson in any area -- be it cooking, engine mechanics, home repair, physics or mathematics can be broken into segments so that the viewers become learners. They can press start and stop buttons as needed to set the pace of the lesson. The simplest videodisc players on the market can provide this kind of operation.

More complex players allow for random-access selection of viewing segments or sub-programs, branching, responses to true or false or multiple-choice questions and capacity to follow a remedial path. The type of program which is in present use by General Motors has a micro processor program in the first few thousand tracks, which takes the learner through a series of stills and/or motion segments. In addition, the viewer can also choose other language by using the second audio channel when it is so prepared.

If the computer system were to incorporate a light pen, it would be possible to combine information from the videodisc and from the computer so that the information from each source is displayed alternately. An example of this may be a short movie and slide presentation on a automobile engine. The computer can command the videodisc to display a certain engine and ask the student to use the light pen to point to a key part of the picture, such as the exhaust manifold. The system would check

the user's response and display the proper reinforcement from either computer or disc or a combination of both.

Another example is a program sponsored by Smith-Kline to teach doctors to develop or update their skills and knowledge in a complex field. Using an ACI computer, a DVA PR-7820 player and WICAT-developed intermediary devices, doctors can follow a programmed learning track of several hour's duration. Doctors can choose several levels of complexity depending on their requirements. As the disc program progresses, case studies, patient history, hospital tests and results are all presented. The doctor is next asked to make a diagnosis, prescribe further tests, recommend treatment and so on. His choices are then reviewed with him and the reasons for his mistakes explained.

This program probably represents the highest level of complexity achieved with the interactive videodisc. In its true sense it is not a videodisc program, but rather, a computer program. Without the videodisc coupling, however, a computer of enormous cost and complexity would be required.

Defense Advanced Research Projects Agency (DARPA) sponsored the development of another kind of program by the Massachusetts Institute of Technology (M.I.T.). Known as "the Aspen Project," this program involves two videodisc machines, a relatively sophisticated computer, a graphics generator and a touch-sensitive video display. Through an extensive series of prepared stills and computer interaction, the viewer is able to take a

simulated tour through the city of Aspen. The viewer is able to travel forward or backward or turn left or right and sees the appropriate view as his direction of travel changes. As the viewer approaches City Hall a voice asks, "Would you like to see the interior of City Hall?" If yes, he is presented with detailed visuals or a short film of the interior details of the building. There are consumer as well as educational and training applications for such a scheme.

Another reported project of this same type is one by Peace River Films. It would allow, for example, a handicapped person to explore and experience a wilderness area that would be otherwise inaccessible to him. Three cameras record a walk along a variety of chosen trails photographing still frames every 2 1/2 feet and in three directions -- forward, left and right. Supplementary detailed motion sequences and slides are presented on specific points of interest. Recorded ambient and specific sounds include such things as bird calls which could be identified later by the second track on the disc. Other visual material may include aerials, maps, microscopic details and general information. The project will thus allow anyone a wide-ranging personalized surrogate tour.

The role of the interactive videodisc will certainly begin to expand in the near future. The ultimate goal is to provide an opportunity for an interactive discourse between learner and programmer rather than between learner and machine. The challenge

therefore will be to produce enough useful, interesting and inexpensive software to effectively add to the viewer's knowledge.

In the longer term, we can expect that the use of the videodisc in education will go beyond stimulus-response to approach simulations. Systems will become smaller, cheaper and accordingly more attractive to the marketplace. An important application could be in conjunction with flight simulators or air traffic control simulators. Combinations of videodisc with computers will provide increasingly more effective applications.

For instance, Hughes Aircraft Corporation has turned to videodisc as a cost-effective alternative to technical manuals. Having used a Thomson-CFS system as a basis for their Training and Maintaining Information System (TMIS), Hughes now want to extend this application to job sites as a "work bench" or job maintenance and training aid.

Hughes describes the system as an "interactive partner in the trouble shooting and repair process."

> Faced with malfunction the technician enters a description of the symptoms on a simple keyboard, using plain English. TMIS may then present one or more queries on the display. As the technician enters his responses, TMIS searches its stored knowledge and displays new queries to narrow the list of possible causes for the observed fault. When it is isolated TMIS displays the proper corrective action.[1]

This system is also used by the U.S. Army for maintainance of the M-60 tank, and by the Phillip Morris Company at its automated plant in Richmond, Virginia.

## INFORMATION STORAGE AND RETRIEVAL APPLICATIONS

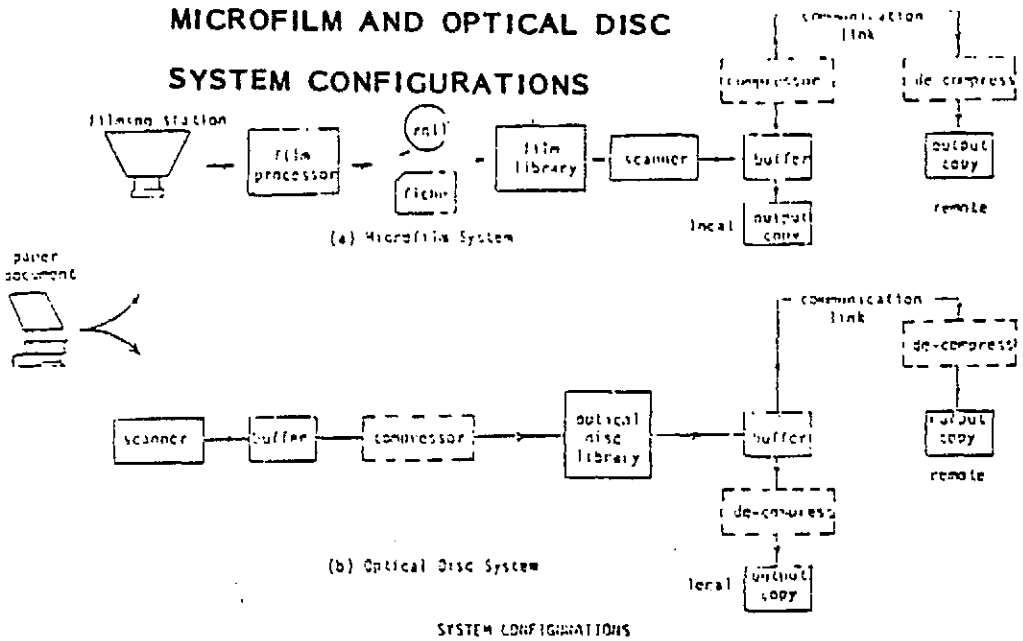
Videodisc technology may find its most important use in the area of information storage and retrieval. This is best illustrated by comparing the role of videodisc in the information storage, retrieval and archival fields with current and known future alternative technologies.

### Optical Disc compared to Microfilm

Both microfilm and videodisc have many desirable features as mass storage media for document preservation, retrieval, and dissemination. Yet with the strong demand for rapid dissemination of documents to remote locations, the compatibility of the storage medium with the communication channel becomes crucial. Optical discs provide such an advantage because they can be linked directly to electronic or computer circuits.

Figure 3 illustrates the differences between the two systems. In the top portion we can see the configuration of the microfilm system. The filming station and the film processor create the microfilm images (roll or fiche) of the paper documents. The films can be organized into modules (cartridges, carousels, etc.) with a conventional retrieval method to project the image of the requested document. This ties up the film module and prevents other users from having access to the same module during that period.

## Figure 3




SYSTEM CONFIGURATIONS

| Parameter | Microfilm | Optical Disc |
|---|---|---|
| 1) recording method | photographic micro-imagery | laser beam recording |
| 2) storage compaction | photographic size reduction | redundancy removal |
| 3) data entry process | photographic filming | electro-optical scanning |
| 4) conversion rate/machine | few pages per second | same |
| 5) life expectancy | archival | about ten years |
| 6) duplication | photographic method | digital regeneration |
| 7) method of retrieval | automatic film retrieval and photographic projection, or electro-optical scanning | automatic control of mechanical motion in conjunction with electro-optical scanning |
| 8) output | microfilm viewer, electronic softcopy display, and hardcopy | softcopy display and hardcopy |
| 9) dissemination method | mail hardcopy, or scan the film for electronic transmission | stored in a form suitable for electronic transmission |
| 10) auxiliary storage | buffer is required to provide rapid services to multiple users | same |
| 11) file updating | selective partial updating | may need a new disc |
| 12) supplies and services | many micrographic vendors | very limited |
| 13) access/retrieval time | about 10 seconds | within seconds |
| 14) suitability for computer processing | must be scanned and converted into a digital format | already stored in a digital format |
| 15) history/performance | known for decades | newly developed product |
| 16) media cost | 0.2 cents/page | 0.02 cents/page |

A computer-assisted retrieval system could access the document by rapidly transferring the image to a buffer storage by means of electro-optical scanning. This would also permit electronic transmission of the image to remote locations via a communications carrier link. The optional compressor permits a 10 to 1 reduction in transmission costs in which the image reconstruction may be either soft copy display or hard copy.

An optical disc system as a storage and retrieval medium is illustrated in the lower segment of the diagram in Figure 3. The scanner uses a buffer to convert the image of a paper document into digital data. Both recording and retrieval processing are controlled by a computer either alone or with an optional compressor. Another buffer serves as an interface between the disc file and the user, whether the file is local or remote.

The table below these diagrams compares the two types of storage media.[3] The major points to be noted are:

- Though most microfilm is of archival quality, it is subject to wear and tear by the frequency of retrieval, mechanical motion for display, and the heat generated by the light source.
- The duplication of film can experience a 5 to 15 per cent degradation per generation of photo-duplicating process. With optical discs using the DRAW method, the accuracy of the duplication is immediately verified.
- The data on optical discs are already in an electronically transmittable form; the microfilm must be scanned.

- Since film comes in smaller basic units with fewer pages than an optical disc, it is easier to replace a piece of film in order to update a few pages.

- With an optical disc the access time is a few hundred milliseconds to a few seconds; for microfilm it is about 10 seconds.

- The cost comparison assumes that a basic film module (100 feet of 16 mm roll film) costs $6, and stores 3000 pages at 24X. A $10 optical disc can store $2 \times 10^{10}$ bits. An 8 1/2" X 11" page scanned at 200 dots an inch generates $3.74 \times 10^{6}$ bits. With a compression of 10:1, a videodisc can store 53,000 pages. The cost compares favorably for optical discs at .02 cents per page as opposed to .2 cents per page for microfilm.

If an organization has already made a large investment in archival-quality microfilm, the change to videodisc may not be sufficiently advantageous and cost efficient unless there are certain additional factors:

- if the information is required on an immediate access or machine-readable form, then videodiscs may be more appropriate
- if color is a significant requirement, videodisc is preferable
- if quality of transmission reproduction is needed, the microfilm scanning device (which has not been used widely to date) may not be as acceptable as videodisc quality.

The choice between storage media should be made with all these aspects in mind plus an awareness that both technologies, are being improved and refined in capacity for revision, speed of access, reproduction and direct-read-and-write.

Moreover, it is important to note that the microfilm system used here for comparison purposes is an ideal system. Most locations currently using microfilm do not have the full array of

equipment presented. Therefore, a disc system with more standard features than a "standard" microfilm system is even more attractive than this analysis would suggest.

## Videodisc compared to Magnetic Bubble Memory

Magnetic Bubble Memory is in an early stage of development, but it is expected to have advantages for storage density and speed of access. This section addresses the questions of how soon the bubble could become a viable competitor, and its functional advantages in either competing with or supplementing the use of videodiscs.[4]

Videodisc and bubble memory systems compare as follows:

- Videodisc has a storage capacity of $2 \times 10^{10}$ bit per square inch. Current bubble memory products have a storage density of $10^6$ bits per square inch, advanced research prototype chips have obtained $10^8$ bits per square inch and there are predictions that it will be developed to hold $10^{10}$ bits per square inch.

- Bubbles are more modular than discs both in terms of data storage and of selective access. Integrated circuit economics dictate that low cost can be maintained for larger capacity modules if that larger capacity also has a higher storage density. It is not yet certain if this is true for videodisc systems. To increase capacity by decreasing the track width, for example, greater accuracy and better performing laser reading systems are required. This may raise the costs substantially.

- The access time for bubbles is shorter than mechanical seeking time for videodisc files

- The bubble memory requires a special packaging system in order to maintain the memory devices. Bubbles

require an even higher degree of environmental control than magnetic media. Consequently, its suitability for archival use is debatable.

Videodisc compared to Magnetic Tape

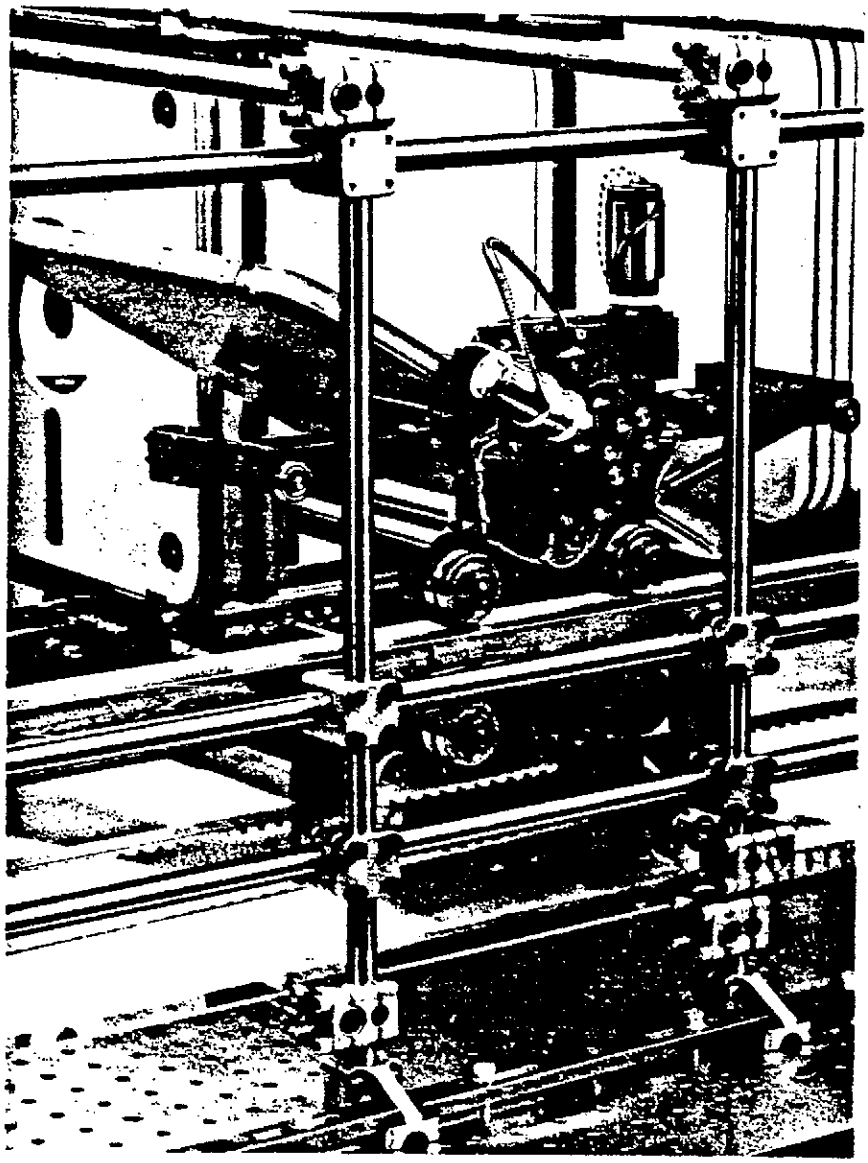
Industry experts predict that storage systems with capacity as large as $10^{12}$ bytes ($8 \times 10^{12}$ bits) will become dominant in the industry. Magnetic tape users will require larger facilities to handle such capacity. It can be a very costly procedure to maintain a sizeable tape library, as there is an ongoing need to rewind (every 6 months) and recopy (every 1 to 2 years).[5] Manpower alone can add to the cost of maintenance because most magnetic tape archives require operator assistance to find, carry and mount the tape.

The videodisc is capable of handling the equivalent of 250 reels of 6250 bpi magnetic tape, 1800 magnetic disc packs (IBM 3340), or 30,000 drums of disc packs with $3.2 \times 10^7$ bits on each disc.

Videodisc selection and playing can all be automated with an automatic "juke box" such as the Philips system shown in Figure 4. The access time for a videodisc with a juke box system can range from 5 to 10 seconds. Related files on the same disc can be retrieved in less than a second. However, the time taken to bring the disc up to speed is considered to be a problem. Therefore, even with fast random access of the data on the disc, a trade-off between more disc drives and discs or "juke boxes" may be necessary to optimize large-scale storage systems.

Figure 4

PHILIPS VIDEODISC PLAYER SYSTEM



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Requirements for bulk storage of $10^{12}$ bits (or a terabit) have been reported mainly by government agencies. These applications include the U.S. Census Bureau for its statistics; the U.S. Law Library for its holdings of cases and judicial material; the National Institute of Health for "digitized" x-ray files; and Social Security files for some 350,000 reels of magnetic tape. While banking applications can survive with tape archival systems, the cost savings of a videodisc system could be quite significant.

Optical discs have a substantial advantage over tape for archival applications. The unstable characteristics of magnetic tape under even ideal room conditions have caused a tremendous interest in optical videodiscs. It is estimated that these discs, if stored under room temperature, will maintain surface and pit integrity for longer than ten years. Under normal room conditions, 3M reports that the DVA disc will last 100 years, Thomson-CSF 60-70 years and other discs, like the Drexler, 20-25 years. Under ideal storage conditions it is expected that these discs will last much longer.

By law many industries are required to maintain archival data for a considerable number of years. The greater the data access frequency or the greater the quantity of information for storage, the greater the need for an automated system. For this reason, videodiscs are very appealing to data processing managers.

# PART TWO

# TECHNICAL DESCRIPTIONS

## INTRODUCTION

After having dealt with the technical functions and their implications in relatively non-technical language, the purpose of Part Two is to set out some of the technical details for the more specialized reader.

## CAPACITANCE SYSTEMS

RCA and JVC are the main developers. Both systems utilize changes in electrical capacitance to re-create a video signal from a conductive polyvinyl chloride disc. The capacitance variation used is in the order of 0.35 femtofarads.

Both RCA and JVC systems are aimed primarily at the consumer market. Educational or industrial versions may come at a later date depending on the success of the initial entry.

## CAPACITIVE ELECTRONIC DISC (CED)

The RCA's CED system uses a disc which is 304 mm. in diameter and approximately 1.78 mm. thick. The disc rotates at 450 RPM or 7.5 revolutions per second and therefore has four frames or eight video fields per revolution. The information itself is in the form of rectangular pits, the orientation of which is at right angles to those in other systems. The pits

are from 0.25 to 0.5 micrometers long and about 4 micrometers wide. The depth is approximately 0.35 micrometers.

Figure 5 illustrates the cross-section of a typical disc side which consists of a lubricating laminate coating over a dielectric layer which covers the pits. Identical triple-layer laminates on either side of the disc allow both sides to be stamped at once. The disc needs no further processing after the stamping takes place. Because dirt or handling will damage the surface, the disc is placed in a protective case and boxed.

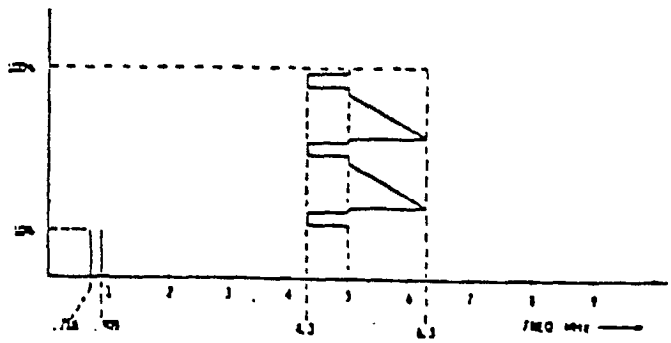
The RCA system is sometimes referred to as a "captive" system because the disc operates with a mechanical pick-up that travels in a groove on the disc surface producing four frames per revolution. The mechanics thus make any form of a still frame unlikely. To get around this, the latest version of the player has a digital display of the elapsed time on the disc and a means of moving the stylus across the surface of the disc without destroying the picture or the walls of the grooves.

Stereo recording also seems possible through differential FM modulation of the carrier signals, but it is not a feature on the discs to be released initially.

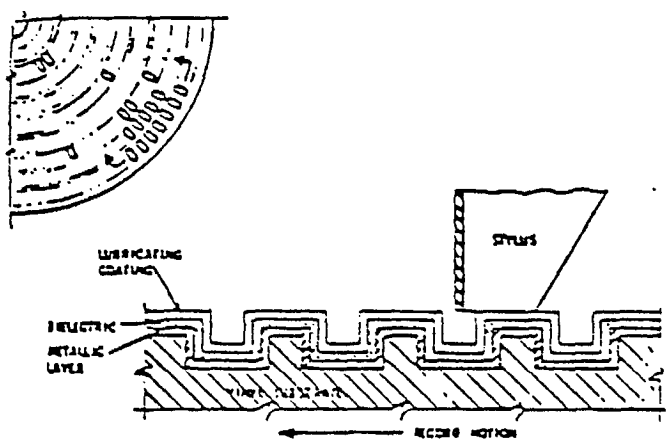
Recording can be done in real time by laser, electron beam or stylus but at present is being done by stylus at 1/5 speed in order to control quality with the simpler technology. During recording, the chroma is separated from the composite signal and translated down from 3.58 to 1.53 MHz where it modulates an

## Figure 5

FREQUENCY SPECTRUM AND DISC CROSS-SECTION OF RCA SYSTEM



Frequency spectrum, RCA system.




RCA disc cross-section.

interleaved subcarrier at 1.53 MHz. The luminance bandwidth is 3 MHz (compared to the broadcast standard of 4.2 MHz) and the chroma is ± 0.5 MHz and is interleaved with the luminance. Masters are made from any type of original material but are transferred to 2 inch videotape as part of the final pre-mastering. Since RCA has not sought secondary suppliers, mastering requirements are not generally available.

The playback time of RCA discs is one hour per side; one disc will be capable of carrying most movies. In conjunction with the simpler replication methods, this factor may result in relatively lower costs for pre-recorded discs for CED players.

VIDEO HIGH DENSITY

The Japanese Victor Company (JVC), a wholly owned subsidiary of Matsushita, has developed a system with many similarities to the RCA system; nevertheless the two are non-compatible. The VHD system uses a disc of conducting plastic, which, like the CED, has a protective caddy enclosure but the rotational speed is 900 RPM and the surface of the disc is without grooves. Horizontal location of the stylus on the flat surface is servo-controlled through control tracks on either side of the signal track. This allows slow motion and still frame capability with relative ease. However, because there are four fields in each revolution, still frames consist of two video frames and consequently some of these "double exposures" are slightly blurry and sometimes jerky.

The sapphire stylus should last about 2,000 hours and the disc about 10,000 hours. Because of the contact involved, a still frame will cause disc wear after about an hour. An automatic release that functions with the still frame mode may be used to alleviate this problem in the future.

The track pitch is 1.35 micrometers, the video carrier wave has a pedestal of 6.7 MHz and a frequency deviation of 1.4 MHz. The luminance bandwidth is 3.1 MHz. The capacity of the system is one hour on each side of a 260 mm disc, 1.8 mm thick.

The basic machine is a linear-play device. A random access unit based on a microprocessor is an optional accessory, as is a pulse code modulation unit for digital playback of audio discs. Stereo sound or two mono channels are a standard feature of the basic unit.

As this system is not projected to appear on the market until June 1982, there are no technical requirements yet available for recording material. However, the masters, which are claimed to produce up to 20,000 pressings are prepared by exposing a photoresist on glass with a laser beam modulated by the signal in real time. The photo-etched pattern is then used to produce galvanic stamping masters, just as in conventional audio discs.

In pressing, it is essential that a consistent and homogeneous conductive mixture of plastic material and dispersed carbon is achieved, and that the mixture is pressed with absolute uniformity throughout the disc. As in the RCA method, both compression and injection molding techniques have been investigated.

## OPTICAL SYSTEMS

There are three kinds of optical systems: transmissive, reflective and photographic. Transmissive and reflective storage and retrieval systems are available in the industrial market place. Reflective units and software are also available in the North American consumer market.

All units operate with some form of a light beam which scans the disc -- thus eliminating problems with wear. Optical systems therefore represent a more developed technology in which the players are more complex and costly than their contact-type counterparts (see Figure 6).

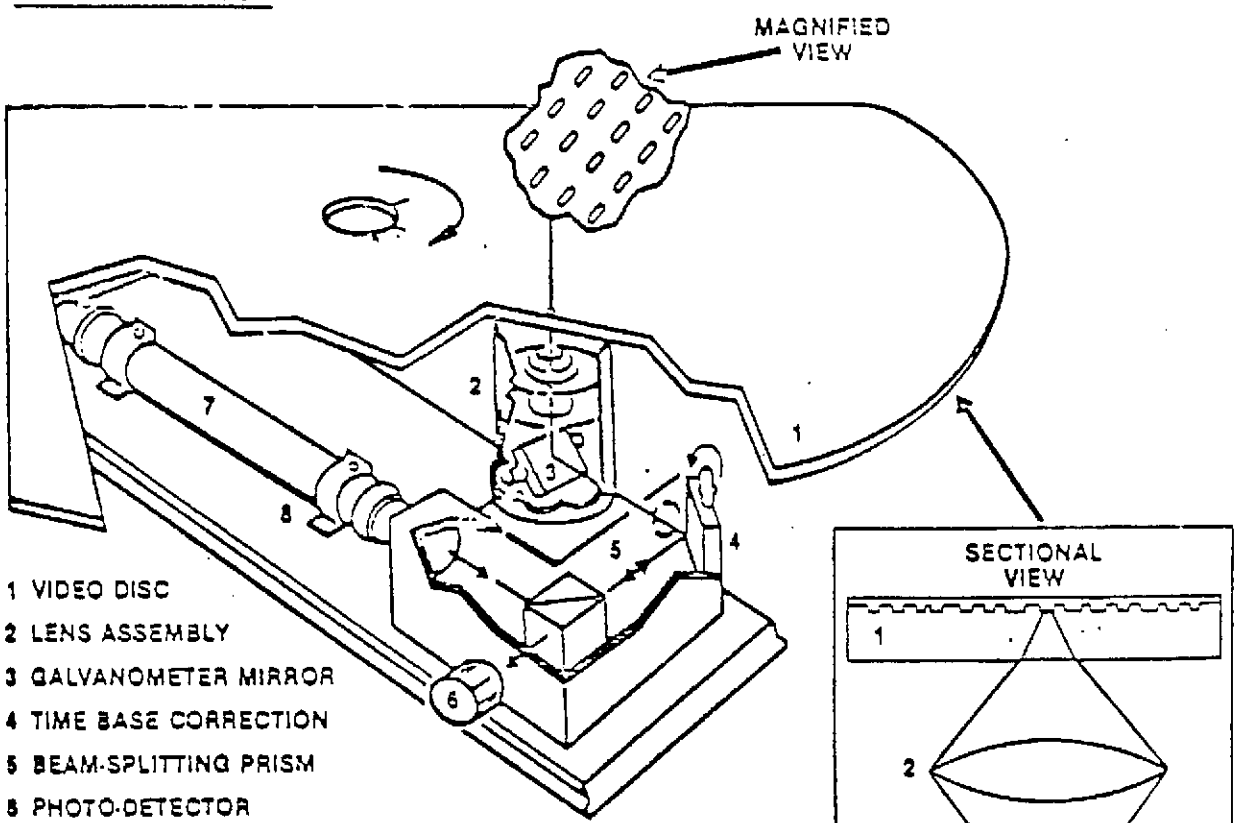
## TRANSMISSIVE SYSTEMS

The ARDEV system now owned by McDonnell-Douglas is of special interest because it uses photographic film as the basis for the disc. First, the film is exposed using a 1 milliwatt laser, then processed using standard photographic processing solutions. After the film is dry it can be played back on a separate player which utilizes a 6-volt bulb as the source. The information on the disc is recorded digitally and the audio can be compressed at 300:1 to give 30 seconds of audio with each still picture. These discs can be replicated using a diazo process.

The priority of the company, now known as the Videodisc division of McDonnell-Douglas Electronics, is to develop a desk

**Figure 6**

PLAYER OPTICS




The exploded drawing above demonstrates the laser and optics module

top manual videodisc copier. However, some industry experts question whether the contact system of reproduction yields dense enough information for storage applications.

Figures 7 and 8 are supplied by McDonnell-Douglas.

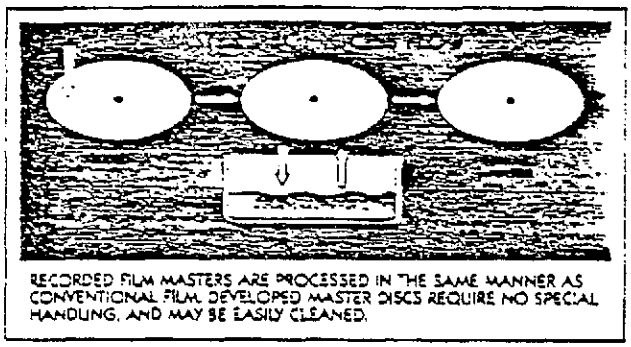
Thomson-CSF of France was one of the first companies to enter into videodisc development. They began work on their optical transmissive system in 1968.

In this system, the light from a laser beam is passed through a thin, flexible and transmissive plastic disc. The disc is 304 mm in diameter and 0.15 mm thick. Rotational speed is 1500 RPM in European systems (PAL/SECAM) and 1800 RPM in North American systems (NTSC). Each revolution corresponds to one videoframe so that random access and information storage is practical.

The disc records information through the implantation of a series of "pits" between 0.1 and 0.25 micrometers deep. The number of pits per second is a measure of the luminance-modulated F.M. carrier; the length of the pits is a measure of the audio and chroma F.M. modulated signals which are added to the luminance carrier. Because the disc is transmissive, the differential light path between the areas of pits and no pits modulates the laser beam as it passes through the disc and is collected by the photodetector. The laser in the system generates a 1 mW helium-neon light beam.

Figure 7

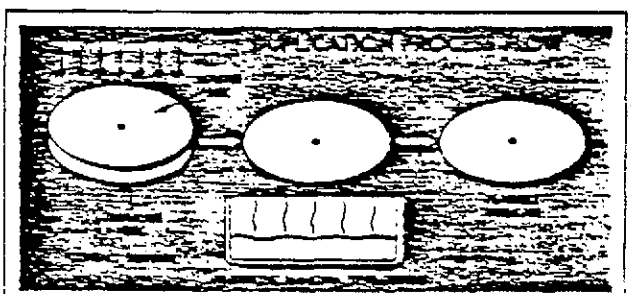
## MCDONNEL-DOUGLAS ARDEU SYSTEM



RECORDED FILM MASTERS ARE PROCESSED IN THE SAME MANNER AS CONVENTIONAL FILM. DEVELOPED MASTER DISCS REQUIRE NO SPECIAL HANDLING, AND MAY BE EASILY CLEANED.

### MASTERING

No clean room required ☐ Low-powered HeNe laser ☐ Less than 60-minute turnaround, for a 30-minute master ☐ Local, inexpensive recording equipment ☐ On-site recording by user ☐ Remote recording capability ☐ Potential for low-cost home recorder ☐ Interfaces easily with existing standard VTR equipment ☐ Real-time recording ☐ Economical masters (insensitive to quantity)

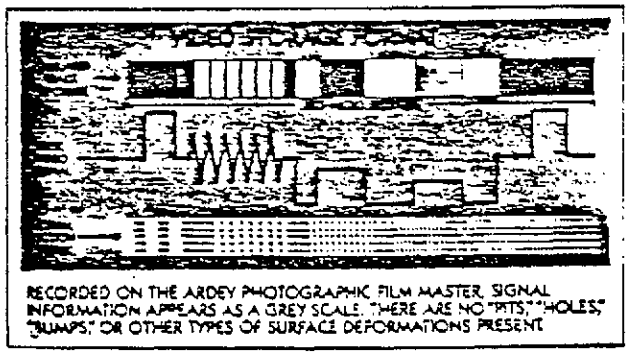


COPIES ARE MADE FROM MASTER DISCS BY SIMPLE CONTACT PRINTING METHODS. A COLLIMATED HIGH INTENSITY, LARGE AREA ILLUMINATION SOURCE EXPOSES THE DUPLICATE. THE COPY DISC IS THEN REMOVED AND PROCESSED IN A MANNER SIMILAR TO AN OZALID PROCESS, UTILIZING ANHYDROUS AMMONIA UNDER PRESSURE.

ANY QUANTITY OF COPIES CAN BE DUPLICATED — FROM ONE OR TWO, TO HUNDREDS OR THOUSANDS — AT EXTREMELY LOW COSTS COMPARED TO OTHER VIDEODISCS. FURTHER, THE SPEED AT WHICH COPIES CAN BE PRODUCED IS SIMILAR TO THAT ENCOUNTERED WITH HIGH-SPEED COMPUTER OUTPUT MICROFILM DUPLICATION. WITH AN AUTOMATED DISC COPIER, CYCLE TIMES OF 2-3 SECONDS PER DISC ARE NOT IMPOSSIBLE TO ACHIEVE.

### DUPLICATION

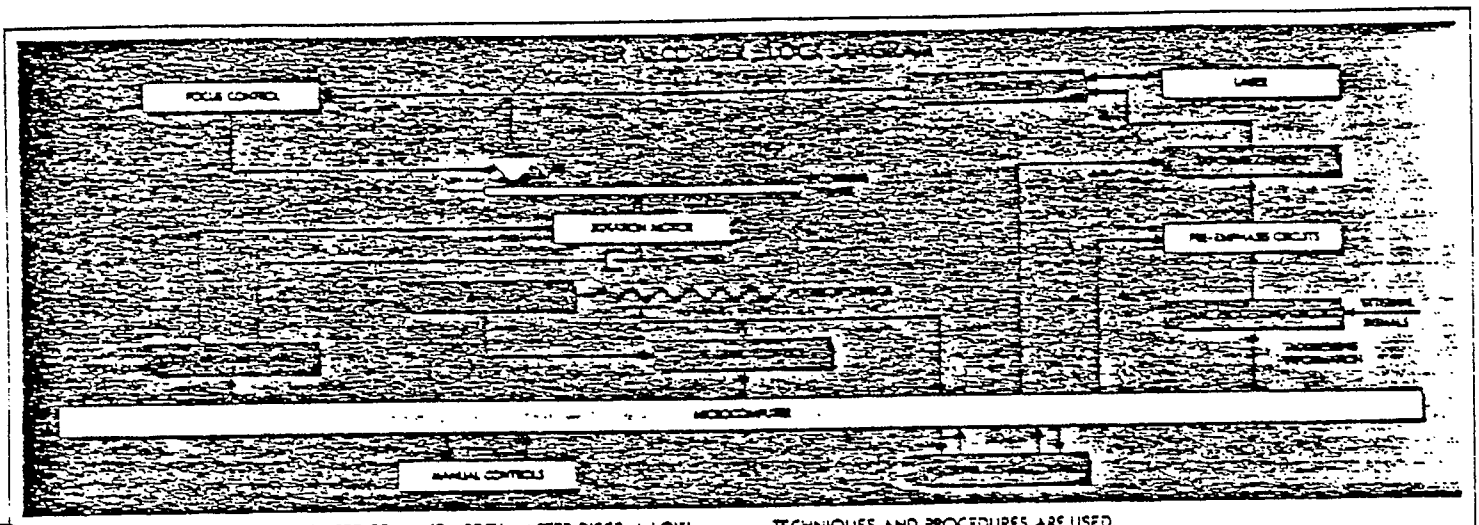
No clean room required ☐ Economical duplication (insensitive to quantity) ☐ Easy, economical contact printing process ☐ Anhydrous ammonia development ☐ Rapid duplication, processing time — approximately 60 seconds ☐ Linear grey scale properties ☐ Low-cost duplication equipment ☐ Potential desk-top-size duplicator ☐ On-site duplication by user ☐ Potential high-speed duplication



RECORDED ON THE ARDEY PHOTOGRAPHIC FILM MASTER, SIGNAL INFORMATION APPEARS AS A GREY SCALE. THERE ARE NO "PITS," "HOLES," "BUMPS," OR OTHER TYPES OF SURFACE DEFORMATIONS PRESENT.

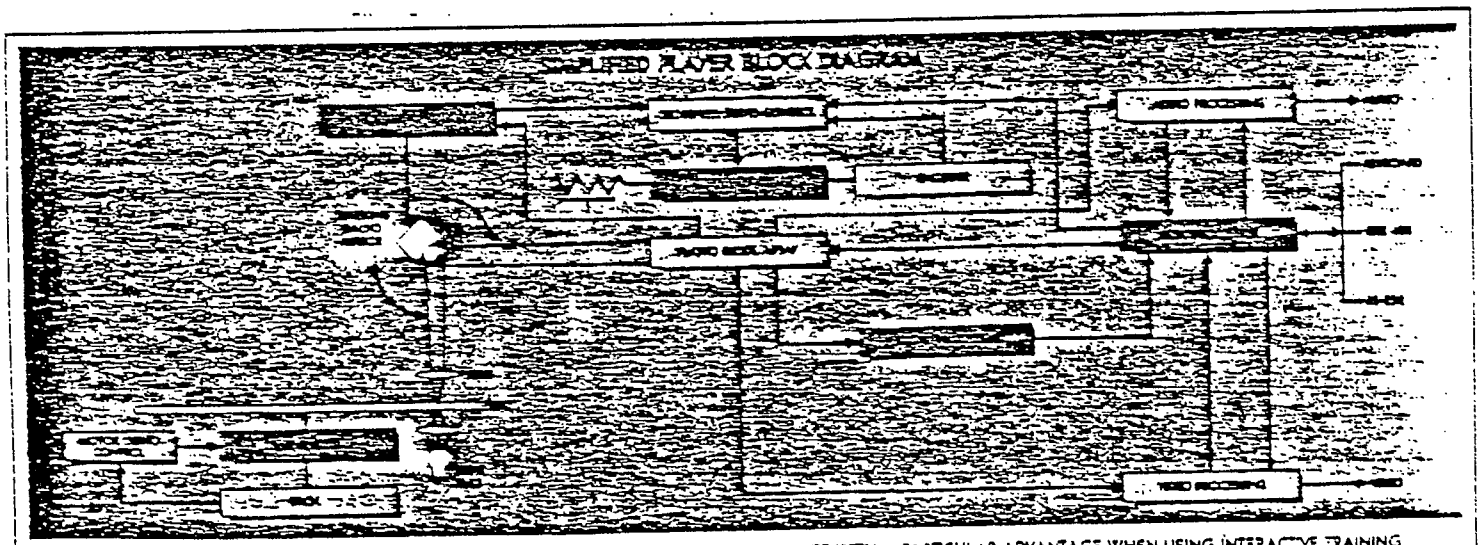
## Figure 8

# ARDEU RECORDER AND PLAYER BLOCK DIAGRAMS



KODAK BLACK-AND-WHITE FILM IS USED TO MAKE ARDEV MASTER DISCS. A LOW-POWER LASER EXPOSES THE SENSITIVE FILM COATING ON THE SURFACE OF THE DISC, IN A VARIETY OF SIGNAL (ENCODING) FORMATS, DEPENDING ON THE DATA BEING RECORDED. THE MATERIAL RECORDS WELL, PROCESSES QUICKLY AND NORMALLY, AND HANDLES EASILY. STRAIGHTFORWARD, CONVENTIONAL FILM PROCESSING TECHNIQUES AND PROCEDURES ARE USED.

SINCE RELATIVELY LITTLE ACTUAL LASER POWER IS REQUIRED TO WRITE THE SIGNAL TRACK, IT IS POSSIBLE TO COMMERCIALIZE A RATHER SMALL RECORDER, FOR ON-SITE USE BY THE CUSTOMER.



BOTH MASTER AND DUPLICATE DISCS MAY BE PLAYED BACK ON ARDEV MACHINES. A UNIQUE FEATURE OF THE ARDEV PLAYER IS THE 12-DIODE ARRAY READ HEAD. AS A RESULT, UP TO TEN TRACKS MAY BE READ, EITHER SEQUENTIALLY OR SIMULTANEOUSLY. THE 12-DIODE ARRAY READ HEAD ALSO PROVIDES THE ARDEV PLAYER WITH A PARTICULAR ADVANTAGE WHEN USING INTERACTIVE TRAINING PROGRAMS. THE ABILITY TO PLAY BACK STILL FRAMES, WITH COMPRESSED AUDIO, WITHOUT THE NEED FOR EXTERNAL STORAGE CIRCUITRY/PERIPHERALS.

In recording, a more powerful laser is focused onto a coated glass disc. The beam is modulated by variable width and frequency pulses and the process continues in a spiral of pits of varying length and spacing. Once the disc is exposed and the surface developed and made electroconductive through conventional galvanic mastering processes, duplicating masters are prepared for replication by embossing or photopolymerization.

The player itself is microprocessor controlled. The basic unit includes the capability for program branching, random access, fast forward and reverse, slow motion, freeze frame and step frame. Although playing time per side is restricted to 30 minutes, the laser can focus on either side of the disc without flipping, so that the effective length of the program is one hour per disc. The unit can hold more information per disc side but then there is a loss of random access and freeze-frame capabilities. Because the Thomson-CSF is an industrial model, the extra program length is of secondary importance.

The thin plastic disc requires neither a reflective nor protective coating, making replication relatively inexpensive. Since the flexible disc is extremely sensitive to dirt, dust and handling it has a protective caddy, which, as with the capacitance systems, is inserted into the player.

REFLECTIVE SYSTEMS

Reflective systems are most commonly used today -- mainly because DVA (DiscoVision Associates) has had as its major consumer for the industrial player 11,000 General Motors dealers in North America.

Pioneer, DVA, Magnavox and Sony utilize the Philips/MCA patent. It is a non-contact, laser-operated system which uses reflective discs. The discs are either 203 or 305 mm in diameter and approximately 2 mm thick. Track density is about 600 per millimeter. If recorded in the constant angular velocity mode (CAV), one revolution corresponds to one T.V. frame. The alternative method of encoding is constant linear velocity (CLV).

Constant angular velocity means that the picture is encoded on the disc so that one revolution corresponds to one T.V. frame. When the laser follows the same track repetitively, the result is freeze-frame. The speed at which the laser moves from the centre outwards is constant, as is the rotational speed at 1,800 RPM (NTSC).

In constant linear velocity recordings, (CLV), the pits maintain a constant relative speed as they pass the pickup unit. In other words, as the laser tracks outward and the circumference increases, the disc slows down to as little as 625 RPM.

The coding process is very similar to that used in the Thomson-CSF transmissive system. A full 60 minutes of video can be stored per side with CAV, only 30 minutes with CLV.

CAV is a good technique for educational and information retrieval applications where a freeze-frame feature is required; CLV is best used for entertainment discs where content space is required.

In the reflective disc, there are a series of rectangular pits: the number of pits per second is a measure of the video-modulated FM carrier signal. The length of the pits is a measure of the two audio-modulated FM carriers that are added to the video carrier to produce pulse width modulation for the sound.

Playback uses a 1 mW helium-neon laser beam which illuminates the surface of the pits and is bounced back by the coating for decoding by a signal detector. The depth of focus of the beam is between 1 and 2 micrometers. Therefore, minor surface defects and blemishes on the clear protective covering do not affect the picture.

Master discs are made of a glass base upon which a layer of chromium is vacuum-deposited. This is inturn covered with a photo-resist. The recording operator exposes a laser beam to the "resist" at a power fifty times that of playback. It is possible to use an even higher-powered laser beam to burn holes in the thin metal alloy on the glass disc.

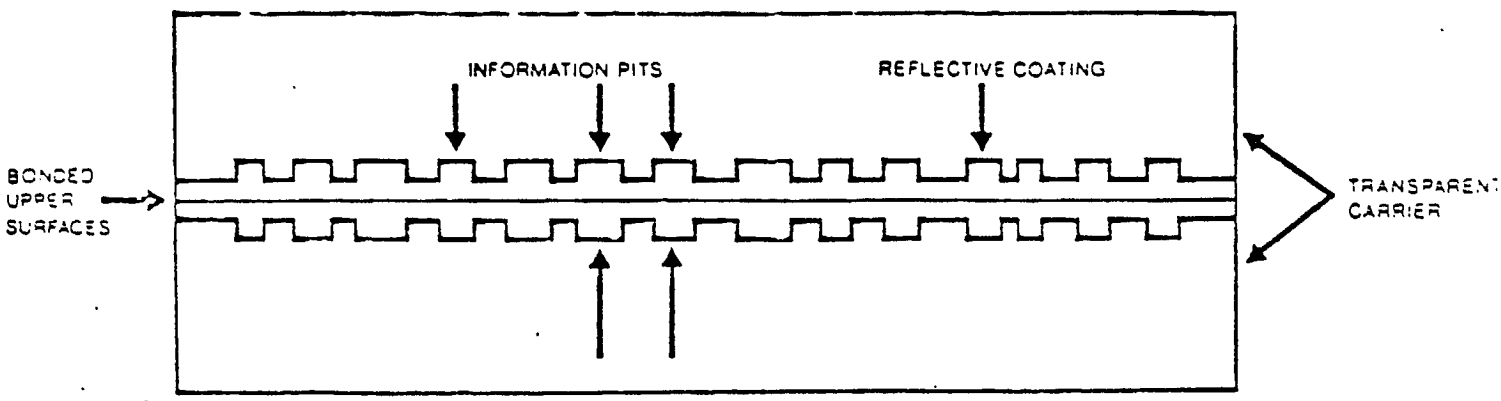
Replication of reflective-type discs has been approached by several different methods. DVA uses injection molding. Sony plans to utilize compression-molding techniques as it does the

audio replication. N.V. Philips, together with 3M, use the photopolymerization (or "2P") technique.

"2P" involves coating a disc with a photoresist and then applying a stamper. The photoresist is cured by exposure to ultraviolet light, followed by normal processing. The "2P" process has the advantage of eliminating the problems of mix consistency and uniform pressing.

Regardless of the technique used, a permanent pattern on plastic is the result; the disc at this point is very similar to a Thomson-CSF disc. When making reflective discs, however, a reflective film is deposited, a protective surface layer is added and a second disc is bonded to the back to create a double-sided disc of appropriate thickness (See Figure 9).

Figure 9




Double Sided Disc

## INDUSTRIAL USER RECORDING SYSTEMS

N.V. Philips has developed an optical recording system to permit user in-house digital recordings. In the "Philips Air Sandwich" disc design, a round sheet or layer of tellurium alloy forms the centre, a thin layer of clean air is held above and below it and Plastic encoats the whole.

The tellurium alloy has a lower melting or burning temperature than the plastic. The recording laser beam penetrates the plastic and then burns the pits in the tellurium alloy. The playback laser also penetrates the plastic to read the recorded information.

The discs are pre-grooved and pre-formatted. This does not require very expensive or complex recording equipment, because the header material is already on the disc and a laser can track an existing groove more easily than it can cut its own. Pre-formatting is done on the tracking grooves. The recording groove, in which a capacity of about $10^{10}$ user bits per side is available, is not used for pre-formatting.

Error detection and correction is done automatically as the system is writing on the disc. If the error rate in the sector being recorded equals or exceeds the error-correction acceptance threshold, a secondary error-checking "reject" code is written, and an "enable-next-sector" signal is blocked. In this way "bad" sectors, in which errors at readout may only be caused by disc degradation or improper reading, are rewritten. If the sector

recording satisfies the error-checking capability of the system, an "accept" code is written and the "enable-next-sector" signal is released.

The objective of this procedure is to raise the error-rate of the optical discs from the region of $10^{-5}$ (which is acceptable for image data) to better than $10^{-12}$. Philips believes this correction system to be more efficient than error correction codes because the usable disc capacity is not decreased. There is room for debate on this claim because the Philips system devotes almost 30 per cent of storage capacity to error correction routines, while RCA indicates a requirement of only 10 per cent in its error-correction coding system.

Philips agreed to develop a recorder and to transfer the technology to Magnavox, its North American subsidiary. The latter is to build a controller to interconnect the recorder with a DEC PDP-11 computer and with a digital player of more rugged design and electronic sophistication than is found in the ordinary videodisc player.

The capacity is one billion bytes of which 700 megabytes are usable per disc side; useful capacity per sector is 4,000 bits. The archival life of the glass disc is estimated at more than 10 years. A data rate of 2 megabits per second and a random access time of 75 milliseconds is expected.

Philips has been exploring still-frame audio capacity in which the sound, being separate from the video, can continue over

Figure 10

PHILIPS DIGITAL OPTICAL RECORDING SYSTEM

- to be added later

a still-frame visual. Five prototype laser-optical, read-and-write digital systems, which operate at 5 megabits per second, have been constructed recently by Magnavox.

RCA's Digital Optical system also uses a tellurium disc. Using the same laser and optic systems to write and read, recording data rates are in excess of 50 megabits per second and storage capacity is over $10^{11}$ bits per disc. RCA is developing a system that will operate at 320 megabits per second, to be used for mapping and data image processing by the U.S. Air Development Center.

RCA's error rates are $10^{-9}$ (one bit error per disc), achieved by use of error-detection-and-correction (EDAC) codes. They add check bits to the data and the resulting information is redistributed with the check bits, reducing storage by 10 per cent. At present, RCA has no plans to reduce the Bit Error Rate (BER) below $10^{-9}$ a process that would require a substantial change in its formatting.

It is reported that RCA wil release their digital optical system in 1982 at an estimated price of $500,000 per system, with discs costing $50 each. RCA has also done some work with erasable discs and is evaluating the Corning Glass erasable medium. An RCA spokesman indicated that if both erasable and non-erasable discs were available, erasable discs would capture 50 per cent of the market.

Figure 11 illustrates the optical disc drive which RCA is presently developing. It has three control systems which are common to most units: motor speed; laser focus; and movement onto the track. The servo arm is mounted below the disc, which prevents the laser head from dropping onto the disc in the case of a power failure. This drive is intended for a "juke box" system holding 100 discs for a total storage capacity of $10^{13}$ bits of information.

Thomson-CSF, through an agreement with Xerox Corporation is developing a write-once and read digital optical disc system for lower cost data storage.

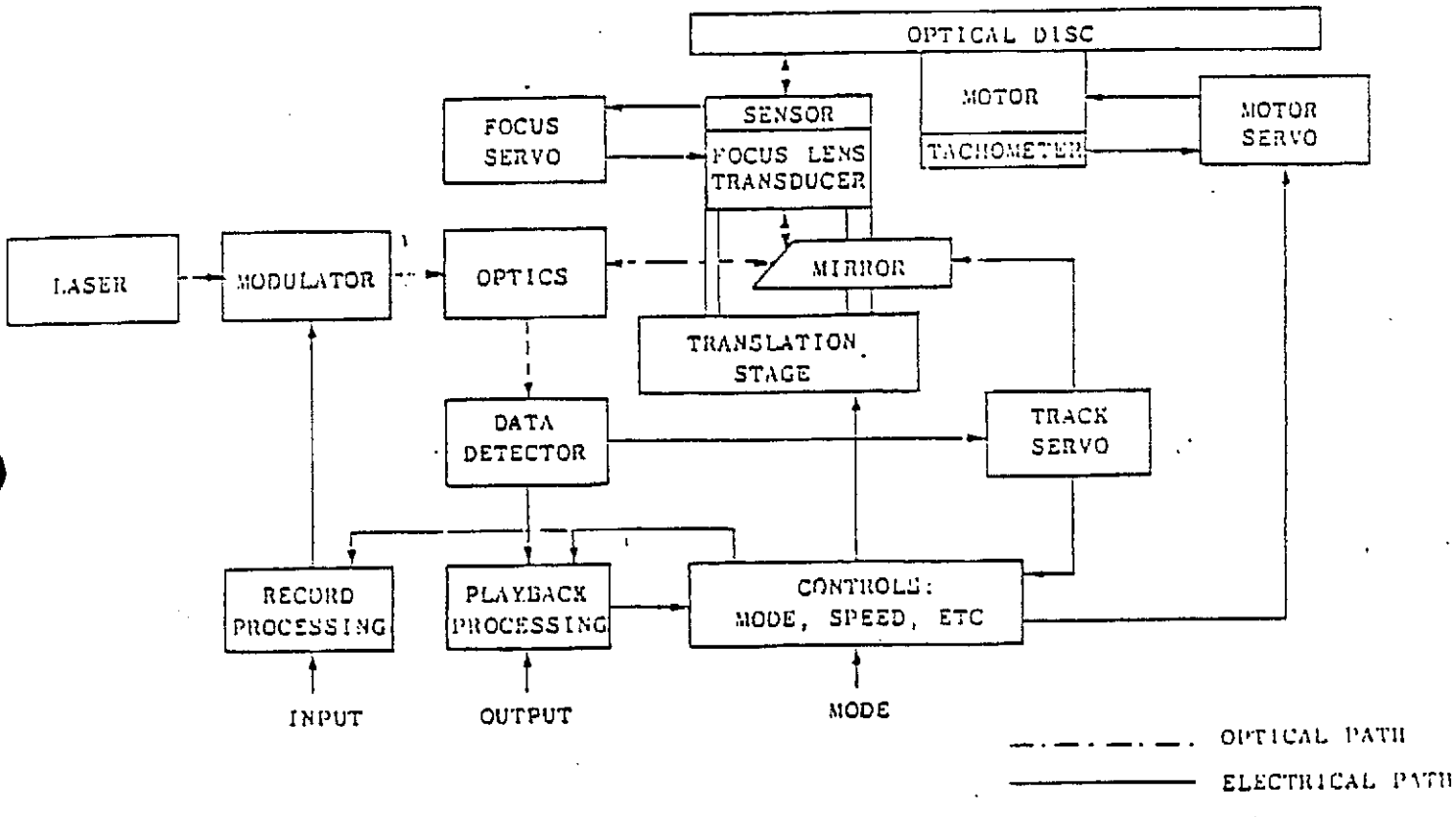
The Thomson disc is a sandwich of plastic substrata with a thermal sensitive layer. The player has the following components: a read and write head composed of radial and vertical servoactuators which focus a laser beam at a light-spot diameter of about one micron on the sensitive layer; a moving arm which shifts the head onto required tracks; an electronic control set; and an electronic interface for coding and correlation of data.

Each 12 inch disc holds $10^{10}$ bits of information. Access times could be as quick as 100 milliseconds. Data transfer rate is 5 to 10 megabits per second. It will be possible to replicate the disc after users have recorded their documents, either personally or through a service bureau.

Thomson expects to implement error-correcting codes to obtain an error rate of $10^{-12}$.

Figure 11

## RCA OPTICAL DISC SYSTEM



## FORECASTS OF FUTURE TECHNICAL CAPABILITIES

### CODING AND INFORMATION CONTENT

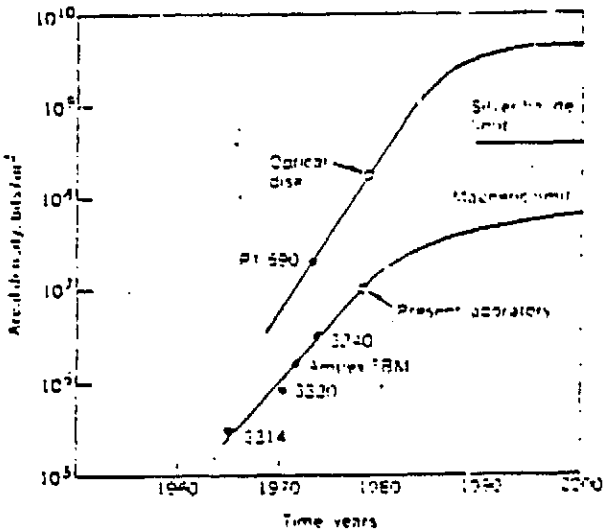
Magnetic recording has a limit of $10^8$ bits/in$^2$ for content density, while optical recording can be expected to rise above $10^9$ bits/in$^2$ as a result of current research. The access time and cost product for optical disc is extremely low, and for all media, the cost for discs will decline over the decade. (See Figures 12 and 13)

In the next few years we can expect numerous developments of optical disc sub-systems including capacities of approximately $2 \times 10^{11}$ bits on a single replaceable disc; larger, mass storage capacity through multi-disc units with capacities of up to $5 \times 10^{12}$ bits; and carousel or other "juke box" arrangements for products with very large capacities, up to $5 \times 10^{13}$ bits. Rewritable discs can be expected within the next five years.

The improved optical disc will use diode-laser (semiconductor) technology to remove the heat problem for the currently used gas laser. Diode lasers will also cost less and last longer.

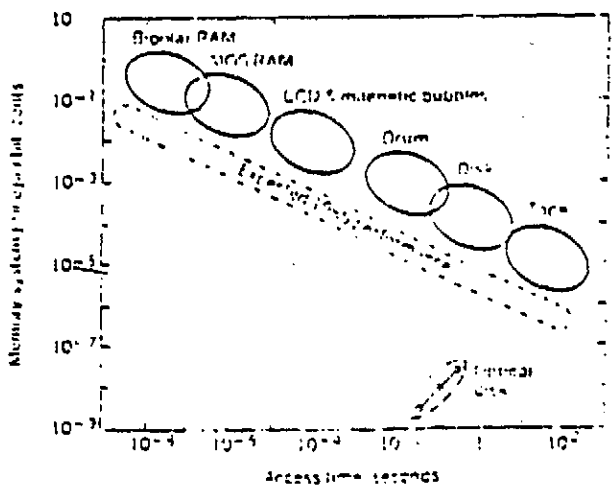
It is not expected that information densities will exceed 1300 M bits per square inch until late in the 1980s. However, by 1990, optical disc capacities of $10^{11}$ bits per side are projected. Track spacing will be reduced in the near future but not to less than 1.25 or even 1.5 microns.

## Figure 12



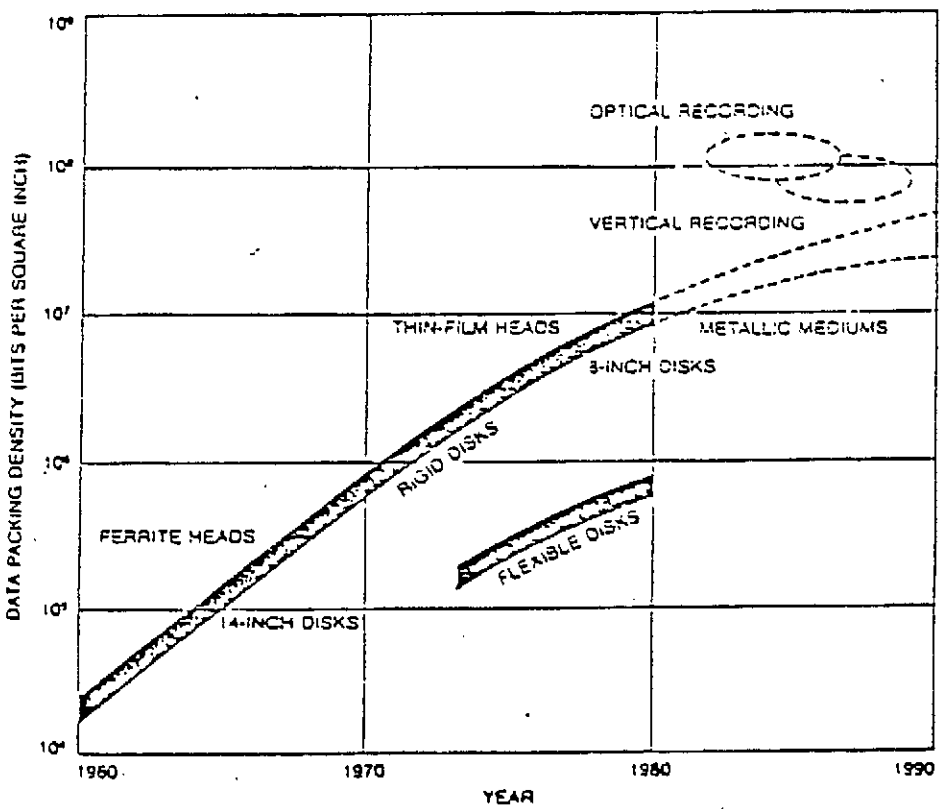

[6] Areal recording density vs. time for various recording mediums, showing that the ultimate optical disk limit exceeds that for magnetic recording.

[7] Access time vs. price for various storage technologies puts the optical disk in a favorable position.



## Figure 13

# ADVANCES IN DISK TECHNOLOGY




ADVANCES IN DISK TECHNOLOGY are reflected by advances in the packing density of data, expressed in this chart as bits per square inch on the surface of a disk. In rigid disks the magnetic medium is coated on an aluminum substrate; in "floppy," or flexible, disks it is coated on Mylar plastic. Two improvements are foreseen for the magnetic technology: the use of metal film instead of iron oxide as the medium on rigid disks and the recording of data in regions of magnetization oriented vertically, or perpendicular to the plane of the disk, instead of horizontally, the current practice. Optical disk technology might attain the greatest storage density.

## HOME INFORMATION SYSTEMS

When considering the possible applications for consumer market use of the information retrieval capability of the videodisc optical memory system, the idea of the "Live Encyclopedia" is a viable and attractive product. This new home information system would cost about 10 per cent to 20 per cent more than the present bound encyclopedias, available today at between $700 to $800, yet it would have a considerable number of advantages over the printed versions.

A bound encyclopedia is a tool for education and information retrieval. This dual purpose requires an indexing system which causes access problems. As an educational tool, encyclopedias should permit a curriculum format, allowing the user to go from an introductory chapter through to specialized sections. As an information retrieval tool they should permit immediate access to detailed sections while providing references to preliminary material or related topics.

A "Live Encyclopedia" offers this branching capability with the additional advantage of a "Global View" feature that allows varying levels from the highly knowledgeable to the casual user a "browsing" technique to access the information.

Using videodisc technology, the Encyclopedia Britannica is divided into two major sections; the Macropedia, or quick reference guide; and the Micropedia, where detailed information is

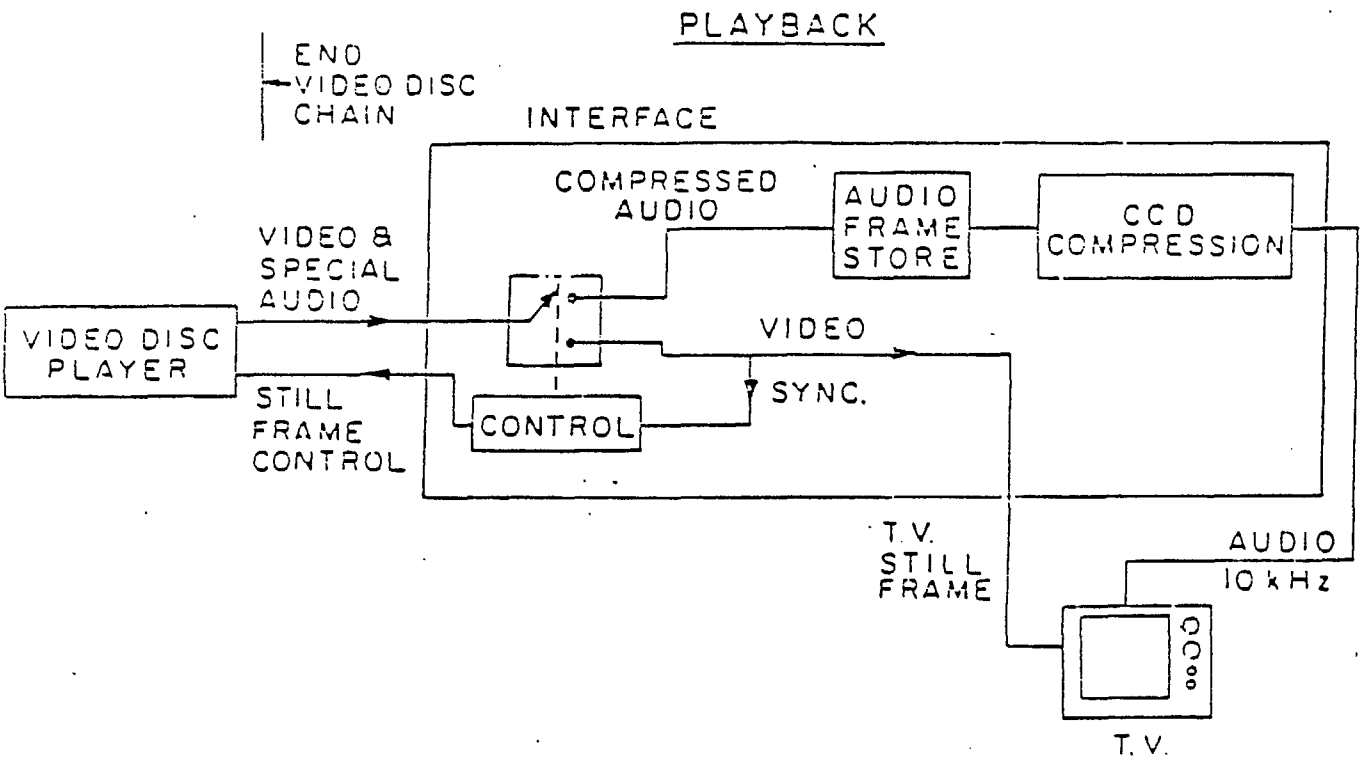
available in full text. For example, in the Macropedia, the topic of great white shark would be included in a chapter on fish but it would be under the specific reference "sharks" in the Micropedia.

The Macropedia contains over 8000 illustrations and 4200 entries, with an average length of 3214 words each. With some 300 words per minute, or 50 words per ten-second picture, a total of 1,350,000 words per disc is possible. This capacity would permit the entire text of the Macropedia to be contained in a commentary on 10 discs which would have a total of 270,000 full-color TV frames and 750 hours viewing time.

The "Live Encyclopedia" could be offered with several levels of accessing methods. Consumers could subscribe to a simple accessing mode with calculator-like keypad. In this mode they would be prompted through their searches with several menus indicating various choices. The second mode would include an alpha-numeric keyboard. A higher level programming system would allow consumers to use key-word retrieval to access to specific segments.

The manufacture of "Live Encyclopedia" discs would require special processing of the audio tracks for an overall time compression of 300. The format of the audio tracks must conform to the NTSC standard. Figure 15 is a block diagram illustrating the recording of a talking encyclopedia disc.

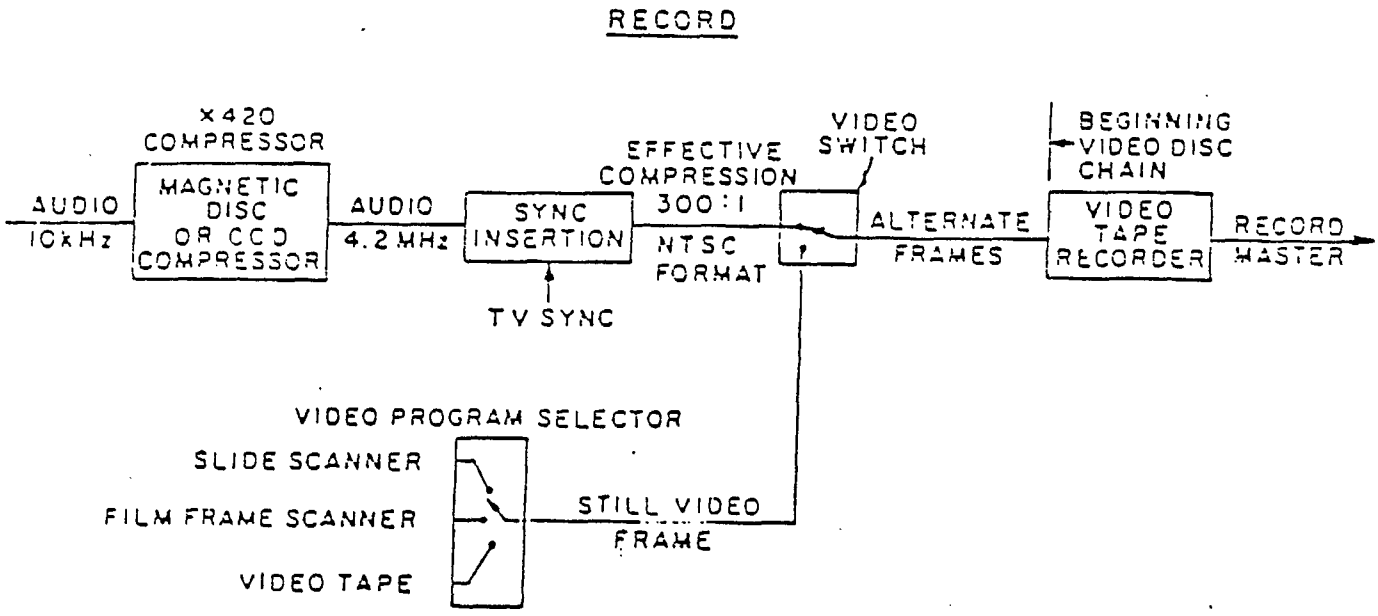
**Figure 14**




Playback of a talking encyclopedia disc.

**Figure 15**

## RECORDING OF A TALKING ENCYCLOPEDIA DISC



Audio commentary is first limited to 10 kHz bandwidth and then time compressed by a factor of 420. Time compression can be achieved by recording the 10 kHz audio in real time on a special magnetic disc at extremely low speed (4.3 rpm) for 10 seconds, then replaying at the normal 1800 rpm speed. The resulting compressed audio will have a bandwidth of 4.2 MHz. After insertion of NTSC synchronizing signals, the effective compression is 300 to 1, which is compatible with the NTSC video format.

The video frame associated with the audio commentary is selected from either a slide scanner or video tape. The still video frame is interleaved with the compressed audio frames so that the video and compressed audio frames alternate. This interleaved format is fully NTSC-compatible and can be recorded on video tape and used as a program source at the beginning of the videodisc chain.

The principle of this technique is to extend the audio information associated with each video still-frame. When alternate tracks are encoded with time compressed audio of 10 kHz bandwidth, the program duration per track is about 10 seconds. This disc would thereby contain 27,000 full color video still-frames and a total of 75 hours audio commentary. No alteration of the normal consumer player would be required and yet the viewer's interface time would increase from a half hour of full-motion video presentation to over 75 hours in the still-frame present-

ation. Manufacturers have stated that it is feasible to compress audio to the level in which 30 seconds for each track could be obtained. This would extend the entire playing time to over 200 hours per disc.

The National Library, National Museums, and similar institutions could put this technology to use in assembling program packages for the public.

## OFFICE INFORMATION SYSTEMS

The combination of the micro processor and the videodisc with other forms of computer technology can realize a tremendous advantage in overall office information systems. Whether linked to mini-computers or large main-frames, it can present the potential for a new form of information system offering executives and managers pictorial and graphic information on which to base decisions.[7]

Studies have demonstrated that executive and professional decision-making can be well enhanced by this new form of "live data."[8] At present, most automated office systems use videodisc technology mainly to provide central registry control over mail and internal memos.

A prototype system for large-scale document handling is the N.V. Philips "Megadoc" system.[9] It stores 25,000 documents per disc in high resolution (2400 lines) and 50,000 in low resolution (1200 lines). Documents can be accessed within 75

milliseconds on a screen or provide a hardcopy in one minute. The data compression technique, basically ignores all the blank spaces within a document, yet the reproduction is exact.

The image storage of the "Megadoc" system is mixed with digitally encoded alpha-numeric data. Thus storage is optimized by a factor of 10. Figure 16 illustrates the difference between the various modes of storing a typical typewritten page of 8-1/4" by 11-1/4" (referred to as $A^4$).

FIGURE 16

MODES OF DATA STORAGE

$10^{10}$ BITS/DISC

40,000 TRACKS/SIDE

128 SECTORS/TRACK

1 PICTORIAL A4 32 TRACKS

| | |
|---|---|
| HIGH RES./WITHOUT COMPR. | 2,500 A4's/DISC |
| HIGH RES./WITH COMPR. | 25,000 A4's/DISC |
| STANDARD RES./WITH COMPR. | 50,000 A4's/DISC |
| ALPHA-NUMERICAL | 500,000 A4's/DISC |

The Megadoc videodisc has 40,000 grooves divided into 128 sectors which provide 1,000 bits each for storing addressable information.

A conventional Philips P857 minicomputer controls the optical reader. New data is fed from the computer to the optical recorder through a special connecting interface. This is shown in the following exhibit. The recorder can act as a conventional magnetic storage system because it is a digital system. The abbreviation glossary below lists the equipment illustrated in Figure 17.

MEGADOC ABBREVIATION GLOSSARY

ODR - Original Document Reader

MEM - Transfer Memory

DIS - Document Display

DOR - Digital Optical Recorder
DOP - Digital Optical Player
JUX - Juke Box Modular System
PRO - Picture Processor
NET - Network Interface
COP - Hardcopy Unit
WOP - Word Processor
DAS - Data Switch
SYS - Software System

The use of a videodisc "juke box" permits the system to handle 64 videodiscs. Document information transfer from one peripheral to the other takes only one second for every 8-1/4" by 11-1/4" document. Eventually a simultaneous exchange between

**FIGURE 17**

## MEGADOC SYSTEM HARDWARE

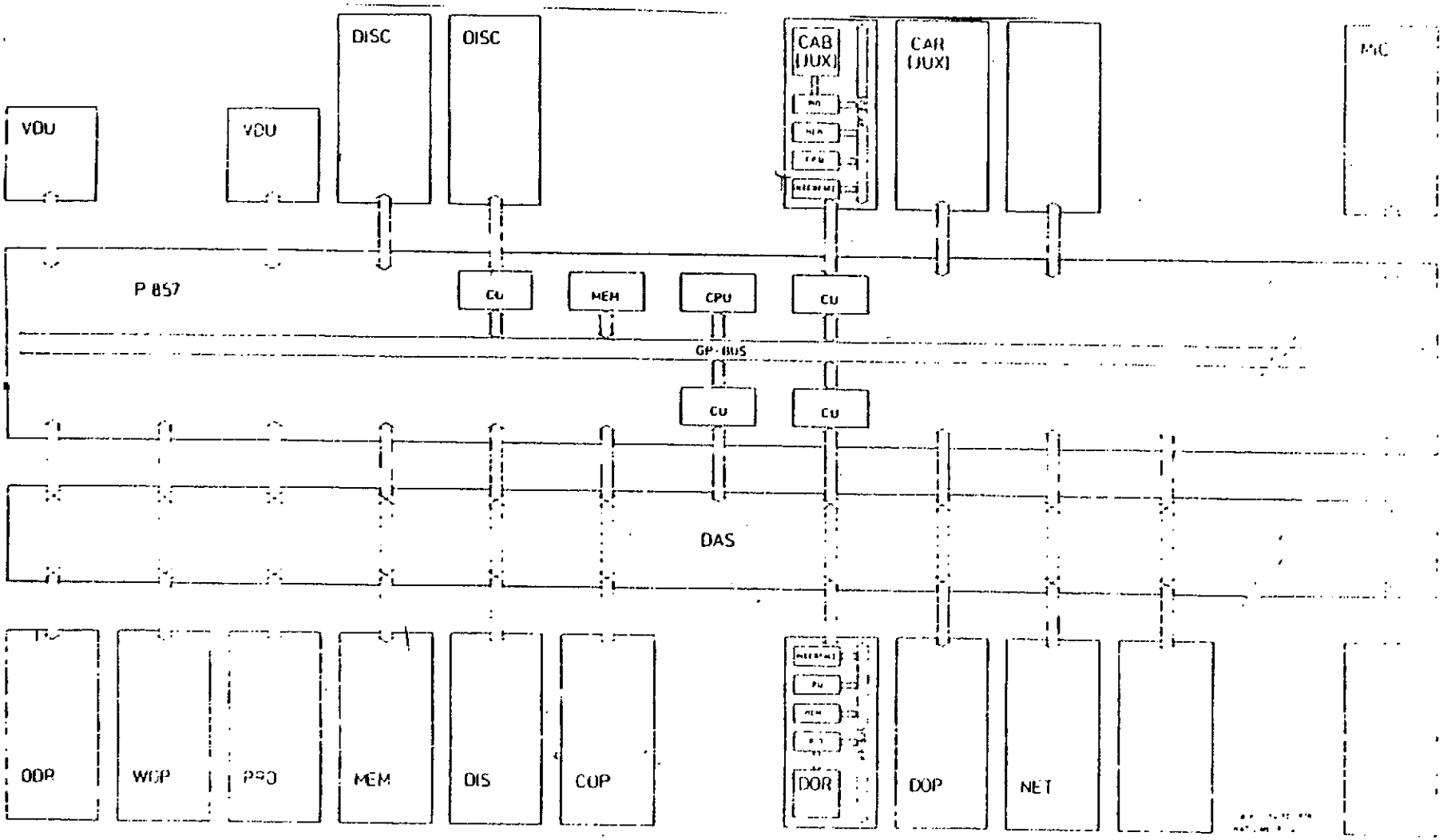
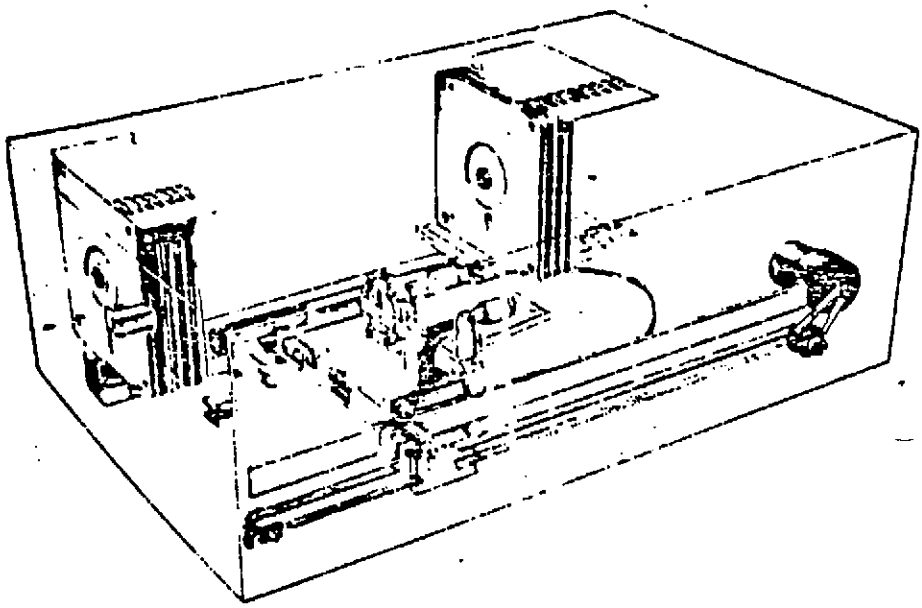


FIGURE 18

"JUKE BOX" CHANGER



from Philips Data Systems, The Netherlands

different pairs of peripherals -- 6 pairs out of 16 peripherals at maximum -- will be possible.

The Original Document Reader (ODR) is a laser-scanning peripheral capable of reading documents as oddly sized as 11" by 17", after which the reader transfers the document into recordable information bits in one second. The encoded document is then transferred into an "outboard" memory unit which has an 1/0 rate (input and output) of 4 megabits per second -- the same rate at which the ODR "reads" the documents. This is hooked into an available laser printer which can copy a document in one second.

Further development on the Megadoc system is expected to increase the total output rate of the memory to 300 megabits per second. This will permit the system to store up to 1.5 million high-resolution documents using only document compression.

Development of the Megadoc project has taken 7 years of laboratory experimentation and it will be another 3 to 5 years before the system is commercially available. Presently, there are four prototype systems operating in Europe.

Another videodisc storage and retrieval system presently in prototype form has been developed by the I.T.T. Research Institute of Chicago, Illinois.[10] Figure 19 below is a block diagram of the components of the system. The size of each block is proportional to the cost of the component (This excludes the cost of the mastering equipment, which had been used as a service.) Unlike a standard TV camera, the image dissector does

not do a raster scan. Instead, each of the four million (2000 by 2000) is individually addressable under the control of a Visacom VC5000, which consists of a DEC PDP 11/03 cpu, analog-to-digital and digital-to-analog converters, and a four megabit memory.

With the image dissector, an entire page is captured at very high resolution and stored in memory. The image in memory is manipulated by computer software to extract a portion of a page. From this a standard TV signal is then created. This enables a good resolution in displaying a very legible page portion.

FIGURE 19

ITT STORAGE AND RETRIEVAL SYSTEM

- to be added later

# PART THREE

# PROGRAMMING THE VIDEODISC

## PRODUCTION: THE PROGRAM PRODUCER'S ROLE

Programming material onto discs is not yet an exact and standardized procedure. There are, however, some basic production techniques as well as some difficulties to be recognized and avoided.

### CONCEPT

There are several ways to prepare material for videodisc replication. Slides, flat art, motion pictures, videotape, computer and original video are resources on which to base production. Organization of basic material is of paramount importance to producers who must develop and follow closely a logical flow diagram. In some cases it may be as easy as determining a beginning and an end, while in others there may be a need to use computers, storyboards and a small army of designers and programmers.

Someone, perhaps the replicator, must decide where the program will start; whether it will have indexes, choices or pause points; as well as where and how it will end.

The following diagram provides a graphic illustration of the programming steps required to produce an interactive videodisc. The step-by-step instructions for entering information into the microprocessor are shown in Figure 20: Microprocessor Programming Instructions.

FIGURE 20

MICROPROCESSOR PROGRAMMING INSTRUCTIONS

| Program Step | Value | Command | Comment |
|---|---|---|---|
| 0 | 151 | PROG | Enter the "program write" mode |
| 4 | 5 | SRCH | Search to the index frame and freeze |
| 6 | 2 | RCLL | Call up register 5 |
| 8 | 360 | STOR | Load 2 in register 5 for decrement |
| 12 | 370 | STOR | Load reward "tell" frame location |
| 16 | | HALT | Load penalty "tell" frame location |
| 17 | 0 | AUD2 | Stop program until next instruction |
| 19 | 181 | SRCH | Turn off channel 2 audio |
| 23 | 7381 | ASTP | Locate frame 181 |
| 28 | 7381 | SRCH | Play to frame 7381 and freeze |
| 33 | 3 | INPT | Search to frame 7381 and freeze |
| 35 | 33 | BRCH | Accept user response from touch pad |
| 38 | 47 | BRCH | 0 Invalid response |
| 41 | 55 | BRCH | 1 Correct response |
| 44 | 33 | BRCH | 2 Incorrect response |
| 47 | 6 | RCLL– | 3+ Invalid response |
| 49 | | SRCH | Recall register 6 |
| 50 | 30 | WAIT | Search to reward "tell" frame |
| 53 | 0 | BRCH | Freeze reward frame 3 seconds |
| 55 | 7 | RCLL | Return to index frame |
| 57 | | SRCH | Recall register 7 |
| 58 | 30 | WAIT | Search to penalty "tell" frame |
| 61 | 1520 | SRCH | Freeze penalty frame 3 seconds |
| 66 | 2120 | ASTP | Locate review start frame 1520 |
| 71 | 5 | DECR | Play review section to frame 2120 |
| 73 | 28 | BRCH | Subtract 1 from register 5 |
| 76 | 0 | BRCH | Go to quiz if register 5 0 |
| | | END | Go to index if register 5 = 0 Exit to "program write" mode |

A typical videodisc pre-mastering, mastering and replicating workflow for a videodisc with microprocessor programming is shown in Figure 21.

FIGURE 21

VIDEODISC WORKFLOW OVERVIEW

| Approx. time | |
|---|---|
| | 1. Telecine or video transfer to IVC 9000 videomaster - can include U-matic videocassette with digital frame count. |
| | 2. U-Matic videocassette is approved for quality of tranfer. |
| | 3. Tape master drives laser which exposes photo-resistant coating on glass based disc. |
| | 4. Glass-based disc submerged in chemical bath - result: removal of unexposed coating, leaving "bump"-like surface texture. |
| 1 week | 5. Acid etching on nickel master from contact with glass disc surface. Result: nickel master surface has "pits" instead of "bumps." |
| | 6. Through a similar etching process, high-quality nickel master is used to make a "mother" with bumps. |
| | 7. A check disc can be made at this stage. In this case the mother is used in the injection mold process for a small quantity of check discs. |
| | 8. Usually, curing of the injection-molded disc takes 4 days. A check disc may not require the full 4 days. |
| | 9. Reflective aluminum is vaccuum deposited on the surface of each check disc side. |
| | 10. A check disc side is sent to producer or other representative to verify frame count and microprocessor program. |
| 1 week | 11. Program verified and returned to DVA. |

12. Verified program keystroked into the PROM burner - when program is "in", a program print-out is run.

13. Print-out is proofread against original program and approved by producer.

14. Approval is phoned to manufacturer.

1 week

15. Completed PROM data edited into audio track II of the videomaster head.

16. Repeat step 3 - to expose photoresist glass master.

17. Repeat step 4 - chemical bath for glass-based master with bumps.

18. Repeat step 5 - acid etch high-quality nickel master with pits.

19. Repeat step 6 - from nickel master, make mother with bumps.

20. From mother make several daughters with pits.

21. From daughters generate injection molding stampers with bumps.

22. Begin disc quantity injection molding process - final discs have pits.

5 weeks

23. Discs cure 4 days.

24. Finished disc sides machined and bonded together.

25. Bonded sides coated with 6 ml. of polyvinylchloride.

26. Two-sided disc remachined for hole size and roundness.

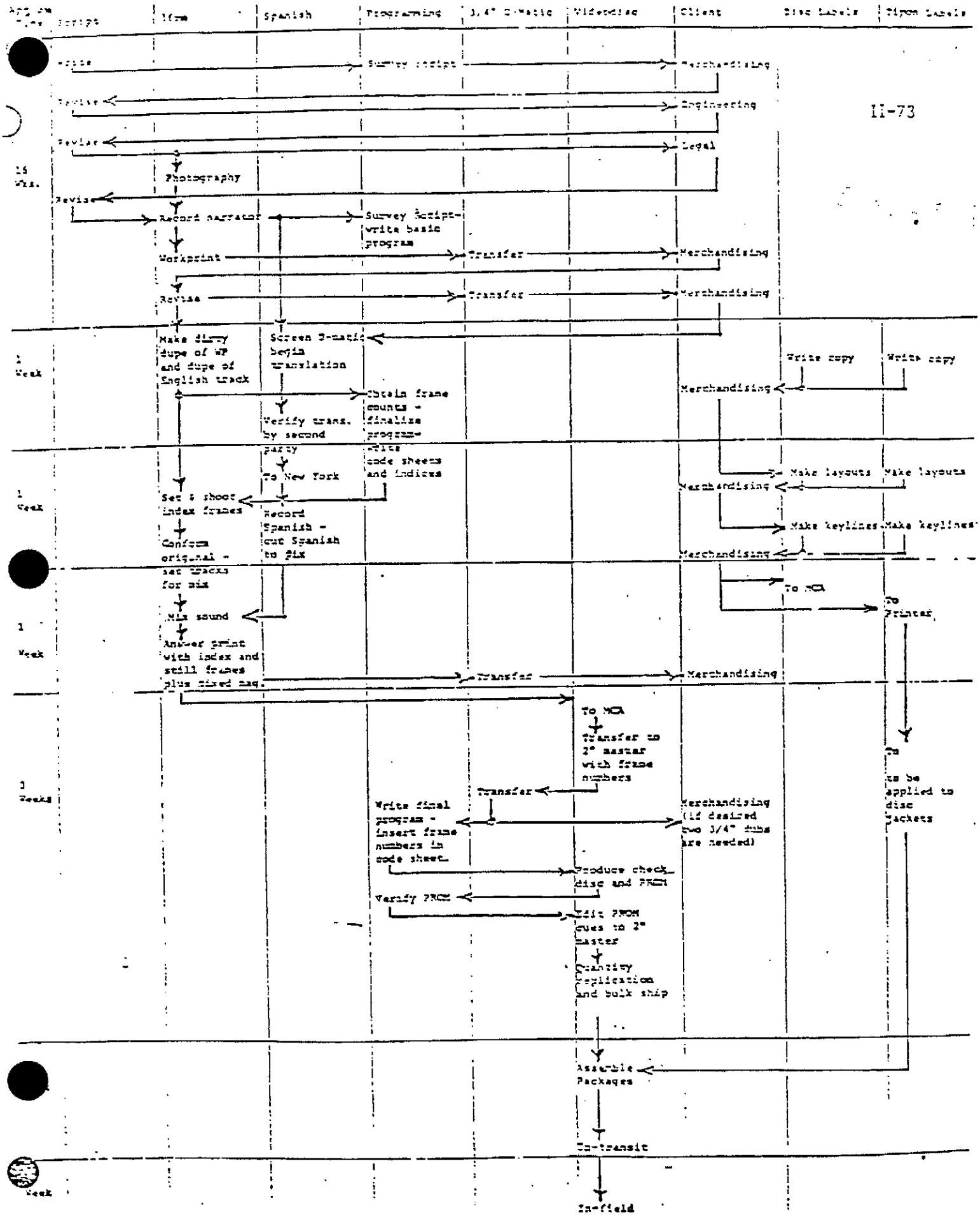
27. Each two-sided disc quality checked.

28. Discs undergo label application and are inserted in sleeves.

For a more detailed example of videodisc production workflow and critical path see Figure 22.

FIGURE 22

## VIDEODISC WORKFLOW CRITICAL PATH CHART



## PREPARATION OF A MASTER DISC

Once the material to be recorded on the disc is decided upon, the program must be transferred to a high quality videotape in preparation for disc mastering.

There are many systems in existence and even more procedures for set-up and operation. Hence, the mastering process requires careful technical planning to ensure the quality and success of the final product.

In almost all cases, several transfers must be made before final release copies are produced. During this stage of production, a 2-inch master tape provides a signal which is encoded with the lead-in track, frame numbers, chapter stops, automatic stops and the lead-out track. At his point, the producers give approval of only the first proof copy or "check disc" before volume replication is started.

The check disc also must have all frame numbers and programming verified. If a microprocessor program is to be encoded on the disc, then it, too, must be carefully checked at this stage. Any error here may result in the rejection of all discs produced, because the mistake is incorporated into a physical part of the disc and cannot be corrected after replication.

## FILM AND TAPE

It is likely that the original material will be film or tape. For the most part, normal production procedures are for the most part satisfactory for linear-play programs. If tape is

used, the control track should be coherent and synchronization signals must be at proper levels to ensure satisfactory transfers. If film is the medium, it should be formatted within Society of Motion Pictures and Television Engineer recommendations to allow for picture cutoff (TV safe areas: 90 per cent safe action, 70 per cent safe title).

If the program requires freeze frames, then the transfer and preparation process is more demanding. A normal video frame consists of two fields: each 1/60 second sequentially interlaced to create a 1/30 second frame. Any movement of the image between or during the recording of the first and second fields will cause interfield jitter within the frame and a flickering blur on the edges of the moving object. The freeze frame, therefore, will be unsatisfactory. This problem is further amplified in systems such as the proposed JVC method, which uses four fields or two video frames in its still-frame mode. At present, when motion in video is frozen, interfield jitter cannot be avoided.

Figure 23 illustrates the freeze-frame mode. The laser beam moves away from the center as the disc spins. Each single revolution constitutes one frame. In freeze-frame mode, the same spiral track will be reread by the light beam. At the vertical blanking interval (VBI), when the beam would normally begin to read the next track, it jumps back and rereads the same track and will continue to do so until it is activated into selecting motion continuity or another frame.

In film the same problem must be dealt with. In normal transfer of 24 frames per second (FPS) film to tape, the 24 FPS of the film must be reconciled with the 30 FPS of the videotape system. To do this, every other film frame is allowed to occupy three video fields instead of just two, which creates a problem in freeze-frame.

The player now has an "extra" field to confuse its counting system. In the DVA system, this is overcome by inserting a "white flag" which electronically signals the laser to begin the freeze frame at the proper point. Because the corrected video-to-film relationship is now effectively one-to-one, a good freeze frame will result. The video frame's two fields are both taken from the one image which was captured or stopped on the film frame at the time of original filming (see Figure 24).

There is a simpler solution. If original film were shot at 30 frames per second, there would be a one-to-one relationship between film and video frames. The need for the white flag would then be eliminated. Unfortunately, the 30 FPS film system is not a commonly used standard. Therefore, when the freeze-frame capability of any player system is an important feature, the source material must be carefully considered to ensure that field interlace does not cause objectionable instabilities of the display.

FIGURE 23

THE STILL FRAME

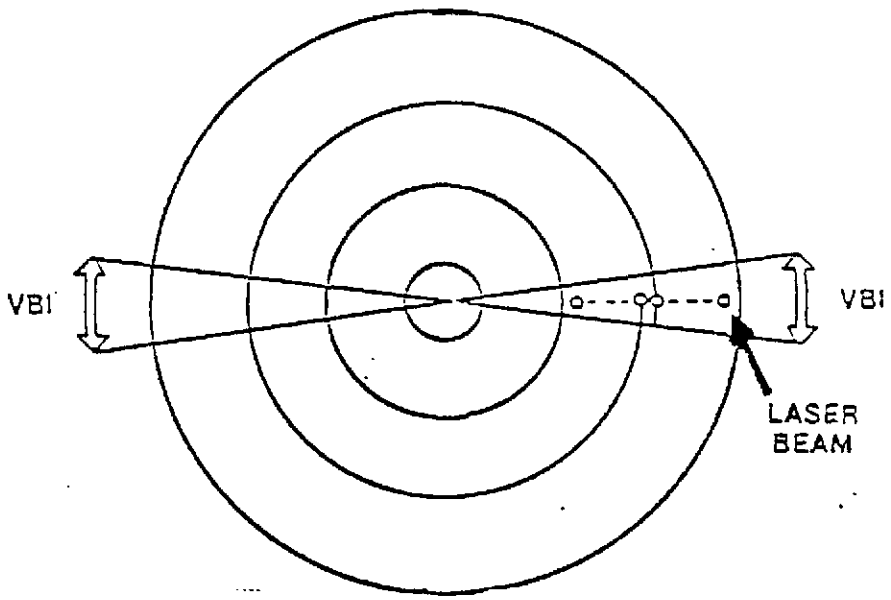
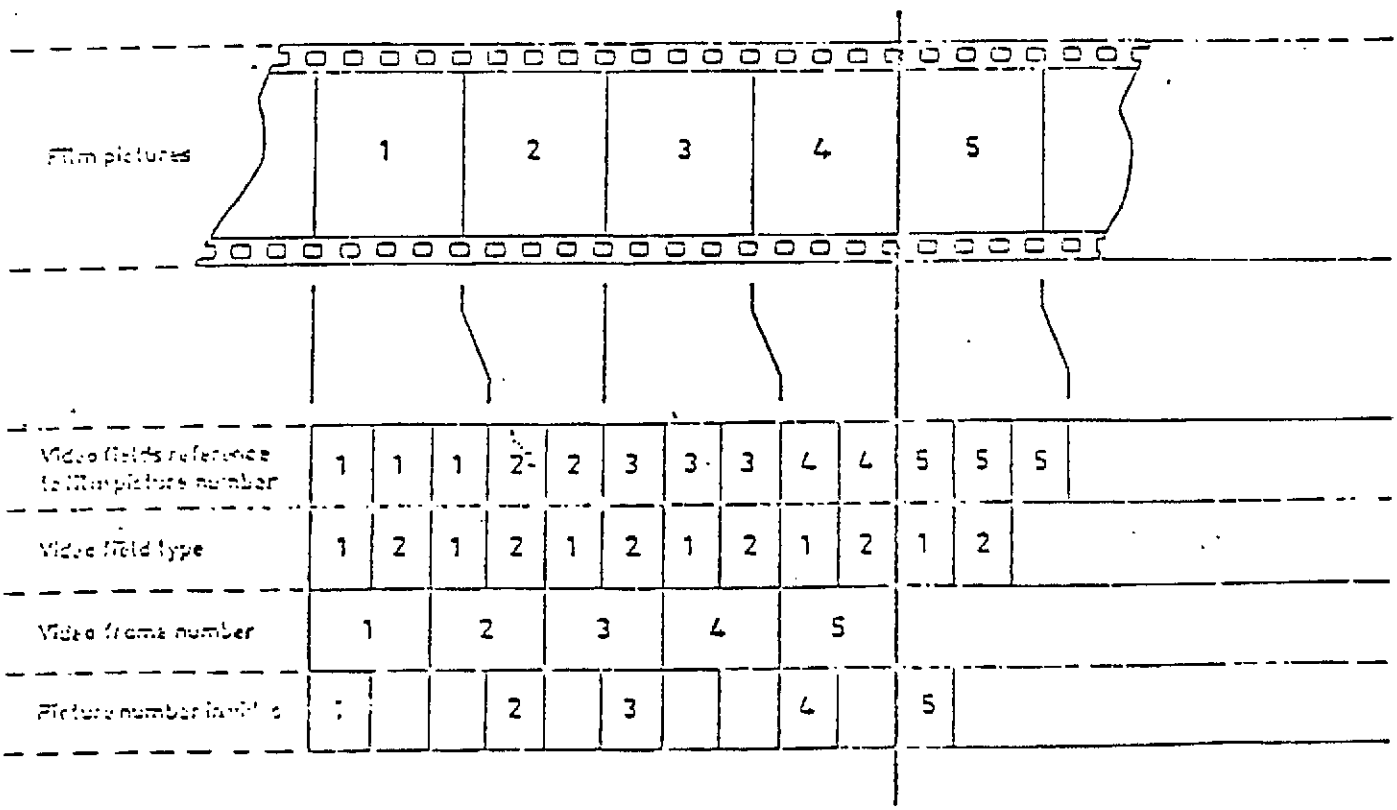



FIGURE 24

## FILM/VIDEO CONVERSION PROCESS



## ENDNOTES

[1]"Training and Maintenance Information System," Hughes Aircraft Company, Ground Systems Group, Fullerton, California. n.d.

[2]The list of companies developing digital optical players and recorders is indicative of the seriousness with which industry views this area. Included are such well-known names as IBM, Exxon, Xerox, Philips, RCA, Bell Laboratories, Thomson-CSF, Wang Laboratories, Control Data, Storage Technology, Burroughs, NCR, Hitachi, Toshiba, Sony, JVC, DiscoVision Associates, Hewlett-Packard, Magnavox, General Electric, Kodak and McDonnell-Douglas. Many smaller firms are involved as second-source suppliers. A number of companies will not even admit what they are doing.

Some of the developments noted indicate that:

- IBM is believed to have digital optical disc development programs in its San Jose, Calif., and Austin, Tex. facilities, as well as ongoing work at its Yorktown Heights, NY research centre.

- Exxon is thought to have the most advanced digital optical system in its Star player from the Star Division of Exxon Enterprises, Inc. at Pasadena, Calif. Curiously, this division is up for sale.

- Xerox, through its Optimum Division in Palo Alto, Calif. has a product line with a one-Gigabyte drive using the DRAW technology and is expected on the market in 1983 at $3-$4,000 U.S. This is far below the cost expected by industry analysts. Its optical document storage system based on the above disc is expected to reach the market at the same time for $15-$20,000 U.S.

- The Toshiba Corporation's DF-2000 document filing system is developed to some extent by SRI International of Menlo Park, Calif. The system combines a laser scanner and laser printer module with an optical-disc memory module. It is priced at $60,000 and destined for delivery beginning late in 1982. Analysts suspect the price will be closer to $45,000.

- The developments by N.V. Philips and N.A. Philips have been described before. Essentially N.V. Philips is developing the digital optical recorder (DOR) in a system called MEGADOC. It is designed for the automated office and priced in the $500,000 U.S. range. The North American affiliate is working on even larger systems of document data storage and retrieval for application by government, military, and huge corporations, such as oil companies.

- RCA's Applied Physics Laboratory in Camden, N.J. is working on a high performance opto-electronic system using a more powerful laser. It is reported to store 12 Gigabytes of data and record at 50 megabits a second. There is also work being done with Corning Glass on an erasable disc. The system is expected to cost $500,000 U.S., with discs at $50.00 to be out sometime next year.

- Little is known about Kodak's work. It is reported to be close to a photo-reflective disc based on photographic foils.

  (i) Another development is the Quixote Recorder by Quixote Corporation that allows fast processing of discs without the need for master metal tooling. Copies can be played satisfactorily on existing optical players. In contrast to the "Ardev" photograph-based system, it is a "pit" technology.

[3]Interview with Mr. Richard Kenville, Manager, RCA's Applied Physics Labs.

[4]"Impact of Videodisc Technology (Optical Memories) on Existing Media and Equipment," Strategic Business Services Vol. II, (1980).

[5]R.L. Hunt, "Special Applications Market for Optical Videodisc," IGC Conference, July, 1976.

[6]K. Broadbent, "A Review of the MCA DiscoVision System," Journal of SMPTE No. 83 (July, 1974).

[7]Peter Schipma, "Text Storage and Display via Videodisc," IEE Research Institute Report, 1979.

[8]James Martin, "Principles of Computer Data Bases," (1978).

[9]J.A. De Vos, "Megadoc: A Document Archiving System," Institute Graphic Communication Conference, July, 1980.

[10]John M. White, "Mass Storage System," IBM Systems Journal, (Oct. 1978).

## CHAPTER III

## ECONOMICS OF THE VIDEODISC

### INTRODUCTION

It is contended that videodisc has almost limitless applications for the consumer and business sectors of the economy. The development and employment of this technology however, face numerous technological and economic obstacles.

In the consumer entertainment market, the videodisc is faced with competition from video cassette recorders (VCRs), and cable and pay television. Prices, features and availability of both hardware and software of videodiscs and the video cassette recorders will likely be significant factors in consumer decisions.

Questions have been raised about the demand potential of videodisc to support three different, incompatible technologies, and whether the mass consumer market will in fact readily adopt the videodisc. Market development will depend on a variety of supply and demand considerations, and the structure of the videodisc industry itself. In Canada, videodisc-related industry is very slight. In the United States, Europe, and Japan,

the developing industry is likely to go through various adjustments and "shake-outs" in the next few years.

This chapter is a much simplified and reduced version of the full economic analysis prepared for the Videodisc Study Project. Some of the original content is synthesized within the text of other chapters, such as the corporate analysis discussion in Chapter One.

Also it should be noted that it was not possible to reflect the recent changes brought about by the sale of 50 per cent interest in Universal-Pioneer by DiscoVision Associates. Except for the management of patents, DVA (owned equally by MCA and IBM) has effectively withdrawn from its videodisc business. Pioneer has indicated it will take over DVA's responsibilities and retain much of the existing staff. It expects there will be no interruptions in fulfilling existing commitments and plans to open a U.S. pressing plant within a year.

## SUPPLY ANALYSIS

The success or failure of a videodisc system will depend not only on the quality, performance features and costs of the hardware, but also -- perhaps even more -- on the quality, quantity, variety, costs and marketing of the software.

## VIDEODISC HARDWARE

As outlined earlier, three different player units have been developed, employing three different, incompatible technologies. Following is a discussion of the costs of the different videodisc players.

### LV: Philips-MCA System

- Magnavox

  Selling for $775.00, the Magnavox Magnavision player in 1978 was the first videodisc player to become commercially available in the United States. Magnavox is planning to add a second unit to its line, a stepped-up model with remote control, fast and slow motion, freeze-frame, stop, search and index.

- Pioneer

  U.S. Pioneer was the second manufacturer to place a player in selected markets. The LaserDisc costs $749.00

U.S. Pioneer also plans to add a higher-priced remote model to its line.

° Universal-Pioneer Electronics

This Japanese firm is currently manufacturing an industrial model of the laser optical videodisc player

(DVA 7820) and is reported to have sold over 10,000 to General Motors. In Canada, although the purchase cost of a single player is about $2,800.00, the price varies with volume.

° Sony

Sony is currently supplying its industrial players to the Ford Motor Company. With a larger microprocessor memory than the DVA PR-7820, it is reported to sell singly at close to $4,000.00 U.S.

CED: RCA System

The first CED model produced and marketed was the RCA Selectavision Videodisc Player at $499.00 U.S. In 1981 it was launched in Canada at $699.00. A compatible system is marketed by Zenith, Sears, and Radio Shack, under their own brand names.

VHD: Matsushita-JVC System

This signal-guided, video high-density (VHD) system is not expected on the U.S. market until June 1982. The video players

are expected to be supplied in the U.S. under such brand names as Panasonic, Quasar Technics, National and Sharp.

Thomson-CSF System

A fourth videodisc system does exist but only for industrial and educational purposes. This is the Thomson-CSF player, which is an optical laser-based transmissive system. It is priced at about $5,000 in Canada.

Like other video/audio equipment, the videodisc player ranges from a basic stripped-down model to a stepped-up or more sophisticated model carrying a variety of features. A recent survey of retail outlets in the U.S. revealed that the average selling price of an RCA player was $486, discounted as low as $269. The LaserDisc player selling price averaged at $699[1], discounted as low as $539.50. The VHD player is expected to retail in the U.S. for approximately $650.

The video cassette recorder industry in Japan is rapidly becoming a major industry in production, exports, and sales. During the 1980s, VCR replaced color television as Japan's biggest foreign exchange earner. Manufacturing 90 per cent of the VCRs sold worldwide, Japan produced .8 million VCRs in 1977, 1.5 million in 1978, and 2.2 million in 1979. In 1980 the figure was 4.5 million, up 102 per cent from 1979. The Japanese Ministry of Trade and Industry estimates a total of 8 to 8.4 million VCRs

will be produced in 1981 and between 10 and 12 million in 1982. Of these, 60 per cent are VHS and 35 per cent Beta, while the remaining 5 per cent refers to other brands. Distribution in both Japan and the U.S. was about 65 per cent VHS and 35 per cent Beta. For Europe the split was 70/13/17 per cent for VHS/Beta/V2000. By contrast, the total number produced in the U.S. in 1980 was only 764,000 units.

Table 5 contains one estimate of the cost elements of producing and marketing the videodisc player in the U.S., with costs expressed as a percentage of the retail price.

TABLE 5

ESTIMATED COST STRUCTURE: VIDEODISC PLAYERS (U.S.-Manufactured)

| Item | Cost (as percentage of Retail (Price) |
|---|---|
| Production | 45 |
| Manufacturer's margin | 12 |
| Distributor's margin | 13 |
| Retailer's margin | 25 |
| Sales tax (U.S.) | 5 |
| | 100 |

Source: Mackintosh International, Euroview Report: Video Disc Players (England: Mackintosh House, 1980).

## VIDEODISC SOFTWARE

Since the videodisc player can only be used for playback of pre-recorded programs, software will be the key to its success in consumer home-entertainment market and the business and educational markets.

### Home Entertainment

#### Availability and Quality of Discs

If the videodisc player is to make significant inroads in the home entertainment market, the pre-recorded programs must be of high-quality yet inexpensive, and they must be in plentiful supply.

For every quality videodisc which reaches a retail outlet a large number have been rejected at the manufacturing level. This adds to the cost of retailing the discs. The originally announced price of $15.95 for a feature movie, for example, jumped quickly to $24.95 despite DVA's claims that rejects are not that significant in terms of production cost. DVA points out the analogy to integrated circuits for which a 20 per cent success rate is considered good. The material cost of rejects is slight. Currently, RCA reports a disc return rate of only 1 per cent.

The supply of software is not always as plentiful as is required. When Magnavox introduced its Magnavision in late 1978, it published a catalogue of 202 titles, but most of these were unavailable. The MCA mid-1980 catalogue included 150 titles of which over one-half were feature films. Pioneer advertises a

variety of programs almost half of which are movies. They claim to have approximately 100 movie titles available for videodisc.

RCA produced a list of 100 titles when it officially mass-introduced its Selectavision in March, 1981. Approximately one-half of these titles were movies. RCA released 25 more titles in May 1981 and by the end of the year were offering 151 titles. In early 1982 they expect to stamp 186 titles, 32 of which are for CBS. By the end of 1982 RCA/CBS may reach 400 titles.

JVC-VHD expects its initial VHD library to include at least 160 major motion pictures. To utilize the system's stereo sound, approximately 40 of these movies will be musicals.

### Program Sources and Supply Alignments

The manufacturers of the three formats of videodisc have entered into a variety of alliances for the purpose of supplying programs for discs and for pressing the discs.

A major source of programs for software are the movie studios. Other sources include TV networks, music recording companies, and independent producers.

DiscoVision Associates has been the primary producer of laser discs having pressed 3 million of them to date. DVA has recently licensed the 3M Company of Minnesota for the mastering and replication of LaserVision videodiscs. In the same format, Pioneer Electronics has recently opened a replication plant in Japan.

DiscoVision has also signed custom pressing agreements with a number of producers and suppliers of programs for the LV disc. These include two leading software companies -- 20th Century Fox Video, Inc. (formerly Magnetic Video) and Paramount Home Video. Fox Video is the largest marketer and distributor of pre-recorded software. Under this arrangement the discs will be pressed by DiscoVision Associates, distributed worldwide by Fox Video, and distributed in the U.S. in conjunction with Pioneer Video.[2]

Yet another agreement on the production of laser discs has been recently concluded between Columbia Pictures Home Entertainment and DiscoVision. In addition, Pioneer Artists has signed an exclusive agreement with Covent Garden Video Productions for rights to home video discs of the Royal Ballet and the Royal Opera.[3]

RCA, using the CED format, has pursued an aggressive purchasing policy of hundreds of titles from a large number of sources, including Paramount Pictures, United Artists, and Walt Disney Productions. RCA discs are also pressed and replicated for the MGM/CBS Home Video label. CBS has a disc-pressing plant under construction for CED disc replication.

By the end of 1981 RCA produced about 3 million discs and estimated a disc-to-player ratio of 18 to one which far exceeded expections. The first CED stereo disc, a Paul Simon concert, which was a big LV Pioneer seller, has been mastered for

June, 1982 release. RCA originally did not intend custom pressing until 1984, but now may do so earlier.

VHD Programs Inc. has concluded an agreement with United Artists allowing the entire library of theatrical features to be released on VHD formatted videodiscs. VHD Programs also received licensed videodisc rights to future United Artists films.

VHD Programs Inc. has also recently announced a new custom pressing agreement which gives it access to the MCA film library, and is negotiating with Walt Disney Productions, Filmways, Time-Life Films, Warner Home Video, and Columbia Pictures for programming.

**Program Distribution**

A number of wholesale or manufacturing companies have entered the disc software business to provide programs for the disc. A wholesaler or manufacturer is a company which has acquired the exclusive or non-exclusive license or right to offer a program for sale or rent on specific video formats for personal home use. Between the wholesaler/manufacturer and the retailer there are a wide variety of intermediate distribution methods.

Examples of the methods by which video software is retailed to the public are presented in Table 6, which provides profiles of a few selected manufacturers or wholesalers of programs.

The software retail network can be divided into four categories: video software specialists, hardware-software special-

gories: video software specialists, hardware-software specialists, general electronic outlets and general merchandise outlets. RCA's surveys have indicated 70 per cent of CED discs are currently sold through hardware dealers. This is an important consideration for RCA because if it does permit extensive custom pressing, the dealers may lose control of disc selling. In the face of heavily discounted player sales, disc sales are the dealer's only real profit opportunity. While RCA may want to further the sale of "discs" through as wide a distribution as possible, the dealers may become reluctant to promote the "players" when lacking a profit incentive.

TABLE 6

Profile of Selected Wholesalers or Manufacturers of Video Programs

Columbia Pictures Home Entertainment
(a division of Columbia Pictures Industries Inc.)

Programs for Beta, VHS videocassettes and for LV videodisc system. Include titles from Columbia Pictures, Cinema V Ltd. and Quartet Films. Videocassette duplicating facilities. Independent representatives marketing cassettes and discs to retailer.

Walt Disney Home Video
(a division of Walt Disney Productions)

Programs for Beta, VHS videocassette and VHD disc format. Duplication is handled by U.S. Video and S/T Cassette Duplicating., Manufacturing representatives and direct mailing. Sale or rental (one of the two major studios to adopt a rental program). Emphasis on rentals. Disney cassettes rent for $26 to authorized dealers for 13 weeks. Dealers may rent cassettes any number of times.

Nostalgia Merchant
(owned by Garrett Enterprises)

Over 150 classic movies; serials (i.e. 15 episodes of Captain Marvel); cartoons; and other films from United Artists, Warner Bros., Hal Roach, Wrather Corp., Republic & RKO, provided on Beta & VHS VCR formats. Direct sale to consumers. Also through 2000-3000 retailers. Forbids rental or exchange. Licenses titles to Video Classics of Australia, and plans to distribute directly in Canada.

20th Century Fox Video, Inc.
(formerly Magnetic Video Corp.)

Primary distributor in U.S. of feature films, with over 300 titles in its catalog. Beta and VHS formats in cassette; LV disc format. 1000 cassette duplicating machines on its premises. Custom pressing of discs by DiscoVision. Retail mail order club. Four field offices and 80 independent distributors. Over 6000 retail outlets. Sale and rental. Distribution outlets in France, U.K., Canada and other countries. Also distributed through Sony outlets.
Table 6 (continued)

Warner Home Video
(subsidiary of Warner Communications)

Source of programs include Warner Bros. Pictures, Orion Pictures, The Ladd Co., New World Pictures, on Beta and VHS formats. Only channel for distribution is WEA Corp., with 8 branches and 22 district offices. Rental and lease/purchase.

Pioneer Video Inc.
(marketing subsidiary of U.S. Pioneer Corp.)

Programs from Paramount Pictures, music contracts with individual artists, and opera and ballet from Covent Garden Video. Discs pressed by DiscoVision Associates. Pioneer and Paramount dealers and representatives.

Paramount Home Video
(subsidiary of Paramount Pictures Inc.)

Paramount programs for videocassette and videodisc (LV) 81 titles currently on video cassettes. Discs pressed by Disco-Vision Associates. Paramount retailers and distributors.

Source: The Video Programs Retailer, July/August, 1981.

Program Rentals

The patterns of program distribution have undergone changes since the introduction of the VCR. At this time there are few systematic rental plans for videodiscs, probably because of the overall shortage of disc copies rather than slow player sales. Initially it was thought that these would be sufficient programs widely enough distributed to support VDP sales. However, player owners purchased far more software than expected. When disc rental will become a factor in the distribution pattern is unknown but if RCA permits custom pressing earlier than 1984 the process will be hastened.

In the case of videocassettes, some studio distributors such as 20th Century Fox, maintain a sale-only policy, while others such as Disney have a rental-only policy. The problem centers on securing the greatest return to the program producer while ensuring accurate accounting. The sale-only policy can not guarantee that, having made the initial purchase, the retailer will not put the cassette in the rental market to increase the number of "exposures" and then eventually resell a discounted used tape. The major studios have maintained that each rental is a showing and should constitute a performance fee but they have no way of enforcing this.

Under rental-only policy, a cassette would be rented to the dealer for a fixed time -- perhaps 13 weeks -- and returned or re-licensed for another period. Any cassette in consumer collections would be deemed a pirate tape.

The sale-only approach assumes that total royalty satisfies the producers and any of the titles offered for rent by a dealer or club violates the sale contract.

The studios have decided to issue two different packages for tapes of each title. Sale tapes can only be sold; rental tapes can only be rented. In the face of massive dealer resistence, this approach was softened slightly by setting up two categories -- the rental-only tape and the L/P or lease-purchase tape, which the dealer can sell or rent and then sell.

Within the rental-only category, a classification system has begun. Warner Home Video, for example, has designated "A" and "B" titles and licenses: "A" titles by 28-day cycles in a sliding scale -- $22.00 the first cycle, then $18.00, then $13,00, and $12.00 for the fifth and any subsequent titles; "B" titles cost half this amount. This means the dealer initially rents the title at $4.50 a week and must re-rent the tape a number of times a week to make a profit. The L/P arrangement allows the dealer to buy the tape on the installment plan.

The Warner Home Video plan however, still has not pacified the dealers, nor have other similar plans suggested by competing studios.

MGM/CBS Home Video's design is to charge dealers $160.00 for a 90-day licence but give the dealer the right to purchase after the "window" is closed. MCA videocassette and Paramount Video Distribution are strongly attuned to sales, whereas Walt Disney

Telecommunications has labelled the U.S. home video industry "tremendously troubled". In the company's view, some studios treat movies as a commodity (for sale) rather than an event (for rent). Disney president James Jimarro noted that Hollywood now wants to regain control of its product and this has resulted in a "growing hostility" between retailers and producers.

The criticism has been made that any of these approaches will severely limit the choice a dealer can offer the consumer. It has also been noted that while rental exceeds purchase by 20 to one, shortly after release there is a rapid change and dealers may be caught with leased tapes for which there is little rental demand. Some of these plans and the attendant accounting are deemed so complicated that merchandisers like J. C. Penney are planning to leave the videocassette rental business.

The whole area of home video rental distribution is in confusion as each of the major suppliers has a different system as it tests for the most acceptable and profitable approach.

**Software Prices and Costs**

In the U.S., discs released to date retail from a low of approximately $10.00 to a high of approximately $30.00. A few exceptional titles exceed $30.00, such as the long-playing movie "Jesus of Nazareth" which retails at $99.98.

Table 7 contains an estimate of cost distribution in the production and marketing of the videodisc.

TABLE 7
ESTIMATED COST STRUCTURE: VIDEODISC

ESTIMATE A

| Item | $ Cost | (Percentage of retail price) |
|---|---|---|
| Factory Cost | | |
| Manufacturing | 1.00 | 4 |
| Royalties to Producers | 2.00 | 8 |
| Promotion | 1.50 | 6 |
| Overhead | .25 | 1 |
| Miscellaneous | .25 | 1 |
| Profit | 6.50 | 26 |
| Total Factory Cost | 11.50 | 46 |
| Wholesale Price | 13.50 | 54 |
| Retail Price | 25.00 | 100 |

Source: Television Digest, March 3, 1980. Estimate made by Argus Research, Inc. for the RCA CED format disc.

It has been predicted that the per copy cost of videodiscs will break even with the cost of videotapes at about 100-250 copies, depending on the size of the tape, and then will rapidly become cheaper in larger numbers. In other words, beyond the advantage of duplicating one VCR copy, the marginal cost of producing discs declines much more quickly than does the marginal cost of tape. This is shown in Table 8.

TABLE 8
PER COPY COSTS FOR ONE-HOUR MOTION VISUAL PROGRAM

| Medium | Quantity | | | |
|---|---|---|---|---|
| | 1 | 10 | 100 | 1000 |
| 16 mm film | $3,591 | $624 | $242 | $187 |
| 3/4 inch video cassette | 65 | 55 | 50 | 47 |
| 1/2 inch video cassette | 67 | 37 | 27 | 23 |
| Videodisc | 3,500 | 350 | 40 | 13 |

Source: E. Sigel et al., "Video Discs: The Technology, the Applications, and the Future" (New York: Knowledge Industry Publications, 1980). Data based on information issued by DiscoVision Associates.

Table 9 shows a comparison of per copy costs of disc versus tape. As shown, the crossover point is somewhere beyond 150 units.

TABLE 9

VIDEO DISC VS. VIDEO TAPE
PER COPY COST COMPARISONS

| | Disc | | | | Tape | | | |
|---|---|---|---|---|---|---|---|---|
| Qty. | Type I 30 Min | Type I 60 Min | TypeII 30 Min | TypeII 60 Min | 3/4" 30Min | 3/4" 60Min | 1/2" 30Min | 1/2VHS 60Min |
| 10 | 212.50 | 420.00 | 256.50 | 508.00 | 28.75 | 42.50 | 23.10 | 26.10 |
| 30 | 75.83 | 146.66 | 91.16 | 177.33 | 26.75 | 39.25 | 21.10 | 29.00 |
| 50 | 48.50 | 92.00 | 58.10 | 111.20 | 25.25 | 37.00 | 19.85 | 26.90 |
| 100 | 28.00 | 51.00 | 33.30 | 61.60 | 23.75 | 35.25 | 18.30 | 25.35 |
| 150 | 21.16 | 37.33 | 25.03 | 45.56 | 23.75 | 35.25 | 18.30 | 25.35 |
| 200 | 17.75 | 30.50 | 20.90 | 37.30 | 23.75 | 35.25 | 18.30 | 25.35 |
| 300 | 14.33 | 23.66 | 16.76 | 28.53 | 22.75 | 33.65 | 17.55 | 23.90 |
| 500 | 11.60 | 18.20 | 13.46 | 21.92 | 22.00 | 32.00 | 16.75 | 22.40 |
| 1000 | 9.55 | 14.10 | 10.98 | 16.96 | 21.25 | 30.85 | 16.25 | 21.40 |
| 1500 | 8.86 | 12.73 | 10.15 | 15.30 | 21.25 | 30.85 | 16.25 | 21.40 |
| 2000 | 8.52 | 12.05 | 9.74 | 14.48 | 20.95 | 30.00 | 15.95 | 20.75 |

Video Disc Front End Costs

Type I

| | |
|---|---|
| Tape-to-tape encoding | $ 550 per side |
| Manufacturing set-up | 1,550 per side |
| | $2,050 |

30 min. disc - $ 7.50 each
60 min. disc - $10.00 each

Type II

| | |
|---|---|
| Tape-to-tape encoding | $ 550 per side |
| Manufacturing set-up | 1,650 per side |
| Data Entry | 60 per side |
| Check Cassette | 120 per side |
| | $2,480 |

30 min. disc - $ 8.50 each
60 min. disc - $12.50 each

All prices U.S. dollars.
Source: DiscoVision Associates, July, 1981.

Business/Educational Software

Much of the software produced and contemplated for industry is geared for educational and training purposes.

Most educational programming currently available on discs is not original but has been transferred to the disc from existing audio/visual formats. However, a small but growing industry comprised of a number of experimental and pilot projects develops educational and training programs specifically for the disc, to take advantage of its various capabilities.

In addition to the special experimental projects being conducted in the U.S., Sandy Corporation of Michigan has become involved with programs for the DiscoVision Associates model PR-7820 industrial videodisc player. Except for mastering and replication, M. J. Petro Productions, Inc. of Windsor, Ontario is producing the bilingual videodisc content for General Motors of Canada.

GM chose videodisc over videotape or film because the videodisc has almost instant access to any program segment. For similar reasons, the U.S. Armed Forces, Hughes Aircraft Company, Boeing Aerospace Company and others are placing instruction manuals on the disc to assist in training workers in the manufacture, use, and maintenance of equipment.

## MARKETING STRATEGY

RCA is aiming the marketing of its videodisc at today's television markets. They believe that some distance must be kept in prices between a disc player and the VCR and between discs and tape cassettes.[4] RCA claims that its CED player is not designed for the affluent, sophisticated video-and stero-oriented purchaser whose prime interest would likely be a VCR with all of its various features. Its target market for the CED is not the gadget-prone audio/videophile, single young males, who are interested in the latest and highly-promoted recent releases.

Rather, RCA has focused on the market of the American middle class: the family centered, TV-oriented purchaser who enjoys movies, is not served by cable or pay TV, and prefers simple machinery operation. It is claimed that RCA's sought-after market of the middle-class American purchaser is reflected in the programs offered on the CED discs. Their opening catalogue appears to be more "classic" than "hit" oriented, to appeal to the stay-at-home family that watches color TV.

RCA's and MCA's LV listings are very price competitive but RCA claims to be in a better per-title revenue-generating position. MCA's LV listings used to range from $5.95 to $29.95, but now include nothing below $10.00. RCA's listings are more narrowly priced between $19.98 and $27.98.

A problem facing MCA DiscoVision is that the special features like random access which typify the LaserVision format are only possible if recording is done at 30 minutes per side (CAV). So far, the market is predominantly for feature films thus doubling the disc sides per release. There has been some shift away from CAV to the 60 minute-a-side format, CLV or linear programming. Thus the cost of manufacturing a two-hour movie is reduced but the special features are lost. Why then should the consumer pay roughly $200.00 more for an LV player than the CED player?

Partly to overcome this objection and to develop programming which utilizes the full capabilities, Optical Programming Associates, a joint venture of MCA, IBM and Pioneer, has been specializing in developing non-linear programs, such as "How to Watch Pro Football." The B. Green Co. has recently produced for OPA an interactive children's program, "The First National Kid Disc." They also produced "Massage - a Touch of Love," which is mildly sensual.

Notably absent from videodisc software, pornography, being otherwise unobtainable, has lent much support to the initial launch of VCRs. However STV in the U.S. is moving to X-rated material to improve saturation. Whether in time the disc companies will ease their content restrictions is unknown but this is certainly a competitive weakness with respect to VCRs. In the

LV format, IBM is a major influence and is unlikely to permit or tolerate much latitude in this regard.

Magnavox executives, in contrast to RCA executives, are more conservative and cautious in assessing the market for videodisc. Their envisaged market is the "upscale customer": an affluent, selective videophile. Magnavox believes that the present and future video entertainment needs of the mass consumer markets can be satisfied by satellite-backed pay, cable, public, and broadcast TV.

Magnavox officials also disagree with the RCA view that the videodisc will serve an entirely different market than the VCR. Magnavox finds that 93 per cent of the customers who purchase the Magnavox Magnavision videodisc players also possess a VCR.[5]

Suppliers of programs for home video are also engaged in determining how much of what content to release, when to release it, and in what way. Differing views are held by 20th Century Fox and Paramount Pictures.

Twentieth Century Fox, operating through its Fox Video subsidiary, is the number one supplier of movies for home video. Their strategy is to offer as large and diverse a video movie catalogue as it can through a policy of "close releasing." This involves the release of films in video form as soon as possible after their first theatrical appearances. Paramount Pictures, however, through its Paramount Home Video division has opted to concentrate on a relatively small catalogue of hit movies.

Their's is a policy of "distant releasing": the release of a movie in video form long after its first theatrical run.[6]

Paramount has a small 80-title catalogue which reflects its belief that it has an obligation to the theatres. This is one reason for maintaining a considerable time interval between theatrical exhibition and video release. Another reason is Paramount's position that a picture's performance in theatres determines whether it will be released for video. A "close release" policy does not provide sufficient time to make this determination.

Originally, the two studios also adopted different methods of movie distribution for home use. Until recently, 20th Century Fox forbade rentals because it was not certain that its fair share of the royalties would be obtained. Paramount favored both sale and rental.

All studios releasing for video do agree that availability of their films on home video will increase well before they are presented on pay/cable, satellite, or broadcast TV.

## DEMAND ANALYSIS

The consumer or user is the ultimate judge of a product in the marketplace, and the determinant of its success or failure. The demand side of the market for videodisc arise to some interesting questions. Who are the potential users in the consumer and business markets? Will the videodisc system appeal to the mass consumer market or will the appeal be in particular market segments designated by age, education and income levels? Where can it be expected to face its most serious competition? How realistic are these projections of a vast consumer market for the videodisc?

As the videodisc is just emerging in the marketplace it is difficult to analyze various aspects of demand. Projections of sales and expected household penetration vary. The industry, which hopes for a vast consumer market, is attempting to stimulate this market with optimistic statements and promotions. In contrast, some industry watchers and analysts have expressed reservations regarding the market appeal of the videodisc; others regard the situation as too premature to make any predictions.

This study examines these views in the light of the VCR market and whatever data is available to analyze videodisc demand.

TABLE 10

PROFILE OF VCR OWNER: U.S.A. AND EUROPE
(U.S. Dollars)

| Characteristic | U.S. | Europe |
|---|---|---|
| Age | 69% of owners between 25 and 44 years of age - median age: 37 | 35 years (median) |
| Income | 81% over $25,000, with median of $33,000 - $35,000 | $27,500 (median) |
| Education (some college level) | 76-84% | 68% |
| Percent Purchasing Pre-Recorded Programs | 44-48% | 41% |
| No. of Pre-Recorded Programs Owned (median) | 3.8-4.3 | 3.8 |

Source: Kalba-Bowen Associates, The Expanding Home Program Video Market, Jan., 1981. International Tape/Disc Association, Inc., A Time Report: The 1980 European Home Video Market, New York, Oct., 1980. Mart Magazine, June 1981, p.16.

TABLE 11
PRIMARY USES OF VCR[1]

| Uses | Percentage of survey group responding |
|---|---|
| Record T V Programs when not at home | 67 |
| Record one T V program while watching another | 44 |
| Record T V program while watching it for repeat viewing | 30 |
| Playing pre-recorded programs | 25 |
| Watching home movies shot with a video camera | 4 |

[1]European market

Source: International Tape/Disc Association Inc., A Time Report: The 1980 European Home Video Market, New York, October, 1980.

TABLE 12

VCR OWNERS WHO BUY PRERECORDED CONTENT

| Type of Program | Percentage of Owners Who Own Type of Program | Average No. of Titles Owned |
|---|---|---|
| Recent Movies | 78 | 7.0 |
| Classic Movies | 39 | 4.7 |
| Adult Entertainment | 16 | 6.3 |
| Children's Entertainment | 8 | 6.3 |
| Variety | 7 | 3.1 |
| How-To/Hobby | 2 | 2.2 |
| Educational | 2 | 1.4 |

Source: Kalba-Bowen Associates, The Expanding Home Video Program, Jan., 1981.

## MARKET DEMAND: SOME THEORETICAL CONCEPTS

Demand for the videodisc system arises in two primary areas: households, interested primarily for entertainment; and industry/institutions, which have a variety of uses for videodisc.

### HOUSEHOLD DEMAND

The VDP is so new that no distinctive profile of the videodisc system has emerged, although a general profile of the VCR owner has been established.

Some characteristics of the typical VCR owner in the United States and Europe are illustrated in Tables 10, 11, and 12, the last two of which contain additional information on the use he makes of the VCR.

There has been some discussion on whether the VCR and the VDP will find a market in the same segment of the consumer sector, or whether they will appeal to two completely different sets of consumers. According to existing evidence, it appears that the VDP and VCR are competitive products in the same market. For the purposes of this study, it is assumed that the profile of a typical VCR owner can be viewed as a reasonable approximation of the profile of a typical VDP purchaser. Furthermore, it is assumed that the demand and sale of VCRs, for which more market information and data are available, can be taken as reasonable proxies for the VDP market.

## THE CURRENT VIDEODISC CONSUMER MARKET

### Sales

To date, only estimates of sales of the VDP are available. RCA claimed that 26,000 CED disc players were sold to consumers in the five weeks following their introduction in March 1981, and projected a target of 200,000 sales by the end of the year. In fact, about 60,000 players were sold after 130,000 had been distributed.[7]

RCA executives point out that although they fall short of their sale target, their distribution of over 100,000 players still indicates an excellent potential market when compared to the first year record of other new technologies -- including the VCR.

However, RCA seems to have made little headway since the initial launch.

Information on VCR and videodisc sales in the Canadian market is very sparse. A small sample survey in November 1980, showed that one per cent of the people contacted owned a VCR. Another attempt to estimate VCR sales in Canada is illustrated in Table 13, in which an estimate of the annual Canadian sales for 1978 and 1979 is based on calculations of imports of VCRs into Canada for September to November, 1978. No VCRs are produced in Canada; all purchases are imported.

To arrive at the number of VCRs in Canadian homes, calculations must consider the unfavorable exchange rate, import duties

and, as of late 1981, the greater availability of TV signals in urban centers against the 70 per cent per year increase in sales. Th us, home VCR sales are estimated to be 100,000 to 150,000--70 per cent of which are VHS, and 30 per cent Beta.

TABLE 13

CANADIAN IMPORTS OF COLOUR VIDEO CASSETTE TAPE RECORDERS

| Price Range ($) | Sept., Oct., Nov., 1978* | | | Estimated Annual 1978-1979** | |
|---|---|---|---|---|---|
| | Quantity (Units) | Value ($) | Average Unit Price*** ($) | Quantity (Units) | Value ($) |
| Up to 750 | 6,710 | 3,863,922 | 576 | 26,840 | 15,455,688 |
| 751-1,500 | 464 | 473,570 | 1,021 | 1,856 | 1,894,280 |
| Over 1,500 | 143 | 396,032 | 2,769 | 572 | 1,584,128 |
| TOTAL | 7,317 | 4,733,524 | 647 | 29,268 | 18,934,096 |

*Actual

**Estimate based on 3 months actual data

***Dollar values are based on selling price F.O.B. plant.

Source: Canada, Department of Industry, Trade and Commerce, Colour Video Cassette Recorders, Ottawa, Occasional Paper.

Compared with American marketing of the videodisc, marketing in Canada has lagged considerably. In early summer 1981, a survey of retail outlets in Windsor and T oronto indicated that only the Magnavox Magnavision unit was on display. In a

random sample of audio/video retailers in Toronto, only two of twelve outlets contacted had a videodisc player on display. Moreover, the supply of discs at these outlets was extremely limited. Other dealers were not inclined to stock the videodisc because, in their opinion, its uncertain market did not justify the investment required. In the fall 1981, Zenith and RCA joined Magnavox on the Canadian market.

In general, dealers were more optimistic about availability of discs for the RCA format than for the Magnavox and Pioneer LV system, even though they believed the LV format to have superior capabilities. Prices quoted for the Magnavox Magnavision ranged from $1100 to $1600, as compared to the $779 list price in the U.S.

## Sales Projections: Industry and Independent

For every optimistic opinion and projection regarding the sales and success of the disc, there is an equally pessimistic one. This only serves to emphasize that forecasting consumer response in a new and untried market is tentative at best.

Table 14 outlines three recent estimates (1981) of video sales by industry watchers. Many of the early videodisc projections appear to have been overly optimistic and have been scaled downward. For example, Argus Research Corporation estimated in 1980 that there would be 4 million unit VDP sales

for 1985. Early the next year, they revised that to 3 million -- scaling down their original projection by 25 per cent.

TABLE 14

INDUSTRY ANALYSTS' PROJECTIONS - U.S. MARKET
VCR, VDP AND PRERECORDED PROGRAM SALES, 1980-1986

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|
| | (thousands of players) | | | | | | |
| VCRs | | | | | | | |
| Annual | 805 | 1,000 | 1,300 | 2,000 | 2,500 | 3,000 | 3,500 |
| Cumulative | 1,995 | 2,900 | 4,300 | 6,300 | 8,800 | 11,800 | 15,300 |
| VDPs | | | | | | | |
| Annual | 35 | 350 | 750 | 1,500 | 2,500 | 3,000 | 3,500 |
| Cumulative | 40 | 390 | 1,090 | 2,590 | 5,090 | 8,090 | 11,590 |
| | (millions of units) | | | | | | |
| PR Program Unit Sales | | | | | | | |
| VCR (cassettes) | 3.0 | 6.0 | 7.8 | 10.0 | 13.0 | 18.0 | 24.0 |
| VDP (discs) | .3 | 3.1 | 8.7 | 15.8 | 35.6 | 56.6 | 92.7 |

Projections made by Argus Research Corporation and reported in The Videoplay Report, April 13, 1981.

Note: By the end of 1981 the projections for VCRs were too low. The EIA reported 1,360,998 VCRs sold in the U.S. Cumulative total is estimated at 3.3 million. VDP sales were about half of the estimate for 1981.

TABLE 14 (Continued)

B. Retailers' Estimate of Video Sales, 1980-82

VIDEO DISCS

| Sales to dealers in units | |
|---|---|
| 1980 | 300,000 |
| 1981 (est) | 4,000,000 |
| 1982 (est) | 10,000,000 |

VIDEO CASSETTE RECORDERS

| Sales to dealers in units | |
|---|---|
| 1980 | 805,000 |
| 1981 (est) | 1,200,000 |
| 1982 (est) | 2,000,000 |

VIDEO DISC PLAYERS

| Sales to dealers in units | |
|---|---|
| 1980 | 40,000 |
| 1981 (est) | 350,000 |
| 1982 (est) | 500,000 |

VIDEO TAPE (prerecorded only)

| Sales to dealers in units | |
|---|---|
| 1980 | 3,000,000 |
| 1981 (est) | 5,500,000 |
| 1982 (est) | 10,000,000 |

PROJECTION TV

| Sales to dealers in units | |
|---|---|
| 1980 | 57,000 |
| 1981 (est) | 75,000 |
| 1982 (est) | 100,000 |

VIDEO TAPE (Blank only)

| Sales to dealers in units | |
|---|---|
| 1980 | 15,000,000 |
| 1981 (est) | 19,500,000 |
| 1982 (est) | 25,000,000 |

COLOR CAMERAS

| Sales to dealers in units | |
|---|---|
| 1980 | 115,000 |
| 1981 (est) | 180,000 |
| 1982 (est) | 300,000 |

Source: MART Video Sales Guide, New York, Morgan-Grampian Co., May, 1981.

TABLE 14 (Continued)
C. Videodisc Player and Disc Sales, 1980-90

| Year | Videodisc Players (units) | Videodiscs (000) |
|---|---|---|
| 1980 | 40,000 | 316 |
| 1981 | 475,000 | 3,709 |
| 1982 | 1,200,000 | 13,059 |
| 1983 | 2,200,000 | 29,434 |
| 1984 | 4,000,000 | 58,234 |
| 1985 | 5,000,000 | 94,634 |
| 1986 | 5,000,000 | 127,634 |
| 1987 | 5,000,000 | 157,634 |
| 1988 | 5,000,000 | 187,634 |
| 1989 | 5,000,000 | 217,634 |
| 1990 | 5,000,000 | 247,634 |
| Cumulative | 37,919,000 | 1,137,556 |

1990 penetration of U.S. TV homes - 140%

Average no. of discs per player in 1990 - 30 discs

Projection made by Wertheim & Co., Inc., a New York brokerage firm, and reported in Videodisc News, March, 1981.

Note: This estimate for VDP is among the most "bullish" and by the end of 1981 proved twice too high for players but slightly low in its number of discs.

Indications of the worldwide growth of VCR sales are reflected in the following projections on Table 15.

TABLE 15

INTERNATIONAL HOME VCR MANUFACTURER SALES TO DOMESTIC DISTRIBUTION
(in thousands)

| | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|
| Japan | 475 | 915 | 1,300 | 1,800 | 2,400 |
| (cum) | (1,320) | (2,150) | (3,450) | | |
| U.S.A. | 475 | 805 | 1,400 | 2,000 | 2,700 |
| (cum) | (1,100) | (1,910) | (3,310) | | |
| U.K. | 125 | 350 | 750 | | |
| (cum) | (218) | (568) | (1,320) | | |
| W.Ger. | 150 | 475 | 700 | 925 | 1,200 |
| (cum) | (235) | (710) | (1,410) | | |
| France | 86 | 144 | 220 | | |
| (cum) | (140) | (284) | (504) | | |

Source: Ken Winslow, The Videoplay Report Nov. 9, 1981.

## Dealer Reaction to Sales Progress

Despite claims by RCA officials that its sales are on target, 78 per cent of the dealers handling the RCA disc player were disappointed with sales in the first few weeks following its mass introduction in March of 1981.[9] The biggest drawback conveyed to dealers by prospective buyers was that the system played only pre-recorded discs and, unlike the VCR, could not be used to record programs off the air.[10]

RCA claims that the disc player is a family purchase, but surveys of retailers give conflicting evidence on this point. The demographics of the videodisc buyer as outlined by some retailers reveal an affluent, white-collar individual with

two or three children, for whom a VCR is too complicated in comparison to the disc player.[11] Most retailers reported that VCRs outsell the videodisc by a large margin.[12]

Very few dealers believed that the price of the videodisc had a favorable influence on the buyer. Some stated that price would have to drop to about $300 to be a marketing attraction.[13] Contrary to RCA's hopes, the most frequent purchasers were in the central states rather than in the large, non-cabled, coastal urban markets.

## FACTORS AFFECTING HOUSEHOLD DEMAND FOR VIDEODISC

### A VDP Projection for Canada

The typical American VCR owner is portrayed as having a median annual income of about $35,000, is in his mid-30's, and is college educated. It is assumed that this portrait also applies to the potential VDP buyer.

A typical Canadian VDP purchaser, therefore, has an annual income of at least $25,000 and is between 25 and 44 years old. Within these limits, the households which also owned a color TV set in 1980 numbered 764,500. If the average cost of a videodisc player is $850 in Canada, consumer expenditures on videodisc players would rise to $650 million if this market was completely saturated.

If sales of videodisc players were to increase by the rate predicted by Argus Research, a total of 765,500 cumulative units

would be reached by the end of 1985. This rough estimate is based on the very tenuous assumption that all households in Canada with incomes in excess of $25,000 and whose heads are within 25-44 years of age are potential purchasers of the videodisc system. This is highly unlikely, as some may prefer other video products.

Video Substitutes and Complements

Rapidly developing technology has brought about changes in existing video products and has introduced new video products into the markets. Some analysts contend that the disc and tape are competing with each other for the same market, while others maintain that they are geared to separate markets.

Most hail the disc as the new technology, and argue that as soon as it catches on with the consumer, the disc will surpass tape. However, in terms of home entertainment, the consumer is just getting used to tape as the new technology. Consumer audio tape formats only really caught on during the 1970's. Since 1976 the U.S. consumer has purchased 75 per cent more tape units than TV sets. Lately, sales of tape recorder-players have been 6.5 times higher per year than sales of traditional record players.[14]

The disc is a programmer and manufacturer oriented product: its success depends on the presentation and availability of created programs. Without programs to satisfy diverse interests, the videodisc has limited appeal. The VCR, on the other hand, is

a user-oriented product. In essence, its versatility far exceeds that of the videodisc, as illustrated in Table 16.

TABLE 16

COMPARISON OF SERVICES: VIDEODISC VS VIDEOTAPE

| Videodisc* Features | Videotape** Features |
|---|---|
| 1) Playback pre-recorded programming | 1) Playback pre-recorded programming |
| 2) A few hundred program titles | 2) 15,000 titles of programs |
| 3) Stereo | 3) Stereo developed (Akai VCR has stereo capabilities) |
| 4) Disc more durable, with longer life | 4) Records programs |
| 5) Rapid search and retrieval | 5) Erase tape and re-program |
| | 6) Records one program while TV viewer watches another. |
| | 7) Used with video camera |
| | 8) Optional tape changer permits 20 consecutive hours of recording and playback |

*Magnavox Magnavision Player

**Sony Betamax Home Videotape Recorder

The main attractions of the disc over tape are: durability; rapid search and retrieval; long storage life; less storage space; greater clarity of picture and stereo sound. Existing products however, are always experiencing changes as technology

advances, and this is true of recent progress in VCR technology. As a result, VCR improvements will raise the quality of the features common to tape and disc as well as the quality of the features which the disc cannot duplicate.

The videodisc industry will be hard-put to catch up to the VCR sales record. Based on recent VCR market growth, it is estimated that the increase of videodisc hardware sales would have to exceed 75 per cent per year, compounded annually for five years, to displace the VCR.

Despite the contention of some industry representatives that the video cassette and the videodisc can co-exist because they offer different capabilities, there seems to be ample evidence that the two technologies are competitive. The VCR is continuing to broaden its appeal with each new development.

Virtually every VHS and Beta hardware manufacturer is planning full-function portable VCRs -- some weighing as little as 8-3/4 lbs. General Electric is introducing a 13 lb. VHS unit and a new color camera as well as a top-of-the line 25-inch color console TV and a widescreen projection TV, both offered with a simulated stereo. The increasing popularity of the portable VCR should lead to an increase in the sale of color video cameras.

Many of the firms currently manufacturing the traditional TV have added projection TV and stereo TV to their line of products. The large screen of projection TV could be a plus-factor in the sales of other video equipment, such as videodisc

and VCR, as well as pay- and cable-TV. Stereo pre-recorded video cassettes are also about to be launched on the U.S. market. This could erase any advantage that the stereo feature has given the videodisc over the VCR.

In the line of new software for VCRs, the most recent is quarter-inch size videocassette tapes, retailing for $49.95 for pre-recorded, full-length, feature films. Some in the industry believe that the quarter-inch VCR is the format of the future. Technicolor, Canon and others are expected to enter the quarter-inch VCR market strongly.[15]

## VIDEODISC, VIDEOCASSETTE, AND CABLE/PAY TELEVISION

Rapid expansion of cable and pay-TV may also affect videodisc player penetration into the home entertainment market. If the major programs on videodiscs continue to be movies, they will be in direct competition with cable and pay-TV.

Studies show that there is a correlation between VCR owners and cable and pay TV subscribers. Over 50 per cent of VCR owners had cable before acquiring a VCR, and about one-third of households indicated that their subscription to pay-TV had influenced their decision in purchasing a VCR. Such a relationship cannot be expected for cable and pay-TV and videodisc. VCR owners would use their VCR recorder/player to tape movies and programs from cable and pay-TV, whereas the non-recording feature of the video-

disc system makes this impossible. The videodisc can be only a competitive alternative to cable or Pay-TV.

DMT, a New York-based research firm, recently conducted a recent sample survey in the U.S. and Canada on home electronic products. The survey showed that 38 per cent of those who do not currently subscribe to cable TV indicated that they would likely do so in the future. A lesser interest was expressed in the videodisc systems.[17]

The Gallup Syndicated Home Video Consumer Survey Program[18] concluded that the success of the VCR was based largely on its appeal as a product which tapes TV programs. Another recent survey showed that 75 per cent of VCR owners thought that the prices of pre-recorded tape were too high.[19] In addition, there have been recent reports of a rapidly growing market for rentals of pre-recorded tape, and a large increase in rental outlets. A rental fee of $5.00 for a tape of a major film, compared to a purchase price of $25-$40 for a disc, could be a major factor in consumer decisions. In the disc-cassette issue, the rapid trend toward tape rentals at significantly lower prices than disc purchase cannot be disregarded. Although disc distributors do not intend to go into rentals at present, dealers consider the durability of the videodisc, particularly the LV disc, ideal for rentals.

## VIDEODISC AND OTHER POTENTIAL HARDWARE

Some videodisc industry officials are optimistically predicting that the videodisc will replace common phonograph record

players. They also believe that because the disc has the capacity to play 12 inch digital-audio discs (by using an out-board adapter to decode the signals - the VHD/AHD system), it will become the standard for digital audio. This view, however, is doubtful considering the recent development of a separate digital-audio format.

Still in the experimental stage is the Philips/Sony compact digital disc (CD) player, which uses the same laser technology but is incompatible with current videodisc players. Sony and Philips had been working separately to develop a digital-audio disc system, but in 1980 Sony abandoned its system and joined forces with Philips. The Philips/Sony CD system was first displayed at the Tokyo Audio Fair in 1980. The CD digital records are only about 4-3/4 inches in diameter and are played by a small solid-state optical laser. With a 80:90 decibel signal-to-noise ratio, the achievements in high fidelity are considered a breakthrough.

The Philips/Sony digital-disc player is expected to be on the market in 1982, with the player priced in the $400-$1,000 range and with discs costing about the same as analog LP records. In addition to carrying audio signals, the disc can also provide text information for display on a TV screen. It is contended that Philips and Sony have chosen to separate home digital audio from the videodisc becuase of the marketability of a replacement "turntable" with digital records.

There are at least three other digital-audio systems being developed: one by Telefunken; one by JVC (which is compatible with the JVC videodisc) called AHD (audio-high-density); and one by DRC-Soundstream in the U.S., in which the record is stationary and only the player's parts move.

Standardization is essential to the survival of digital audio systems, as it is unlikely that record manufacturers will want to make different versions of every record to fit different players. The Philips-Sony alliance hopes to establish the world-wide standard with its CD system. It has close ties to Polygram, one of the world's largest record conglomerates, as well as to Polydor, Mercury, and Decca.

Another development is the concept of solid data storage which may render digital audio obsolete before it has become entrenched in the marketplace. With solid data storage, consumers have access to a central library via a telephone line and a terminal, and their players can receive a pure signal ready for amplification without any moving parts.

## PRICES OF VIDEODISC AND OTHER VIDEO PRODUCTS

On the average, videodisc recorders are less expensive than VCRs. VCRs currently sell in the U.S. for between $600 and $2,000, depending on the features of the equipment. In contrast,

prices of VDPs range from the modest RCA player, which lists for $500, to the higher priced LV players, at about $775 per unit. Similarly, the disc is less expensive than pre-recorded cassettes.

Using U.S. prices and assuming $800 as a median VCR price and $60.00 as a median program purchase price, it can be calculated that the RCA-CED player costs 38 per cent less than a VCR player and a CED disc containing a feature film costs roughly 65 per cent less than an average VCR pre- recorded feature program. There is some evidence that VCR prices are showing signs of dropping in competition with the videodisc.

Pre-recorded video cassettes show 20:1 rental-to-sales ratio for newly released feature films, and a 5:1 rental-to-sales ratio for older movies and classics. The ratio of pre-recorded content ownership to player is much higher with VDP owners than with VCR owners. Only a limited segment of the buying public appears able to afford a sizeable collection of purchased VCR software. While discs are less expensive to purchase than cassettes, the price of discs cannot compare with the rental price of cassettes. This difference may soon produce a major disc rental industry.

Similarly, the prices of cable and pay-TV have to be considered in the entertainment media struggle. Most of these TV broadcast services are available at a lower cost per month than the price of one major feature disc. Since consumers purchase

the videodisc primarily for movie programming, cable and pay-TV pose a direct competitive alternative. Given its varied programming for a fixed price, cable or pay-TV could well be much more attractive than the videodisc to the average Canadian and American family.

Table 17 estimates the composition of the VDP retail price that Canadian consumers are expected to face on the basis of factory costs in the U.S.

TABLE 17

CANADIAN PRICE STRUCTURE FOR IMPORTED VIDEODISC PLAYERS

| Item | | $ |
|---|---|---|
| U.S. Import Cost | | $285.00* |
| Equivalent Canadian Price (1.17 factor) | | 333.45* |
| Tariff (most favored nation 12.5%) | | 41.70 |
| | Total | $375.15 |
| Importer's Margin (28%)** | | 105.04 |
| | Total | $480.19 |
| Manufacturer's Sales Tax | | 43.22 |
| | Total | $523.41 |
| Retailer's margin (28%)** | | 146.48 |
| | Total | $669.89 |
| Retail Sales Tax -- Ontario 7% | | 46.89 |
| Price to Consumer | | $1716.78 |

*Based on manufacturer's price of 57 per cent of U.S. retail.

**Estimated, applying figures used for the United Kingdom as found in Mackintosh International, Euroview Report: Video Disc Players, England, Mackintosh House, 1980.

While the prices of VDPs and VCRs are basically higher in Canada than in the U.S., the price differentials between video-disc and video cassette, and the differentials between the various brands, are relatively similar. In Canada, prices for VCRs list from approximately $1100 to $2200; VDPs range from approximately $700 for the CEDs to $1100 for the LV equipment. This is roughly 50 per cent more than list prices in the U.S. Prices of VCR and VDP software are also higher in Canada.

The rental of hit movies on video cassette is becoming a major industry in Canada with a number of outlets established specifically to rent, as well as sell, cassettes. A variety of options are open to the consumer, such as joining video clubs, or purchasing a VCR and obtaining a certain percentage of the price as a credit in the form of free rentals. The latter option is becoming popular.

If a consumer belongs to a video club (usually with a membership fee of $50), the price of major movie cassette rentals ranges from $3 to $8 per day. This is considerably less expensive than purchasing a pre-recorded cassette or a disc for the VDP, which in Canada would cost the consumer from approximately $25 to $40.

The question of whether prices are or will be a factor in a consumer decision to purchase one format or the other depends on how sensitive consumers are to the prices of these products.

Surveys of retail outlets in the U.S. have led to published sales reports which indicate that the best selling items are the middle-to-higher priced, full-featured VCR units.[20] People may well feel that if they are spending money on a VCR they might as well go all out, and get the best value and the most service possible for the money they spend. Consumers who are interested in video apparatus tend to look at the cheaper models first but are then attracted by the great capabilities and advanced features of the more expensive models -- which they generally end up purchasing.

American dealers reported that customers who had purchased the videodisc player were knowledgeable about its capabilities and the differences between the formats. Thus many buyers are attracted to the LV system as it is more technologically advanced than the CED.

Most likely, the early buyers of videodisc systems tended to be the sophisticated video and stereo-oriented purchasers who wanted the technology of the laser format. Such reports, therefore, would not likely cause concern at RCA, which has publically stated that its CED player is designed for the family-centered, budget-minded, middle-class purchaser. It appears that prices have not been a dominant factor in the consumer's decision to purchase either a VCR or VDP.

Some dealers have indicated that they could sell more VDPs only if price was substantially lower. But if major price

reductions were required to stimulate sales following the initial surge of sales on the heels of the RCA campaign in March 1981, it can only be concluded consumers are not yet ready for mass market purchases of the videodisc at current list prices or at prices slightly lower.

## INDUSTRIAL/COMMERICAL/EDUCATIONAL APPLICATIONS AND DEMAND

The videodisc can do much more than recycle movies or concerts. It can be made to communicate with the viewer by changing, responding, and interacting according to viewer input. It is these interactive videodiscs that hold promise for extensive use in the business-education world.

Although the videodisc cannot record, its rapid search-and-retrieval time gives it an advantage over the VCR for storing and accessing information. Where a VCR has to run videotape back and forth to reach a given point, a videodisc can simply raise and locate its stylus at the required place in a matter of seconds. With such features as single-frame advance and freeze-frame, and when interfaced with other apparatus such as mini-computers, the videodisc system has numerous interactive possibilities. It appears that the nature of the optical videodisc is highly compatible with the needs of industry and education.

There are currently several projects throughout American universities assessing the videodisc as an instrument for

education. Brigham Young University, in conjunction with Mitro Corporation, designed and created a computer link between a microcomputer and videodisc player. The program, Time-shared Interactive Computer Controlled Information Television (TICCIT), has produced several interactive discs.

The Nebraska Educational Television Network has produced several optical videodiscs. One disc about gymnastics concentrates on beginning tumbling; another focuses on Spanish instruction. A college-level disc for individualized instruction in educational psychology has been received favorably. The NETV is also planning to develop videodisc content for the hearing impaired which will coincide with other programs planned by the Barkley Centre Media Development Project for the Hearing Impaired.

WICAT, Inc. in Utah, is believed to have developed the first disc program for individualized instruction, an optical disc entitled, "The Development of Living Things." Other WICAT projects are underway for the Navy and the Army Communicative Technology Office.[21]

Utah State University established a program for teaching retarded children. Another study teaches students how to use a library card catalogue.

The Massachusetts Institute of Technology has developed a bicycle repair course on videodisc in which computer-controlled random-access capabilities allow the student to examine the re-

pair process. M.I.T. has also been looking at the use of the videodisc for delivering instructional programs in connection with a non-broadcast distribution project supported by the Corporation For Public Broadcasting.

The potential of the videodisc as an educational aid was the subject of a major study conducted by WICAT, Inc. The WICAT study compared achievement levels and study time between traditional college classroom students in a biology class with students exposed to the same biology lessons on videodisc. The results showed disc students reducing study time by as much as 30 per cent over classroom students, and at the same time outscoring the latter by 15 to 21 per cent on test scores. WICAT concluded that the delivery of classroom instruction via videodisc was not only feasible, but superior.[22]

In industrial applications, videodisc technology is challenging conventional media. Sandy Corporation, in Southfield, Michigan, has produced more than 30 hours of programming for 6,000 Chevrolet dealerships nation-wide.

American Express is designing a Travel Information Processing System (TRIPS) linking videodisc players to a computer network. Potential travellers will be able to take a brief tour of possible destinations and to view color photos of hotel rooms or resort locations at a travel agency before making a reservation.[23]

Magazine discs are also being contemplated. Transmedia Communications Network has been formed to produce and market videodiscs in conjunction with special-interest magazines. Since the primary thrust of the content will be of a how-to nature, the discs will be targeted at the specific readership of particular magazines.

The videodisc may be of significant use as an electronic catalog. Sears, Roebuck and Co. in the U.S. has initiated an experiment to place its 236-page summer catalog on a videodisc. This will test the future of videodisc technology in catalog retailing.[24] One of Sear's objectives is to reduce its printing and distribution costs, which in 1980 totalled $100 million.

Industry will also examine the videodisc as an inexpensive, economic alternative to existing systems. It has been estimated that to store on magnetic disc packs the same amount of information as is on one videodisc (which costs only a few dollars) would cost $40,000 for magnetic discs packs alone.[25] Government departments and agencies are to employ the videodisc for purposes such as storage, or instruction. Some departments in the U.S. government have already adopted the videodisc for selected purposes.

In the United States, the military has invested heavily in the development and use of videodisc. The U.S. Army is planning to obtain laser optical videodisc players and compatible micro-

processors for use in its newly developed JOIN (Joint Optical Information Network) recruiting system. This system will provide an electronic questionnaire for the prospective recruit, gathering information on his education, job experience, areas of interest, and so on. In another videodisc application, a six-foot high stack of maintenance manuals on the Army's M-60 battle tank has been transferred onto a single disc.

While interest in the potential of videodisc in business, education and government is widespread, and although numerous pilot and experimental projects have been initiated, no data currently exists that would permit a numerical assessment of the current demand for videodisc players and discs in these sectors. Similarly, until it is clearly established which areas will give the videodisc commercial viability, it is impossible to attempt to quantify potential sales. This matter is further complicated by the fact that videodisc technology may have marketable potential through interaction with other new technologies yet to be explored.

THE "ELECTRONIC REVOLUTION"

Much literature devoted to societal changes often comes under such titles as "the electronic revolution." While this section is not concerned with these larger issues, the role of videodiscs and videocassettes is certainly reflected in the accelerating marketing of consumer electronics as a whole. Videodisc and video cassettes, therefore, are assumed to be a part of this "revolution."

A number of projections estimate the growth in consumer LTLIBE*V=IA *Z ANIF ZSILBA SA @ideo games, large screen TVs, VCRs and VDPs, Teletext and Viewdata services, digital audio. "Video go," an RCA study released in late 1981, has projected the penetration of various video sources in U.S. households for the year 1990 (see Table 18 below).

TABLE 18

U.S. HOUSEHOLD PENETRATION OF VIDEO SOURCES - 1990*

| | (Percentage of TV Households) | |
|---|---|---|
| | 1990 | 1979 |
| Network Stations | 100 | 100 |
| Independent Stations | 80 | 72 |
| PBS | 92 | 90 |
| Cable | 50 | 23 |
| Pay Cable | 35 | 10 |
| Subscription TV | 7.7 | 0.5 |
| Direct Broadcast Satellite | 5 | -[- |
| VCR | 17 | .1 |
| Videodisc Players | 28 | -- |
| Home Computers | 13 | .1 |
| Video Games | 20 | 14 |
| Teletext & Viewdata | 33** | |

* Note: Since the FCC didn't proceed with mandating videotext circuitry in TV receivers, the estimate for Teletext and Viewdata services has been reduced to 8 per cent.

Other projections are similar but the more recent ones tend to lower VDP expectations and increase those for VCR. The most conservative still project that VDP will be found in 20 per cent of the homes at the end of the decade.

These projections imply a fragmentation of audience at the expense of network viewing. This topic is treated in detail later.

*RCA Study

## CONCLUSIONS

The home video industry is growing rapidly on the strength of the video cassette recorder. The market for VCRs has shown an almost explosive growth. Faster than it can be sold, prerecorded content is receiving wide exposure as video stores, video clubs, and video magazines proliferate.

Since the function of the videodisc player is essentially the playback of pre-recorded content, the consumer has yet to find compelling reasons of economy, picture and sound quality, or of unique and more immediate content to warrant mass purchase. Expenditures to develop and promote players and discs have to date been far greater than profits, but there seems to be no loss of faith by any of the three groups targeted at the consumer market. RCA has conducted extensive marketing but has not yet demonstrated that CED technology is reaching the "75 per cent" of consumers described in this demographics.

Whether the consumer will be enticed to videodisc when prices of players come down and when discs enter the rental stream is not certain. If 1981 is considered to be the first year of the videodisc, then the sales results compare favorably with those for color TV, microwave ovens, and a number of other electronic innovations.

Since recent figures are unavailable, the Canadian picture is even less clear. The best estimates show that VCRs have penetrated about 150,000 TV homes in Canada -- only 2 per cent

compared to 4 per cent in the U.S. and 7 per cent in Japan and the U.K. Often, this smaller growth in comparison with the U.S. is considered to be caused by the higher costs due to exchange and duty and lower levels of disposable income. However, these reasons do not seem valid if comparisons are made with the even greater per household penetration in the U.K. The extent of VCR sales in Britain is usually attributed to the storage of existing TV entertainment channels and the desire for recent U.S. movies.

It is too early for any significant data on consumer behavior in Canada with respect to videodisc. The number of owners is probably too small to reflect any pattern other than a desire for novelty. The prolification of videodisc technology proliferate in Canadian homes will ultimately be a reflection of its success in the U.S.

## ENDNOTES

[1]Videoplay Marketing Newsletter, May 30, 1981.

[2]Dealerscope, June, 1981.

[3]Leisure Time Electronics Reports, June 1, 1981.

[4]MART Magazine, June 1981, p. 44.

[5]Ibid.

[6]K. Winslow, "Quick Release May Make the Difference," Video, June, 1981.

[7]Videoplay Report, March 30, 1981.

[8]The Video Business Guide Nordmedia Inc., N.Y., August 1980, p. 94

[9]Video Week, April 30, 1981.

[10]Globe and Mail, April 15, 1981.

[11]Video Business, June, 1981, p. 54.

[12]Ibid., p. 58.

[13]Ibid.

[14]Audio, April, 1981.

[15]Billboard, June 6, 1981.

[16]Merchandising, June, 1981, p. 87.

[17]Leisure Time Electronics, summer 1981, p. 77.

[18]The Videoplay Report, March 30, 1981.

[19]Video Week, June 1, 1981.

[20]Audio Marketnews, Vol. 7, May, 1981, p. 24.

[21]E. Sigel, et al., Video Discs, The Technology, the Applications, and the Future (New York: Knowledge Publications, 1980), pp. 73-74.

[22]Videodisc News, May, 1981.

[23]Ibid., December, 1980.

[24]Business Week, May 11, 1981.

[25]Videodisc News, May, 1981.

## CHAPTER IV

## VIDEODISC AND THE LAW

### INTRODUCTION

The purpose of this chapter is to explore the legal interpretation of videodiscs, an audio-visual device certainly not envisaged in the Copyright Act[1] of 1924. At first there was some worry that videodiscs might be considered "contrivances" and not subject to copyright protection under the law. Anyone could buy the disc for "Les Plouffes" and play it on a broadcast or cable channel, having satisfied all obligations through the disc's purchase.

However, some aspects of home video fit readily into the terms of the Copyright Act; therefore, their legal requirements and rights are well known. VCR's of all formats, for example, have been determined to be "dramatic works" and are afforded the same copyright protection as cinematograph works.

Nevertheless, videodisc technology is still in its early stages of development. It is possible that the Copyright Act may not provide effective protection for new applications. For this study however, discussion will limit itself to what protection the law can now provide rather than explore what may be.

A close and critical look will be taken at the legal aspects of the three main phases of commercial videodisc exploitation -- its production, its use and its eventual protection.

It must be stressed that this analysis focuses on the current situation under Canadian copyright law, and in selected foreign jurisdictions. It does not attempt to be an exhaustive review of all the possible rights and responsibilities that exist in law in respect of videodisc or a video work such as:

- trademarks and patents
- proprietary rights
- breach of contract
- unfair competition
- censorship
- privacy
- freedom of information
- access to government information
- national security
- contempt of court
- libel; defamation; negligent misstatements; misleading; advertising

Analysis of these areas would be beyond the terms of references of this study.

Several of these issues, however, are touched on later in this chapter and some legal analysis is available. A review that addresses some of these issues is found in Richard Hahn's paper to the Canadian Bar Association's seminar on the future of film, television and home entertainment, "Great Expectations." Hahn identifies a number of the rights and obligations in the video field beyond copyright.

For instance, of defamation he says:

> In producing video programmes, references to any individuals or identifiable groups of individuals which deprecate their reputation and good name by false statements must be carefully avoided. The rights of the individual in defamation are personal and do not survive the death of the individual. However, care must be taken to ensure that any references to any persons who are dead may not be inferred as references to their relatives or close associates.
>
> The laws of defamation have been applied to the embodiment of words or actions in films and television production. The potential for liability for damages for defamation is substantial.[2]

With respect to privacy:

> The common law does not recognize the principle of invasion of privacy or the rights of a person to prevent another from using his name or likeness. Some jurisdictions, notably in the State of New York, have established this right by statute. To date, the Provinces of B.C., Manitoba and Saskatchewan have passed specific legislation governing the right to privacy. However, the courts in Canada have not otherwise enforced this right as common law. Recently, this provision was used to prevent a Canadian company from using "Here's Johnny" for portable toilets.[3]

And trademarks:

> Titles of video productions, names and visual representations of characters, events and places may be protectable matter as trade marks.

. . . In choosing a trade mark, it should be distinctive and it should not describe or deceptively mis-describe the product or service with which it might be used. The trade mark should not be confusingly similar to other marks, whether they may be registered trade marks or unregistered marks. Care must also be taken to avoid use of geographical names or names which are primarily surnames of individuals. These constraints may inhibit the protection of names of characters but would not necessarily prevent protection of fictional events and places.

. . . In general, rights in trade marks are derived from actual use. Furthermore, care must be taken to indicate by notice that a particular name or design is used as a trade mark. In Canada, rights are also derived from the application for a trade mark registration based upon proposed use. Additional rights in Canada may be derived from the making known throughout Canada of foreign products and services. This may occur through spillover advertising from the United States.

Depending upon the country, protection may exist for registered marks and unregistered marks. Therefore, care must be taken to insure that all necessary searches and applications for registration are made in countries where trade marks may be used.

. . . In the audio-visual field, revenues from trade marks are generally derived when the producer licences others to produce the various merchandising products or to engage in services using the trade mark. In Canada, care must be taken in such licensing or protection may be lost.[4]

## PRODUCING THE VIDEODISC

The industrial manufacture of videodiscs is bound to be constrained by numerous laws and regulations governing labor, machinery, products, and every other aspect of actual production -- not to mention tax provisions relative to the manufacture and subsequent distribution of the finished product.

This part of the chapter will be concerned with the legal principles found primarily in copyright legislation[5] governing the recording of intellectual material on a videodisc. It will address two basic questions: what may legally be recorded on a videodisc and how can it be done?

A videodisc can only contain material that already exists in a different fixation, or material that was specifically created for a videodisc production. The opening discussion addressed the difficulties that arise mostly with the recording of pre-existing material. This is followed by an examination of the copyright laws regarding "original" works -- works created for the specific purpose of a videodisc production. Finally, miscellaneous laws and regulations related to such productions are reviewed.

### PRE-EXISTING WORKS

Material contained in other media, such as films, music, magazine articles or data bases can be transferred to disc. These works existed prior to the development of videodisc technology and were probably not created with a view to videodisc

distribution. The videodisc manufacturer must satisfy himself that he is assigned all necessary rights to transfer the material from another medium onto his projected videodisc.

Questions to answer are: Which works are protected by copyright? What is the extent of copyright protection? Which authorizations are needed? Which exceptions may apply? These questions are answered in an analysis of the Canadian Copyright Act that deals with authorization needed and compulsory licences.

## The Copyright Act

Generally speaking, the creator of a work is protected in every other country as if he were a national of that country through international conventions and domestic legislations. This principle of international copyright law is known as "national treatment." Canada has adhered to the 1928 Text of the Berne Convention (Rome). Accordingly, section 4.(1) and 4.(2) of the Canadian Copyright Act extend protection to foreign authors who are nationals of countries with which Canada has international agreements.

In making a videodisc in Canada, the only applicable legislation is Canadian law. The Canadian Copyright Act, is exhaustive, in that copyright or copyright-related protection exists in Canada only in accordance with the Copyright Act. The Act grants certain exclusive rights to owners of copyright in certain works. But the Act of 1924 is limited by its failure to reflect

technological advances in the area of communications.

The Ilsley Commission of 1957, the Economic Council of Canada (1971), and the Consumer and Corporate Affairs working group (1977) have all issued reports suggesting revisions. The current Department of Communications and Consumer and Corporate Affairs task force may resolve the contradictions among the different reports.

**Works Protected**

Section 4.(1) of the Copyright Act categorizes four types of works protected in Canada: literary, dramatic, musical and artistic. The work is only protected under copyright when it is "fixed," that is, "in some material form, capable of identification and having a more or less permanent endurance."[6] The work must also be "original", which means that: "the product must originate from the author in the sense that it is the result of a substantial degree of skill, industry or experience employed by him . . . It does not mean the work must be the expression of original thought."[7]

Section 2 of the Act describes what may be included in each category. Except for musical works, this section does not attempt to define the categories but merely lists some of the material that may come within the ambit of one or the other category.

While "literary works" can include maps, and charts, sheet music, plans, tables and compilations, their common denominator is that they are fixed on paper, whatever their nature[8] or appearance.

The second catogory "dramatic works" includes "any piece for recitation, choreographic work or entertainment in dumb show, the scenic arrangement or acting form of which is fixed in writing or otherwise."[9]

"Musical works" refer to "any combination of melody and harmony, or either of them, printed, reduced to writing, or otherwise graphically produced or reproduced."[10]

Finally, "artistic works" include "works of painting, drawing, sculpture and artistic craftmanship, and architectural works of art and engravings and photographs."[11]

Section 2 of the Act goes on to define the phrase "every original literary, dramatic, musical and artistic work" as including:

> . . . every original production in the literary, scientific or artistic[12] domain, whatever may be the mode or form of its expression, such as books, pamphlets[13], and other writings, lectures, dramatic or dramatic-musical works, musical works or compositions[14] with or without words, illustrations, sketches, and plastic works relative to geography, topography, architecture or science.

Therefore, it is assumed that most works will fit or be made to fit in one of the four categories established by

Section 4.(1) and therefore highly likely to be protected by copyright.

Three special kinds of works now deserve our attention: cinematograph productions, contrivances by means of which sounds may be mechanically reproduced, and compilations.

Cinematograph productions will fall within the "dramatic works" category. To be a "dramatic work," the cinematograph production must be one "where the arrangement or acting form or the combination of incidents represented give the work an original character."[15]

And, in section 3.(1)(e), it is stated that "if such original character is absent, the cinematographic production shall be protected as a photograph."

It may now be concluded that the cinematograph production which is not of an "original character" as expressed in Section 2 will be protected as a mere photograph, itself falling within the category of "artistic works."

In short, then, a cinematograph production may be either a "dramatic work" or an "artistic work" in the nature of a photograph, depending upon its original character or absence thereof. The distinction is important both in terms of ownership of the copyright and in terms of duration of protection.

Contrivances by means of which sounds may be mechanically reproduced are generally referred to more simply as "mechanical contrivances." These are sound recordings. Section 4.(3)

protects them "in like manner as if such contrivances were musical, literary or dramatic works." It is important here to understand that copyright will subsist in the contrivance per se, quite apart from any copyright which may, or may not, exist in the recorded work.

Compilations are included in literary works.

> Copyright may be either in respect of the matter or the arrangement. Therefore in the case of works that depend for their quality of novelty on arrangement only, there need be no originality in the material itself. It is only in the compilation - in its form and arrangement - that originality exists, and this is sufficient.[16]

It is therefore clear that compilations in the nature of a data base would be proper subject matter for copyright protection in Canada.

To summarize, works falling within the bounds of the Copyright Act are every literary, dramatic, musical and artistic work as these are defined in the Act, as well as cinematograph productions, sound recordings per se, and compilations including those in the nature of data bases.

However, and recalling Section 45 of the Act, no other work is protected. The two most important categories of works thus omitted are broadcast signals and artists' performances. Therefore, broadcasters and performers must turn to other legislation or to their own negotiated agreements for protection.

## Public Domain

Works whose period of protection has expired are said to fall into the public domain. Because of the intricacies of classification, the term of copyright protection will be varied and complicated. However, it is generally dependent upon the life of the author -- if the work was published during the author's life time. Problems arise when authorship is anonymous or pseudonymous; when the work is a collaboration of several authors; or when it is posthumous.

Section 5 of the Act provides protection during "the life of the author and a period of fifty years after his death."

Within the category of artistic works, photographs are an exception. They are protected only for a period of fifty years from the making of the original negative from which the photograph was directly or indirectly derived.[17] It will be recalled that, depending on their "originality of character," cinematograph productions will fall within the dramatic work or the artistic work category.

Mechanical contrivances will be protected for a period of fifty years from the making of the original plate from which the contrivance was directly or indirectly derived.[18]

A final exception is to be found in Section 11 which provides that "works prepared or published by or under the direction or control of Her Majesty or any government department (shall be protected) for a period of fifty years from the date of the first publication."

## The Meaning of "Copyright"

Section 3.1 of the Act states:

> . . . "copyright" means the sole right to produce or reproduce the work or any substantial part thereof in any material form whatever, to perform, or in the case of a lecture to deliver, the work or any substantial part thereof in public; if the work is unpublished, to publish the work or any substantial part thereof.

The Act goes on to describe a long list of rights that can be reduced to the following:

- the right to produce or reproduce the work or any substantial part thereof [s. 3.(1)]
- the right to produce or reproduce a translation of the work [s. 3.(1)(a)]
- the right to make any record or other contrivance by means of which the work may be mechanically delivered. [s. 3.(1)(d)]

The other rights listed in Section 3.(1) will only take their full meaning once the videodisc is produced and ready for exploitation. In terms of strict production, the three rights mentioned above are those most likely to be infringed upon by the videodisc producer.

These rights are quite independent of each other. Thus, the re-typing or the taking of photographs of a novel for example, prior to embodying this "adapted" copy in a videodisc, would constitute an encroachment of the right to reproduce -- quite apart from the making of the videodisc itself, which would constitute an infringement of the right to make a record.

Moreover, with respect to the right to make a record, it must be pointed out that recent Canadian jurisprudence establishes that this right is infringed upon by whoever actually makes the record without authorization. Section 3.(1) is not exhaustive; one must also look at Section 4.(4), where we find that the making of a videodisc that includes a pre-existing musical work taken directly from an existing sound-recording would constitute a double infringement if not authorized. It would violate the exclusive right to make a record of the musical work and the exclusive right to reproduce the sound-recording.

Section 12.(7) points out that such an action could also infringe on "moral rights" where the author:

> . . . has the right to claim authorship of the work, as well as the right to restrain any distortion, mutilation or other modification of the work that would be prejudicial to his honour or reputation.

However, since practically all Canadian courts have been reluctant to give much importance to this section, it is safe to assume that "moral rights" will not be the subject of much judicial development in Canada.

To summarize, copyright principles will apply in Canada to videodiscs of pre-existing works, provided these works are original literary, dramatic, musical or artistic work as envisioned by the Copyright Act, and provided they are still within the term of protection. The "maker" of the videodisc will need authorization to reproduce or translate the pre-existing works as

well as to make a contrivance by means of which the work may be mechanically delivered.

## Authorization Needed

### Ownership of Rights

Section 12.(1) states that "the author of a work shall be the first owner of the copyright therein." Unfortunately, there are many exceptions to this rule.

Photographs are treated differently. Section 9 provides that copyright resides in the owner of the negative. It is therefore possible that the actual photographer would not be the owner of the copyright for the photograph he took.

Further, Section 12.(2) provides that:

> Where, in the case of an engraving, photograph, or portrait, the plate or other original was ordered by some other person... in the absence of any agreement to the contrary, the person by whom such plate or other original was ordered shall be the first owner of the copyright.

Under Canadian copyright legislation, this is the only instance where the copyright in a commissioned work would be vested in the commissioner.

The Act, however, does speak of works made in the course of employment. Where ownership resides in the employer if the work was made in the course of employment (s.12.3) and where the Crown is involved, Section 11 provides that any work prepared for the Crown is owned by the Crown.

Mechanical contrivances are treated in terms of ownership, much as photographs. The owner of the copyright in the contrivance per se is the person who was the owner of the original plate from which the contrivance was directly or indirectly derived, at the time when the plate was made.[19]

One must be particularly careful when dealing with cinematograph productions. As was seen earlier, these productions may fall within the category of either dramatic or artistic works. Cinematographs could therefore be treated as photographs, depending on the originality of their character. This leaves two possibilities with respect to copyright ownership. In the first instance, the "original" cinematograph production is considered a dramatic work and therefore the copyright will be vested in the author.[20] In the second, "non-original" production is a photograph and the copyright will be vested in the owner of the negative, unless the production was commissioned.

**Assignment (Section 12.(4)**

Assignment can be a mere part of the copyright. For example, the author of a dramatic work may have assigned his sole right to make a record while retaining his sole right to produce a translation. The assignment may be for a limited period of time, and cannot continue longer than twenty-five years after the author's death.[21]

Therefore, the prudent videodisc producer who wishes to use a pre-existing work will attempt to trace all possible assign-

ments and obtain contractual guarantees that the person who is granting him an authorization does indeed have the right to do so.

Finally, no assignment is valid unless it is in writing, signed by the owner or his agent.[22]

Union Contracts

Certain works such as broadcast signals and live performances are not protected by copyright. As a result, there are many problems involving performers' acts. However, as the performer derives some protection from the common law as well as from contracts, the videodisc producer would be well advised to obtain authorizations before reproducing a given performance on a videodisc.

In Canada, the major performers unions[23] have all taken or are taking a close look at the new videodisc technology. It is assumed that they will be negotiating standard contracts to govern the use of their works and other contributions in videodisc form.[24] However, the proposal of a "standard contract" by one group or association does not necessarily entail acceptance of that contract by videodisc producers. Therefore, it may be expected that although model agreements will indeed evolve, they will not be a mere acceptance of union proposals. Furthermore, it must be pointed out that most legislatures will hesitate to force the acceptance of a model contract by inserting it directly in the legislation.

Compulsory Licences

Statutes which deprive the copyright owner of his right to refuse the grant of an authorization can be found in sections 7, 13, 14, 15 and 19 of the Copyright Act and are generally referred to as compulsory licences.

While sections 13, 14 and 15 are of no interest for this study, section 7 is. The reproduction of any work twenty-five years after the death of the author, is permitted under section 7, provided that certain formalities have been accomplished and that royalties have been paid to the copyright owner. Such royalties would be calculated at the rate of 10 per cent of the "publication price."

Section 19 allows for a contrivance to be made for the mechanical performance of a work as long as the contrivance is lawfully made and that certain formalities (including the payment of a minimal royalty) are fulfilled. In such circumstances, the copyright owner is compelled by the statute to grant his authorization for the making of the subsequent contrivance. The section is applicable to literary, dramatic and musical works, and although it is presently used strictly for sound-recordings, it is possible that it might also apply to the making of video-recordings.

In any event, Section 19 is the subject of much heated doctrinal debate and opposing judicial decisions. Should the

the statute ever be revised, Section 19 will probably be the first to be amended.[25] Meanwhile, perhaps it offers easy legal mechanisms for the production of videodiscs and would warrant a specific detailed study that the present overview cannot undergo.

Conclusion

The videodisc producer must be aware that written authorization to transfer a pre-existing work onto videodisc is needed in most instances, unless the work has fallen into the public domain. Even where the pre-existing work is not protected by the Canadian Copyright Act, such as is the case with performers' live appearances, common law principles would probably be found to prevent the videodisc producer from benefiting freely from the fruits of someone else's labour. Consequently, contractual guarantees should be sought from the owner of every contribution to be recorded on the videodisc.

WORKS CREATED FOR A VIDEODISC PRODUCTION

In dealing with works created especially for videodisc, the legalities are the same. Whether the work transferred to videodisc was pre-existing or whether it was created for the specific purpose of being recorded on a videodisc, it remains a work which is distinct from the videodisc per se. In other words, there is always a "pre-existing work."

In practice, however, where a work is created specifically for a videodisc production, the videodisc producer and the author of the work will likely have an employer-employee relationship. At the very least there will be a contractual relationship between the two, so that the videodisc producer will not have to go through the sometimes extremely difficult searches for a clear copyright title.

While gathering his material, therefore, the videodisc producer will in effect be gathering the very contributors from whom he must obtain the necessary authorizations. In making "original" videodisc productions, the producer benefits by dealing with the first owner of copyright, the author himself.

Under those circumstances, contractual arrangements could very well be modelled on the contracts now in use in the sound-recording and motion picture industries.

> To sum up, the producer of a videogram . . . has to negotiate with and secure the consent of all those who have contributed to the creation of the videogram or pre-existing work, including the authors and composers, producers of films . . . producers of phonograms and performers.[26]

## OTHER LEGAL ASPECTS

This section will look at other legal aspects of the disc, including possible deposit requirements once the videodisc is produced.

## Legal Aspects Related to Contents

These fall into two categories, proprietary rights and delictual acts.

### Proprietary Rights

Claims may be made against the unauthorized use of certain materials, like the use of one's own portrait. A videodisc production may be charged with trademark infringement, a breach of confidentiality, or a breach of contract. Claims of unfair competition are likely to be made whenever a videodisc embodies material similar to that found on another videodisc or even another medium.

### Delictual Acts

Even where the videodisc production does not infringe a copyright or some other proprietary right, the inclusion of certain material in it might constitute a delictual act. For example, a videodisc may be in contempt of court if it embodies a public affairs program which discusses legal action that is still sub judice. Similarly, the making of a videodisc that includes seditious, blasphematory or obscene material could constitute an offence under the Criminal Code. The videodisc that reveals certain confidential government documents might pose a threat to national security.

Less obvious situations are those where a videodisc might contain defamatory or negligent statements which could give rise

to legal claims in damages as well as to injunctions to restrain the distribution of the videodisc.

**Preventive Measures**

These questions are not specific to videodisc, but are the daily fare of all communications industries. The videodisc producer should also follow the prudence and code of ethics developed in the newspaper, film and television industries. Admittedly, there will always be times when the videodisc producer, like the newspaper publisher or the television program director, has to make a personal decision to accept the risk of legal proceedings against the distribution of a particular production.

## Legal Deposit

**National Library of Canada**

It would appear then, that a videodisc published in Canada would fall within the meaning of "book" under Section 11.1 and .2 of the National Library Act[27] and would therefore be subject to legal deposit requirements.

However, Section 4 of the National Library Book Deposit Regulations[28] exempts a number of documents (such as educational kits of non-book materials) from deposit requirements.

As an extrapolation of the latter regulation, it has been the National Library's policy not to require the deposit of videodiscs or cinematographic works. However, since January 1, 1978, deposit of educational kits of non-book materials has been specifically requested. Thus, educational videodiscs or

videodisc kits containing important print material would be subject to deposit in the Canadian National Library.

**Deposit Requirements in Quebec**

It is the policy of the Bibliotheque Nationale du Quebec[29] not to request deposit of film and audio-visual works. The more logical depository would be the Cinematheque Nationale, where the Loi sur le cinema[30] provides that the owner of any new cinematographic or audio-visual work produced in Quebec must deposit one copy of that work with the Cinematheque Nationale. However, that section of the Act has yet to be proclaimed. Meanwhile, the conclusion is that videodiscs are not subject to deposit requirements in Quebec.

## USING THE VIDEODISC

The fact that a videodisc has been lawfully produced does not imply that it can be used freely, without regard to the interests of contributors of material embodied in the videodisc. This section is concerned with possible infringements of the rights in the contents of the videodisc and not with the protection of the videodisc itself. It is taken for granted that the videodisc being used is one that has been lawfully produced.

The guiding principle is that use of the material embodied in a videodisc is lawful only if authorized as a result of an agreement or from the operation of the law itself.

## USES AUTHORIZED BY CONTRACTS

It is imperative that videodisc producer determine what exploitation will be made of his videodisc at the time he is acquiring rights for production. This will allow him to obtain the necessary authorization for such exploitation.

The authorization needed is again dependent on what rights are conferred by the Copyright Act. It is not necessary, however, for the producer of the videodisc to try to cover every possible use by third parties. For example, if the producer himself does not intend that his videodisc be used in public to perform the works embodied in it, he would not be responsible for procuring necessary authorizations for such performances.[31] But a videodisc producer who intends to sell or license his

videodisc for radiocommunication should ensure that he does have the authority to allow for such a use of the protected works on his videodisc. This responsibility is similar to that of a film producer, who, in acquiring rights for the actual production of his motion picture, customarily acquires rights for secondary exploitation.

It must be expected that some rights will not be assigned to the videodisc producer for the simple reason that they will have been pre-assigned to a collective.[32] In those instances, certain standard clauses in the nature of a waiver are usually inserted in the contracts.

It is always a good procedure to take advantage of the signing of a contract to clarify any situation which the Copyright Act leaves in ambiguity. For instance, "radiocommunication" is not defined in the Copyright Act. Therefore, whether it encompasses cable and satellite distribution as well as conventional broadcasting is not specified.[33] Such a question could and should be resolved by contract.

Similarly, the use of a videodisc in an information storage and retrieval system might result in a "reproduction" of the work embodied on that videodisc. It is unclear whether Section 3.(1) of the Copyright Act ever envisaged the right to reproduce as encompassing such a "reproduction." It may be wise for the videodisc producer who intends such application of his videodisc to ensure that this question is resolved in his agreement with the

authors. No authorization is needed, however, to effect what is clearly not an act reserved exclusively to the author. For example, it would serve no purpose to negotiate an authorization to lend the videodisc to the public as there is no "public lending right" in the Canadian Copyright Act.

USES AUTHORIZED BY LAW

A particular use of the videodisc could be covered by one of the exceptions provided for in the Copyright Act. Because the Act is rooted in print technology, only a few of the exceptions might be applicable to videodisc uses.

One exception is Section 17.(2)(a) titled "fair dealing." Although this section is often said to be the legal basis for a "right to quote" that interpretation is incorrect. (The so-called "right to quote" is in fact a result of Section 3.(1), which vests in the author an exlusive right to reproduce his work.) Rather, Section 17.(2)(a) applies when the courts, having established that an infringement has occurred, must consider whether that infringement is "covered" by the defence of "fair dealing."

The second most often encountered misconception about the fair-dealing provision is a confusion between the "fair dealing" itself and the purposes of that "fair dealing." It is often believed, for example, that anything done in the course of research or private study is ipso facto "fair dealing." This is not the case. Canadian jurisprudence is well set on this.

In spite of these limits, the "fair dealing" provision remains the most important exception to the exclusive rights of authors, precisely because it can be used against any encroachment of any exclusive right. Libraries, archives and educational institutions in particular are likely to find that this exception opens the door onto rather wide manoeuvering grounds.

Section 17.(2)(d) of the Act exempts from protection "the publication in a collection, mainly composed of non-copyright matter, bona fide intended for the use of schools." Educational videodiscs could therefore fall into this category.

Finally, attention must be brought to a peculiar section of the Copyright Act buried in the part that deals with performing rights societies.[34] Section 50.(7) reads in part:

> In respect of public performances by means of any radio receiving set or gramophone in any place other than a theatre that is ordinarily and regularly used for entertainment to which an admission charge is made, no fees, charges or royalties shall be collectable from the owner or user of the radio receiving set or gramophone, but the Copyright Appeal Board shall, so far as possible, provide for the collection in advance from radio broadcasting stations or gramophone manufacturers, as the case may be, or fees, charges and royalties appropriate to the new conditions produced by the provisions of this subsection.

This exemption might be applicable to discs embodying aural works exclusively, and the possibility exists that it could also apply to at least the sound portion of a videodisc, provided, of course, that the videodisc is a product of the "groove" technology.

The above are the main exemptions to be found in the present Copyright Act that might be applicable to videodisc uses. During studies for the revision of the Act, more exceptions have

been sought by educational institutions, libraries and archives. These did not address the new technology of videodisc information storage, but were mostly directed to "traditional" reproduction technology, notably photocopying. It is therefore doubtful that a new Act would introduce drastic new principles or rules to govern uses of protected works embodied in a videodisc.

## LEGAL CONSEQUENCES OF CERTAIN USES

By virtue of Section 19 of the Act, once a literary, dramatic or musical work has been recorded in Canada on a contrivance capable of delivering sounds mechanically, with the consent of the copyright owner, this work then becomes subject to a compulsory licence for the making of other such contrivances. The copyright owner may feel he is at a financial disadvantage given the minimal royalty provided for in the Act[35] and the possibility that the making of a videodisc might lead to a future compulsory licence against at least the sound portion of the disc. The copyright owner of a musical work, for example, might prefer withholding his permission to use his work in a videodisc production.

An even more important concern of the copyright owner of a work to be recorded on a videodisc is the possibility that distribution of the videodisc might be interpreted as a publication of his work. As long as his work remains unpublished,[36] the author enjoys stronger copyright protection. In Canada, the revision process of the Copyright Act has given way to the European Common Market theory of "exhaustion of rights,"

whereby certain rights of the author (for example, that of control in one territory) are exhausted upon publication of the work.

These concerns are certainly important enough to give copyright owners some pause. It is presumed that their impact will be most felt in the royalties that the videodisc producer must pay to the copyright owners for works embodied in the videodisc production.

## PROTECTING THE VIDEODISC

This section examines the rights of the videodisc producer and focuses in particular on copyright protection under present Canadian law. Since videodiscs will probably find a market in foreign countries, it also reviews the protection provided by selected foreign legislation.

## PROTECTION IN CANADA

### Copyright Protection

To be protected by copyright, a work must be included within the categories of Section 4.(1) ("original literary, dramatic, musical or artistic works"). It will be recalled as well that the definition given of that phrase in Section 2 of the Act includes "every original production in the literary, scientific or artistic domain, whatever may be the mode or form of its expression."

The particular medium of the videodisc does not seem to be an obstacle to its being protected by copyright. However, it remains to be seen if this "new work" can be made to fit within one of the four categories of Section 4.(1).

#### Cinematograph Productions

In the eyes of the layman, videodiscs are analogous to films. But they cannot be analogous in law because videodiscs are not works produced by an action analogous to cinematography. The cinematography process involves shining a light through a transparent film and capturing the resulting "filtered"

image on a screen. Videodiscs do not meet the process requirements of this definition.

**Dramatic Works**

Section 2 of the Copyright Act defines "dramatic work" as including "any piece for recitation, choreographic work or entertainment in dumb show, the scenic arrangement or acting form of which is fixed in writing or otherwise . . ."

There are two important elements here. First, the definition is not limitative: it only identifies to illustrate what may be included in "dramatic works." Second, the requirement for fixation refers to any material form as opposed to a strict fixation in writing. It would therefore appear that a dramatic work expressed in no other form than a videodisc would be protectable by copyright in Canada.

Although the videodisc might be an acceptable vehicle for expression of a dramatic work, this does not necessarily mean that the videodisc is a dramatic work. As in their interpretation of what constitutes copyright, however, the Courts appear to be extremely liberal in their construction of what constitutes a dramatic work.[37] Thus, provided a work satisfies the normal requirements of originality[38] and meets with the liberal jurisprudential conception of a dramatic work, it would be protected as such, even if its sole form of expression is a videodisc.

Such a videodisc work is afforded the same copyright protection as dramatic works in general. By virtue of Section 3.(1), the owner of the copyright in that work has the exclusive

right to produce and reproduce the work, to perform it in public, to publish it, to transform it into a non-dramatic work, to record it on a mechanical contrivance, to communicate it by radio-communication and to authorize all of the above. As well, the dramatic work benefits from "moral rights" protection as outlined in Section 12.7 of the Act.

The first owner of the copyright is the author.[39] If the dramatic work's only form of expression is the videodisc, it is possible that the producer qualifies as "author" for the work. The particularities of employer-employee relationships require careful attention.[40]

Finally, the duration of copyright protection in a dramatic work is the life of the author and an additional period of fifty years.[41]

**Mechanical Contrivances**

Section 4.(3) of the Act deals with mechanical contrivances. These are " records, perforated rolls, and other contrivances by means of which sounds may be mechanically reproduced . . . "

Although the videodisc is both audio and visual it could be protected as a whole under Section 4.(3). However, a safer interpretation considers only the sound portion of the videodisc within the class of mechanical contrivances.

Though Section 4.(3) states that such contrivances are protected "in like manner as if such contrivances were musical, literary or dramatic works" (presumably depending on the category

of work recorded), other sections of the Act render this comparison virtually useless.

Thus, the first owner of copyright for mechanical contrivances will not be the author, as is normally the case with literary, dramatic and musical works, but rather the owner of the plate from which the contrivance was derived.[42] Moreover, term of protection will not be based on the date of the author's death or the date of the first publication of the work, but on the date of the making of the plate from which the contrivance is derived.[43]

Only one right is granted by Section 4.(3): the right to reproduce any such contrivance or any substantial part thereof in any material form.[44] The rights granted in Section 3.(1) do not apply here. By way of illustration, the owner of the copyright in a videodisc protected as a contrivance would not have the sole right to communicate his work by radiocommunication.

On the other hand, it is interesting to note that mechanical contrivances are not subject to the compulsory license of Section 19.

To summarize, in Canada, videodiscs enjoy the full benefit of copyright protection provided they fall within the category of dramatic works. Otherwise, the aural components of the videodisc benefit from the limited protection afforded mechanical contrivances.

The only recommendations made that deal directly with videodiscs are to be found in the 1977 Keyes-Brunet report[45] to the government. This report urged that videograms generally

(motion picture films, videotapes and videodiscs) should be protected by copyright as a specific category of works; the ownership of copyright should rest with the "maker"; the term of protection be fifty years from the date of making; and the rights granted be the rights to reproduce, to perform in public, to broadcast and to adapt the videogram.

Other Forms of Protection

There may be other remedies against unauthorized exploitation of a videodisc production. An example is the Copyright Act's specific protection to authors: that their specific edition is protected indirectly by the exclusive rights granted to the author of the work expressed therein. Videodisc producers could follow that example by obtaining an assignment on the authors' behalf of their rights in the contributions embodied on the videodisc.

Apart from this "indirect" copyright protection, videodisc producers would also benefit from protection deriving from certain common law principles. The theories of reliance, passing off, and unjust enrichment may have some application in the cases of unauthorized exploitation of a videodisc.

## PROTECTION UNDER FOREIGN LEGISLATIONS

International copyright conventions honor the principle of "national treatment" that is, works are protected in each country according to the laws of that country.

The countries whose legislation was surveyed for this study were chosen either on the basis of their legal affinity with Canada, or their present interest in videodisc technology. They are: the United States of America, France, Japan, the United Kingdom, Australia and Germany. Table 19 summarizes the results of this survey.

As we can see, except in the case of France, videodiscs are protected.

TABLE 19

COPYRIGHT PROJECTION UNDER FOREIGN LEGISLATIONS

| Country | Date of Act | Discs Protected | Applicable Sections | Term of Protection |
|---|---|---|---|---|
| USA | 1976 | yes | 102 | life + 50 years |
| FRANCE | 1957 | no | | |
| JAPAN | 1970 | yes | 16, 29 | 50 years after public or if not public, after creation |
| UK | 1956 | yes | 13.(10) | varies according to registration under UK Films Act 1938 - usually - until registration + 50 years |
| AUSTRALIA | 1968 | yes | 98.(2) | publication + 50 years |
| FRG | 1973 | yes | section 2 qualified by 94, 95 | publication + 25 years |

It can be expected that in most countries, protection in one form or another will be extended to videodiscs. It is logical to assume that protection would normally be found in the

respective copyright laws of each country, yet the examples given above show that this is not always the case. Notably, France (and, it may be presumed, the countries in France's sphere of influence) has a restricted view of copyright subject matter. However, even under that jurisdiction, the laws of unfair competition take the place of copyright protection. Such an alternative probably exists in most countries and therefore, it can be assumed that videodiscs are afforded protection in varying degrees throughout the world.

## CONCLUSION

Although the legal obligations enumerated in this chapter may appear an impossible burden to the videodisc producer, it must be recalled that they are not different from the obligations assumed daily by other producers of information. In time, routine procedures will be established as in other cultural industries and the production of videodiscs will go on lawfully, without having produced the feared overhaul of present legal principles.

It is too early, however, to come to a similar conclusion upon review of the legal aspects of using a videodisc. For a variety of reasons, questions still to be answered include: What are the possible technical uses of a videodisc? Who will use videodiscs -- governments, corporations, educational institutions or individuals? What will be the motivation behind videodisc applications -- will legislators find it easier to favor disinterested enterprises, such as education and archives, than commercial ventures, such as entertainment? In the area of videodisc uses, therefore, it is probable that legal adjustments will have to be made. Market uncertainties and pending changes in the laws are wholly dependent, of course, on public acceptance of the new technology.

Finally, it is obvious that the protection of videodiscs is inadequate under Canadian law and will not be adequate until the Copyright Act is revised or replaced by a new Act.

## ENDNOTES

[1]An Act respecting copyright; 1970 R.S.C. chap. C-30.

[2]R. Richard Hahn "The Acquisition of Rights in the Video Field", (March 1981), p.4. Paper presented to the conference on "Great Expectations: the Future in Film, Television and Home Entertainment", sponsored by the Canadian Bar Association and the Media and Communications Law Section, Vancouver.

[3]Ibid.

[4]Ibid., pp. 5 - 7.

[5]Ibid.

[6]Canadian Admiral Corporation Ltd. v. Rediffusion Inc. et al. (1954) Ex. C.R. 382, 14 Fox Pat, c. 114; 20 C.P.R. 75.

[7]Harold G. Fox, The Canadian Law of Copyright and Industrial Designs, 2d ed. (Toronto: The Carswell Company Ltd., 1967), p. 41.

[8]An inclusion which appears to be in direct contradiction of the definition given in the Act of "musical work."

[9]Copyright Act s.2.

[10]Ibid.

[11]Ibid.

[12]Given the disappearance of the words "dramatic" and "musical", it must be presumed that "artistic", in this sub-section, has a more embracing meaning than it has in the definition of "artistic work."

[13]As was established earlier, "pamphlets" are already included within the definition of "books", which leaves us with a redundancy within a redundancy!

[14]"Compositions" is not defined in the Act and one is left to ponder what the difference might be between a "musical work" and a "musical composition", assuming of course (from a reading of the French version of this sub-section) that "musical" does qualify "composition."

[15]Copyright Act, s. 2.

[16]Fox, Canadian Law of Copyright, p. 110.

[17]Copyright Act, s.9.

[18]Ibid., s. 10.

[19]Ibid.

[20]This, of course, raises the other problem of trying to establish who is the author of a cinematograph production:

> La loi canadienne, elle, est silencieuse. Elle ne dit pas que l'oeuvre cinematographique est une oeuvre de collaboration, et elle ne designe pas le titulaire du droit d'auteur . . .
> Dans la practique les contrats passes a propos de la realisation de l'oeuvre, reglent le probleme de la designation du droit d'auteur. En l'absence de stipulation il semble que la jurisprudence se prononce pour le producteur, et ce d'autant plus, qu'un lien de preposition existe presque toujours entre le createur et le producteur (Jacques Boncompain, Le droit d'auteur au Canada (Le Cercle du Livre de France Ltee, 1971), pp. 157-158).

[21]Copyright Act, s. 12.(5).

[22]Ibid., s. 12.(4).

[23]Association of Canadian Television and Radio Artists; Union des Artistes; American Federation of Musicians.

[24]Gillian Davies: "Legal problems deriving from the use of videograms" Video Rights, vol. 1, No. 2 (Nov. 1980), ISSN 0143 8573 - for a view of the situation at the International level.

[25]Wanda Noel, Compulsory Licenses and Copyright; RIDA, no. 108 (April 1981), p. 51 - for a broader discussion of compulsory licenses.

[26]Davies, "Legal problems", p.11.

[27]An Act respecting the National Library R.C.S. (1970), Chap. N-11.

[28]Consolidated Regulations of Canada, Vol. XII (1978), Chap. 1109.

[29]Loi sur la Bibliotheque Nationale du Quebec L.R.Q. (1977), Chap. B-2.

[30]Loi sur le Cinema L.R.Q. (1977), Chap. C-18.

[31]The right to perform in public is an exclusive right of the author, by virtue of s. 3.(1).

[32]Individual owners of copyright may assign certain specific rights to an organization that will then administer

those rights collectively. In Canada, the better known collectives are the Composers, Authors and Publishers Association of Canada (CAPAC) and the Performing Rights Organization of Canada (PRO). Both administer performing and radiocommunication rights in musical works.

[33]Canadian Admiral Corp. Ltd. v. Rediffusion Inc.; C.P.R. Vol 10 Sec. II: p. 75. It is widely held in Canada that this case put to rest the possibility of a "cable distribution right". The case, however, was decided on May 21, 1954, in the trial division of the then Exchequer Court of Canada and was never appealed.

[34]ss. 48 to 51 exclusive.

[35]Copyright Act, s. 19.(5).

[36]"Unpublished" in the copyright sense, which does not mean that the work in unknown or inaccessible. The concept of "publication" is at the center of most discussions in the copyright community.

[37]Rose-Marie Perry op. cit. p. 268; Fuller v. Blackpool Winter Gardens et al 2 Q.B. (1895), 429; Kantel v. Grant, Nisbet & Auld Ltd. et al Ex.C.R. 84 (1933), p. 95..

[38]Means that the product must originate from the author in the sense that it is the result of a substantial degree of skill, industry or experience employed by him.

[39]Copyright Act, s. 12.(1).

[40]Ibid., s. 12.(3).

[41]Ibid., s. 5.

[42]Ibid., s. 10.

[43]Ibid.; duration of copyright protection will be fifty years from the making of such plate.

[44]Ibid., s. 4.(4).

[45]A.A. Keyes and C. Brunet; op. cit. p. 82.

# APPENDIX I

Richard Hahn prepared the following "Checklist for Acquisition of Rights" and presented this at the Bar Association Seminar in Vancouver.

## Preparatory Checklist for Acquisition of Rights Agreement

In preparing agreements for the acquisition of rights in the video field the following issues must be initially addressed:

- What is the Intellectual Property and Material Object which will be embodied in the final production?
- Who are the persons who own or control the Intellectual Property or Material Object?
- What is the production role of the person from whom the rights are acquired and is there a possibility that this role may change?
- Is the Intellectual Property which is being acquired based upon other works in which rights subsist?
- What are the valuable elements of the Intellectual Property being acquired which even of themselves are protectable as Intellectual Property or otherwise?
- What is the form which the production will initially take i.e. film, television programme, videodisc?
- What are the possible forms which the production may subsequently take i.e. will there be sequels, remakes or other derivative works such as, novelizations or merchandising?
- What means of communications will be used for both the initial production and future productions?
- What collective agreements exists which govern the licensing or acquisition of rights. Which of these are optional and may be superceded by contract?

- Is there a possibility that any of the rights in the production or any of the elements of the production may revert to the grantor by virtue of statutory provisions such as copyright or by virtue of breach of contractual provisions?

- Where pre-existing productions are being acquired, what are the possibilities that a claim will be brought for breach of warranty of title and in such an event what is the financial position of the entity warranting title?

## APPENDIX II

### Checklist for Acquisition of Rights(1)

1. DATE

2. PARTIES

3. AUTHOR: Name; Citizenship and Residence at Date of Creation and Publication

4. IDENTIFICATION OF OBJECT OF GRANT: Title; Description; Particulars of Existing Registrations;

   Type : Literary; Artistic; Dramatic; Musical; Photograph; Choreography; Sound Recording; Videotape; Video Disc; Motion Picture.

5. PUBLICATION DATA: Data; City; Country; Name and Address of Publisher.

6. IDENTIFICATION OF RIGHTS GRANTED:

   (A) ALL: Assignment; Employment.
   (B) SPECIFIC: (i) Material Object; (ii) Intellectual Property.

   a) Perform in public; Communicate by Radio, T.V., Satellite; Reproduce; Translate; Edit.
   b) Convert into: Novel; Abridgements; Merchandising; Remakes; Sequels; Other Forms.
   c) Receive Royalties from Rights Not Granted (Subsidiary Rights)
   d) Sublicence to others
   e) Negative Rights to Restrict Against Competition by Grantor for duration of exploitation of Production

7. EXTENT OF GRANT: Duration: Term of Copyright and/or renewals or specific terms; Territory; Exclusive vs. Non-Exclusive; Possibility and effect of Reversion.

8. OBLIGATIONS OF GRANTOR: Delivery; Conditions of Acceptance; Responsibility for changes and corrections; Non-Competing works; Option on future works.

9. OBLIGATIONS OF GRANTEE: Exploit vs. Non-Exploit; Methods of Marketing; Protection of Rights: Notice, Deposit, Registration, Prosecution.

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(1) R. Hahn.

10. COMPENSATION: Fees; Royalties; Accounting.

11. COMPLIANCE WITH GUILD AGREEMENTS: Compensation, Credit, Exclusions.

12. WARRANTIES OF GRANTOR: Ability to enter into Agreement; Existence of copyright in Berne Union and U.C.C. countries; Publicity and Privacy; Defamation; Non-Existence of Impediments or Claims; Particulars of Reversion of copyright; All Elements of work included in grant.

13. INDEMNITIES: Claims of third parties; Inclusion of all Damages and Costs.

14. GENERAL TERMS AND CONDITIONS: Notice; Assignment; Jurisdiction; Enurement; Independent Contractors; Execution; Waiver; Limitation of Terms of Inconsistency with Collective Agreements, Laws, Statutes, Entire Agreement; Survival of Warranties or other terms; Arbitration; Termination: Expiration, Breach, Bankruptcy.

# CHAPTER V

# HARDWARE AND SOFTWARE INDUSTRIES

## PART 1

## HARDWARE INDUSTRIES

### INTRODUCTION

To date it has been estimated that over $1 billion in private funds have gone into research and development preparatory to the marketing of videodisc products. Of this sum, virtually none has come from Canadian sources or been expended in Canada.

The reason for this is evident. Canada has minimum consumer electronics research and production capability. The production of Electrohome Ltd. of Kitchener, Ontario, the largest Canadian firm in this industry, represents a small fraction of the overall Canadian market.

There is little incentive or need for the three major videodisc groups, RCA, Philips, or Matsushita, to include Canadian based development or to involve Canadian secondary suppliers. Consequently the latter have not developed expertise in the area.

Estimates provided earlier indicate that videodisc technology could have multi-million dollar sales in Canada by mid-decade. Should this be the case, Canadian demand would be met primarily through imports of technology, content and systems software.

The following examines potential Canadian participation in the "hardware" aspect of the videodisc industry which includes the manufacture of players, secondary component suppliers, and discs.

## THE CANADIAN MARKET

A survey of Canadian electronics manufacturers and distributors with respect to videodisc was commissioned by the study group. While an effort was made to be as complete as possible by contacting all the firms likely to have an interest in the topic, it is possible that a situation was overlooked or withheld due to confidentiality.

## THE RADIO CORPORATION OF AMERICA (RCA)

RCA Ltd. has branch offices across Canada with production plants in Don Mills, Ontario (record division); Midland, Ontario (color picture tubes); Prescott, Ontario (televisions); and St. Anne-de-Bellevue (photo detectors).

RCA introduced videodiscs to Canada in mid-1981. According to Daryle Beatty, Vice President of Sales for International Activity, the RCA plant in Indianapolis, Indiana will manufacture all videodisc players and discs for North America. The construction of other disc-mastering and replication plants is not expected in the near future because RCA officials estimate set-up costs of the main plant to be in the vicinity of $20 million, with design and construction taking up to two years.

This apparently is not an indication of a desire by RCA to continue as the sole replicator of its CED style discs. RCA is prepared to license firms to replicate videodiscs compatible with its system. Although it acknowledges that the more software available, the better it will be for RCA, custom pressing and

replication licensing agreements (outside of CBS) are not expected until late 1982 at the earliest with Fox Video and Paramount as the first contenders.

PHILIPS ELECTRONICS LTD.

Philips Electronics Ltd., the wholly owned Canadian subsidiary of N.V. Philips of the Netherlands, intends to market the N.V. Philips optical laser videodisc player in Canada.

Philips Electronics Ltd. has branches across Canada. It has divisions with concerns ranging from consumer products, telecommunications, lighting, scientific and electronic equipment, automotive products, and broadcasting equipment, to medical X-ray equipment. The divisions are located in Scarborough and Strathroy, Ontario and in St. Jerome, Quebec.

Philips Electronics Ltd. will obtain Magnavox players from their American counterpart's plant in Knoxville, Tennessee. DiscoVision Associates will continue to manufacture Magnavox in California for the foreseeable future.

PANASONIC CANADA LTD.

Panasonic Ltd. is already manufacturing and marketing the Matsushita-JVC VHD machine in Japan. Panasonic Canada plans to introduce the VHD videodisc player into Canada in late 1982, depending on the availability of an adequate quantity of suitable software.

Although videodisc players will initially be manufactured in Japan, a joint venture between Matsushita and General Electric

may lead to their manufacture in the U.S. There are no plans to manufacture disc players or discs in Canada. Discs will be produced in Japan, England and the United States.

THOMSON-CSF CANADA LTD.

Thomson-CSF Canada Ltd. is a division of Thomson-CSF in France. They have commercial representatives in Toronto, Ottawa and Montreal.

Thomson-CSF manufactures an industrial videodisc player with a transmissive optical disc. The disc players are manufactured in Paris and exported to Canada. Thomson-CSF Canada Ltd. has no Canadian manufacturing facilities at this time. To date they have sold six videodisc players in Canada; five to Bell Northern Research and one to the Public Archives of Canada. The Ottawa office was unable to provide any indication of future plans for Canada since all planning is done at the head office in Paris.

GTE SYLVANIA CANADA CORP.

GTE Sylvania Canada Corp., recently purchased by N.V. Philips, imports all their consumer products from the U.S. except for their small black and white and color televisions which are imported from Korea. They also expect to import all videodiscs players and discs to be sold in Canada. They have no plans for Canadian manufacture of videodisc players or discs.

HITACHI SALES CORP. CANADA LTD.

Hitachi Sales Corp. Canada Ltd. plans to introduce the RCA style capacitance system in Canada. They have not as yet set a definite date for entry into the Canadian market.

SANYO CANADA LTD.

Sanyo, aligned with the RCA group, will produce the CED disc player for the U.S. market. Sanyo Canada Ltd. is proposing to market the RCA capacitance system in Canada this fall. Fisher Corporation, a subsidiary of Sanyo, will market the optical laser version but their plans for Canada have not been determined.

Sanyo expects to manufacture CED players in Japan and export them to Canada. They have no arrangements to manufacture videodisc players in Canada at this time.

Sanyo, like Hitachi, has no interest in the videodiscs themselves except for their availability. They too will have to rely upon RCA for their supply of discs.

TOSHIBA OF CANADA LTD.

Toshiba, a potential hardware supplier of the Matsushita VHD videodisc players, will produce the RCA CED system in Japan for the Canadian market under its own label.

Toshiba of Canada Ltd. conducted a series of demonstration workshops across Canada to introduce the RCA capacitance player. Their VCR (video/cassette recorder) entered the Canadian market in the fall of 1981.

Toshiba, like Hitachi and Sanyo, are in the hardware business only. They have no interest in the discs other than to ensure that there is an ample supply for their players.

ELECTROHOME LTD.

Electrohome is the only Canadian owned company currently manufacturing consumer electronic products. According to Bob Parker, Electrohome's Product Manager, they have no immediate plans to introduce a videodisc system to the Canadian market, but will probably go with either the VHD or CED by mid-1982.

Electrohome has no plans to manufacture videodisc players now nor in the future. The company is skeptical about the possible success of videodisc technology and point to the current competition in the Canadian home entertainment market from cable and shortly, from pay-TV. They can not justify the set-up costs required to make videodisc players.

SONY OF CANADA LTD.

Sony has decided not to join any of the groups competing in the consumer videodisc market. They already manufacture the Betamax-Video Cassette Recorder and are of the opinion that tape will prevail over disc in the consumer marketplace. However, Sony does have an optical laser industrial model which Ford Motor Company and Ford of Canada dealers will use.

Sony of Canada has pre-mastering facilities in Toronto. Although all mastering and replication is currently done in Japan, Sony may build a mastering and replication unit in Palo Alto, California, where it currently has research facilities.

## CANADIAN MANUFACTURING AND PARTICIPATION IN THE VIDEODISC INDUSTRY

Early inquiries indicated there was very little interest in videodisc technology among Canadian manufacturers other than those involved in the consumer electronic industry as noted above. This view was borne out through discussions with senior representatives of manufacturers of both consumer and commercial electronic equipment.

The survey did identify Canadian manufacturer working on an aspect of videodisc technology. Matrox Electronic Systems Ltd. is developing a control sub-system for a data storage videodisc application on behalf of unnamed U.S. principal.

Several electronic and data system firms reported they looked at videodisc but concluded that it was too late to become involved with an industry leader, and that the technology is too well advanced to start up independent activity in Canada. Canadian manufacturers feel that there are other areas of business pursuit which are more appropriate to them and more profitable.

For specific scenarios involving small, medium and large investments, see Part III of this Chapter.

## FEASIBILITY OF VIDEODISC REPLICATION IN CANADA

Record companies surveyed included both large companies such as Quality Records and CINRAM, and smaller companies such as Golden Records. With one exception, none of those interviewed has a current involvement with videodisc. The exception is CINRAM which, according to its president, is "the only firm presently capable of pressing videodiscs in Canada." They are not, however, currently involved in the production of videodiscs.

All of the record companies expressed interest in videodiscs but most lacked the resources to enter into videodisc manufacturing.

The estimated costs of constructing a manufacturing plant and facility for videodisc replication vary from as low as $5 million for CED discs through $15-$30 million to replicate optical laser discs.

DISKODAR Inc. has stated an intention to build a plant in association with AFEM Productions Ltd. in Montreal.

They have a non-exclusive licence from N.V. Philips in Holland to pre-master, master, and eventually press videodiscs.

# PART II

# SOFTWARE INDUSTRIES

## INTRODUCTION

Applications of the videodisc technology in the digital optical recording configuration have a significant potential market for the mass storage of information, both as a read-only and as a read-write medium. Forecast as a significant aspect of the office of the future, these applications should be a serious competitor to present technologies such as microfiche, magnetic tape, and high-capacity magnetic-disc drives. High-density and/or high-resolution storage of the data on the disc itself is only a part, but an essential part, of the videodisc system. Many other components are involved, including optical recognition scanners, computer interfaces, monitors and terminals, "juke boxes" to hold the discs, and even hard-copy printout terminals. All of this has to be organized and controlled by packages of sophisticated software.

## THE CANADIAN SCENE

To gain some idea of how Canadian industry and research stands in relation to the software and information storage/retrieval applications of videodisc, a small survey was conducted. This included both research into either videodisc for hardware or software modifications and development in specific applications or new uses.

## RESEARCH AND DEVELOPMENT

### Ontario Institute for Studies in Education (OISE)

The Ontario government is funding a research project at the Ontario Institute for Studies in Education under the direction of Dr. William Oliver. This unit has been given a $1.25 million grant to find a cost-effective method for the production of interactive videodisc materials. OISE has produced several hundred hours of instructional material for industrial and manpower training and for continuing education. They are also working on a text book for the production of instructional video.

The system involves a consumer model LV player, a unique microprocessor, some applications of Telidon, and the software.

### National Research Council (NRC)

The National Research Council has developed an authoring language for Computer Aided Instruction (CAI) called Natal-74 (National Authoring Language). In a small demonstration project designed to illustrate possible videodisc uses, the NRC

linked an optical laser videodisc player to a PDP-10 computer controlled by Natal-74. This allowed them to use the disc system in place of a carousel slide projector. The results showed easier identification, and superior access and storage of material than with the projector/carousel system.

University of Toronto

The Computer Graphics Group of University of Toronto is planning to work with interactive videodiscs. This research will utilize experience gained in earlier experiments which used tape.

Microdesign Ltd.

Microdesign Ltd. is a software company that designs programming methods for microcomputers. It has been exploring speech compression in digital form for possible use with discs.

Microdesign was also involved in a later stage of a project conducted by Zapsystems of Toronto (see below) to solve some of the engineering problems encountered in connecting a computer and a videodisc system.

Microdesign intends to submit a proposal for providing design avionic maintenance manuals on videodisc.

Zapsystems Ltd. (Toronto)

Zapsystems is a "travel systems" company which offers computer assistance to travel agencies. It was recently involved in a joint project with American Express. ZAP hooked up a computer to a videodisc player to create consumer demonstrations for travel agencies. The player used was an optical laser system with computer-assisted random access memory.

GEM Research (Victoria)

GEM Research is primarily involved in educational software. Their research with videodiscs is centered on linking Apple microcomputers with DiscoVision videodisc players. GEM is concerned with the software problem of using "an intelligent interactive branching system" to create programming which could be used for industrial training and educational instruction.

APPLICATIONS

Several Federal Government agencies and departments have shown interest in videodisc applications: the Public Archives, the National Library, Museums, National Defense, and the Departments of Consumer and Corporate Affairs and Employment and Immigration, (see Chapter V - "Federal Government Involvement in Videodisc Technology.")

As well, a few private companies have considered or are involved in commercial applications. Cable Systems Engineering, a division of Rogers Cablesystems Incorporated, has investigated possible applications as a tie-in to their cable services. Applications such as picture storage of catalogue pages and the capture of broadcast images by frames on videodiscs were of interest although, for Cable Systems, it was essential that the videodisc system be capable of recording current material. capability, however, does not exist, and therefore Cable Systems is no longer investigating videodisc applications.

Goodwood Data Systems Ltd., a firm which develops and manufactures airport information processing systems, is also interested in commercial application for videodiscs.

Goodwood has begun a preliminary study to consider incorporating videodisc into computer-aided learning systems to replace alternative sources of electronically generated images such as tape.

Bell Northern Research is experimenting with a number of Thomson-CSF players as sources for switched video in fibre optic telecommunication systems. In such a system, the home terminal would request programming from a central exchange. To permit greater flexibility in consumer demand for tune-in at the beginning of a program, the Communications Research Centre is looking into the possibility of videodisc playback using multiple scanning lasers on each playback machine.

# PART III

# CONCLUSIONS

## CHAPTER CONCLUSIONS

The potential size of the domestic videodisc market, the multinational domination of export markets and the entry costs for disc replication are inhibiting factors to the development of a Canadian videodisc manufacturing sector. None of the multinationals engaged in videodisc technology for consumer or other applications plan to design or manufacture any of their hardware or software requirements in Canada.

The RCA group, which will market its CED consumer player in the Canadian market, will consist of RCA Canada Ltd., Hitachi Sales Corp., Sanyo, and Toshiba of Canada Ltd. and possibly Electrohome Ltd. The Philips group will consist of Philips Electronics Ltd., and probably GTE Sylvania Canada Corp. in the consumer market and Sony in the industrial market. Panasonic and possibly Electrohome will market Matsushita's VHD system. (Electrohome has yet to decide between the CED and the VHD system.)

Thomson-CSF Canada Ltd., is already selling their optical laser transmissive disc system for industrial training use in Canada through their own sales force.

As might be anticipated, none of the three above groups which manufacture consumer players has indicated an intention to produce or assemble disc players in Canada. Panasonic, Hitachi, Toshiba and Sanyo will manufacture their CED disc players in Japan; RCA will do so in the United States; Philips and Pioneer will manufacture their LV players in the United States, Europe and Japan. The VHD Group centered in Matsushita will manufacture its player in Japan and possibly Europe. It appears that all videodisc players sold in Canada will be imported.

The same situation applies to the discs produced or marketed by these consumer electronic companies. However, at least two Canadian firms, DISKODAR Inc. and CINRAM Ltd. have expressed interest in videodisc replication.

Current Canadian research and development in videodisc applications is primarily directed toward the improvement of programming for interactive videodiscs. It is expected that as the feasibility and efficiency of the optical digital disc becomes more certain, government and business attention will turn to industrial applications of the technology.

# CHAPTER VI

# CULTURAL CONCERNS, EDUCATION AND TRAINING

## PART ONE

## CULTURAL CONCERNS

### INTRODUCTION

The culturally-based industries taken as a whole are big business in Canada and are deemed vital to a sense of national cultural expression.

Many of the issues are, however, the same as for more conventional industries: providing jobs for the skilled and semi-skilled; ensuring opportunities for our intellectual and creative talent; and maintaining an industrial base adequate for the needs of a modern, developed nation in a world becoming vastly more sophisticated in its technology and trade. All of these factors apply, of course, within the context of a huge geographical area and a relatively small population and domestic market.

On March 31, 1979, Prime Minister Trudeau stated at the Juno Awards:

> The cultural activities are the ones in which Canadians engage themselves the most . . . The cultural industries are bigger than steel in Canada, they're bigger than pulp and paper. Some six billion dollars a year. It's a big industry. And we have to remember that -- we the audience, we the outsiders, we the government, we the onlookers -- that if an artist creates and performs for himself or herself, he's also up against industrial competition in Hollywood, in Europe and other parts of the world. And that's why its not any more possible for any country to be without a cultural policy than it is to be without an industrial policy.

This concern is not new. In the fall of 1980, the Minister of Communications Francis Fox, addressing the International Institute of Communications stated:

> Even in the days when the chief vehicle for cultural invasion was the motion picture screen, the flow of traffic was overwhelmingly one way. Proliferation of satellite channels, coaxial cable systems, video cassettes and discs, as well as other broadcast technology, could easily turn that flow into a tidal wave sweeping everything before it, including traditional values and the treasury of national, regional and local expressions.

Thus, these seem to be the basic considerations:

- the strength of our cultural industries is vital to the nation's well being;

- the advent and success of the new delivery systems, video cassette recorders and videodisc players, could represent more competition, and hopefully new opportunities for growth.

## BROADCASTING/PERFORMANCE INDUSTRIES

### GENERAL AND INTERNATIONAL CONSIDERATIONS

Home video will have a significant impact on the broadcasting and telecommunications industries. There will be intensified competition for the consumer's time and disposable income.

First of all, it appears that there is a shift in consumer spending habits and in the use of leisure time. The often-mentioned North American "baby boom" is in the process of the "nest-building" cycle. This group is a large population bulge advancing through the age group statistics but is, however, somewhat divisible in terms of income. The leading edge of the group is relatively affluent and this is where the audio/videophile is found.

Social characteristics such as "keeping up with the Joneses", have not changed all that much. "Most consumer durables are sold to people actively emulating the social behavior of those in a more elevated economic stratum. Leisure expenditures are a way of improving one's lifestyle," according to an article in the Wertheim Industry Comment, January 2, 1981.[1] The article goes on to say:

> The dominant durable in the postwar period has been the automobile, the single product most identified with prestige for the American family. When one considers the amount typically spent on an automobile above the minimum level required for transportation, one begins to appreciate the extent to which Americans will spend money for comfort, enjoyment and prestige.
>
> It is our view that the next principal area for prestige expenditures is the Home Video center or, as we prefer to call it, the home screening room. Over the next 20 years, we

> expect to see an important percentage of family rooms, recreation rooms and living rooms converted or divided into viewing areas, complete with video cassette recorders, videodisc players, pay/cable hookups, video programmable games and projection or large screen television sets.
>
> To put the entire package together using the most expensive equipment in each category would cost under $7,000 (U.S.). A Chevrolet Citation costs more.

This quotation is typical of a number of industry analyses which then recommend variously MCA, RCA, Columbia Pictures, Warner Communications, etc. as wise investments. However, it is not conjecture that color TV set sales have never been so great and that VCRs are in such great demand that dealer mark-ups have firmed in spite of steadily rising manufacturing capacity. (Just before the Royal Wedding, Thorn in the U.K. had four jets in the air at a time, air-freighting VCRs from JVC in Japan.)

In attempting to project the rise in VCR and VDP sales, a number of analysts believe that there is an analogy to color TV. Other analysts hold that the growth will not be as explosive. What the latter critics may have missed is that color TV sets were first available in the U.S. in 1954. Sales were almost negligible until about 1961 when full color-programming schedules were broadcast. The analogy to color TV may hold, and the same kind of sales explosion may happen when the videodisc player is supported by a full line of cheaply rented programs available before pay-TV programs.

The above referenced Wertheim report indicated that a comparison of VCR/VDP sales growth with color TV set sales showed a much quicker consumer acceptance, and in the case of VCRs, a

pattern of almost explosive growth not reached by color TV until about the eighth year. A cautionary question remains: Is it a phenomena like CB radio that suddenly tops out? There is no indication of this so far.

The whole area of home entertainment, until now, has been growth. However, the cross-relationships are not so clear. There have been a number of recent statements forecasting the doom of conventional broadcasting as the home viewer begins to take control of programming choice. Most of these are discounted primarily with the suggestion that the networks do have the resources to fight back. There does seem, however, to be some drop in total prime time viewing of conventional TV (the U.S. networks are reported to have lost 3.6 share points in 1980) and evidence of some audience fragmentation toward VCR and cable or pay-TV homes.

A study undertaken by Media Science Newsletter divided homes into three categories:[2]

° Non new electronic media homes -- those homes equipped only with a conventional TV set restricted to off-air reception.

° Basic new electronic media homes -- those homes with one or more of the following: basic cable, STV, MDS, DBS, video games.

° Advanced new electronic media homes -- those homes with one or more of the following: pay/cable, VCR, VDP, 2-way cable, picture phone, videotex, home computer, movies on demand, keyword video.

The projected TV market segmentation for 1980-1990 is as follows:

| | Percentage of U.S. TV Homes | | |
|---|---|---|---|
| | Advanced New Electronic Media | Basic New Electronic Media | Non-New Electronic Media |
| 1980 | 13.6 | 19.2 | 67.2 |
| 1990 | 61.1 | 21.4 | 17.5 |

The switch in relative position between "non-new electronic media homes" and "advanced new electronic media homes" from 1980 to 1990 is almost a complete inversion of today's situation.

An analysis of the changing patterns of TV set prime time use in the three types of homes as their relative numbers change according to the preceding table, produces the following table.

TABLE 20

PROJECTED PRIME TIME AUDIENCE SHARES
1990 VS. 1980
IN TOTAL U.S. TV HOMES

| | 1980 | 1990 |
|---|---|---|
| VCR/VDP/Videotext Home Computers | .5 | 13.5 |
| Pay/cable | 1.7 | 11.6 |
| STV/MES/DBS/Videogames | 1.0 | 4.1 |
| Basic Cable | 1.1 | 5.3 |
| PBS | 3.3 | 2.4 |
| Other Commercial TV | 11.6 | 14.8 |
| 3 Networks | 86.5 | 60.4 |

Source: Media Science Newsletter.[3]

These columns are not percentages and do not add up to 100, but they do indicate a large shift in shares of prime time audience away from the three networks and to a lesser extent a shift from conventional television generally.

RCA, which owns NBC, "cable," satellites, record divisions, etc., comes to similar but more conservative conclusions. It notes in its "Video 90" study that in 1979 in the U.S. out of the 45.4 hours of average weekly TV viewing, almost 97 per cent came from network and independent TV stations. By 1990 over 13 per cent of viewing will be spent with other sources.[4] These are U.S. projections, but doubtless have some relevance for Canada.

TABLE 21
COMPETITION FOR THE TV VIEWING AUDIENCE

| | 1979 Average Weekly Viewing 45.5 Hours | | 1990 Average Weekly Viewing 48.1 Hours | |
|---|---|---|---|---|
| | Hours | percentage | Hours | percentage |
| Network Stations | 39 | 85.8 | 35 | 78.8 |
| Independent Stations | 5 | 11.0 | 6.4 | 13.0 |
| All Others* | 1.4 | 3.2 | 6.7 | 13.2 |

*Note: The "all other" category may appear to be understated since the newer video products will not have the same high penetration as TV sets. Penetration in homes of all other by 1990 is estimated at: Pay/Cable - 35%, STV - 7.7%, DBS - 5%, VCR - 17%, VDP - 28%, Home Computers - 13%, Video Games - 20%, Teletext and Viewdata - 33% (amended to 8% with failure of FCC to mandate circuitry in TV sets).

Source: "Video 90," RCA Study, 1981.

The projected decline in viewing of conventional television has already produced considerable speculation in the advertising

industry on how to adjust for these changes and how best to reach consumers. Various mechanisms for introducing advertising content into cable and pay/cable have been discussed. There is also much speculation on advertiser supported home video. This may have a beneficial effect on publishing. Conventional broadcasting however, will suffer if commercial revenue is redirected into video magazines on disc or cassette and/or if discs and cassettes, such as those with "do it yourself" content, are subsidized for target audiences by the inclusion of commercial messages. Given a good penetration of players and a reduction in costs of replication, such a scenario has possibilities. The basic consideration for conventional television will be whether the demand for broadcast advertising time grows sufficiently to offset home video-induced fragmentation.

The impact of home video on pay-TV is again a matter of conjecture. From the consumer's point of view, feature films are probably cheaper via pay-TV and therefore, why buy or rent players and discs and/or cassettes? Then again, why subscribe to pay-TV when most movies eventually become available on conventional TV? The answer seems to lie in the immediacy of availability, the personal convenience of "on demand" viewing, and, as in pay-TV, the uninterrupted and unedited programs. It appears certain that feature films for home video will be released before release for pay-TV, giving home video a strengthened competitive position. In a decade, however, a large proportion of the population may utilize both home video and pay-TV.

Such concepts as the "wired nation" will probably weaken under the impact of these developments on the home entertainment industry. Analysis of the costs of a switched two-way broadband network usually assumes that all the cable services present or future, plus a number of others, such as high quality picture-phone and the accessing of huge video libraries, will be available in a single "wire" -- the optic fibre.

The reality, however, may be that a large share of the cost of a switched, two-way broadband network could only be supported by consumer purchase of the entertainment services which are now or will be served by pay-TV and home video. The Hollywood majors and other distributors will try to obstruct delivery of their product by the common broadcast carriers and thus permit the new technology carriers to become the profit centers. This in part may be an important reason for Hollywood's support of home video.

CANADIAN BROADCASTING CONSIDERATIONS

Ninety-eight percent of the Canadian population has television service. It is not suprising that Canadians watch 23 1/2 hours of television a week. Over 50 per cent of the homes in Canada subscribe to cable; 70 per cent have it available. As of writing, pay-TV licence hearings are underway and home video pre-recorded content has begun to penetrate the Canadian market.

Pay-TV subscribership in Canada may not move as swiftly as it has in the U.S. Because Canadians already have greater choice in numbers of channels, pay-TV here is a re-selling job rather

than a marketing tool for initial cable purchase as it is in the newer U.S. systems.

Home video, for reasons enumerated before, will also have slower growth in Canada because Canada does not have large segments of population with limited viewing choice. Eventually, however, overall home video penetration will be similar to that of the U.S.

Canadian public and private broadcasting have the skills and facilities to mount home video production either from broadcast material or from content made especially for discs or cassettes. The CBC has produced many specialty programs in both languages which may have a new market in disc and cassette form. More important, CBC has the experience to produce more of this kind of material to meet new consumer video demands, and could become a major producer of home video content.

The private sector has excellent program production facilities and marketing skills. Together with in-house and independent producers, they may be able to exploit the international and domestic markets for home video and pay-TV.

New delivery systems are making other sources of income available to producers, but the content must have a wide international appeal. If the efforts mounted do not have world class production values, they may not be viable in either the domestic or international market.

A Canadian marketing strategy will therefore need to pool the combined resources of the performing arts, the independent producers, the broadcasting system (including cable) and the

private and educational broadcasters, in order to make substantial quantities of programming which is Canadian in character and world exportable in quality.

## THE PERFORMANCE INDUSTRIES

The 1978 survey of leisure time activities showed an increase in the rate of public participation in the performing arts that was more than five times the rate that could have been predicted from demographic data. Younger age groups and more formally educated groups made up the largest segments of the audience. Notwithstanding this remarkable growth rate in audiences, Table 22 indicates that subsidies from all levels of government and private donations provided 43 per cent to 57 per cent of income for the performing arts.

TABLE 22

THE PERFORMING ARTS, 1978

| | Dance | Music | Opera | Theatre |
|---|---|---|---|---|
| No. of Companies | 21 | 34 | 6 | 92 |
| Average Season (weeks) | 42 | 38 | 18 | 35 |
| No. of Performances | 1,759 | 1,935 | 361 | 16,111 |
| Avg. Cost/Performance | $7,800 | $10,300 | $20,300 | $2,400 |
| Audience | 1 mil+ | 1.5 mil+ | 425,000 | 4.3 mil+ |
| Avg. Cost/Audience | $12.13 | $13.34 | $17.20 | $8.84 |
| Total Income | $12 mil | $19.7 mil | $6.9 mil | $34.2 mil |
| Federal % | 30 | 20 | 17 | 20 |
| Provincial % | 11 | 15 | 10 | 16 |
| Municipal % | 5 | 5 | 5 | 5 |
| Private % | 11 | 75 | 15 | 9 |
| Earned % | 43 | 44 | 52 | 50 |
| Total Expense | $12.4 mil | $20.4 mil | $7.4 mil | $35.1 mil |
| Deficit | $.4 mil | $.7 mil | $.5 mil | $.9 mil |
| Deficit %/Income | 3.3 | 3.6 | 7.2 | 2.7 |

Source: Statistics Canada. Survey of the Performing Arts, Ottawa, 1978.

The year 1978 marked large gains over 1977 in the number of performances and size of audience; however, while the four arts cited had a surplus in 1977, Table 22 shows deficits for 1978.

By 1980 grants had leveled and costs had risen due to inflation. Most companies were placed in a serious financial position and the financial situation is still difficult.

Still, many of the companies have great achievements to their name and according, The Stratford Festival, Shaw Festival, the Royal Winnipeg Ballet, Les Grands Ballets Canadiens and the National Ballet deserve their international reputation for excellence. Their works and repertoire have substantial potential for the electronic market either as studio adaptations or in the "live from . . ." treatment.

Activities along this line are already taking place outside Canada. Covent Garden in London (Royal Opera House, Royal Ballet) has completed arrangements whereby works are electronically produced by the BBC in exchange for one domestic telecast. The master recording belongs to the theatre and is available for distribution in other media. Pioneer Artists (LaserVision) is reported to have secured exclusive rights in videodisc to Covent Garden properties. The West End Producers Association in London, England is also reported to be negotiating the rights for secondary release for theatre properties.

In examining the question of the new video markets as revenue sources for the performing arts, the National Economic Research Associates of Washington, DC have produced estimates of the potential VDR/VDP revenues. Using the Argus Research Corporation projection outlined in Theodore W. Anderson's article, "The Emerging Video Disc Market". NERA states that if those projections are accurate, 1990 annual sales of cassettes and discs in the U.S. could reach $207 million and $848 million, respectively. When projected to cultural programming it follows:

> We would, of course, expect some portion of cassette and disc purchases to be of cultural programs. If the video disc and video cassette markets resemble the phonograph record market, then cultural program purchase patterns are likely to resemble those of classical and dramatic musical (e.g., opera or Broadway musicals) records. According to sources at CBS Records, approximately 4 percent of total sales in the United States are of classical or dramatic musicals. If the video market resembles this market, then we would expect cultural programs to account for about 4 percent of total annual sales of video cassettes and video discs. Assuming a 15 percent share of royalties, performing arts companies' earnings from this aftermarket could reach $2.8 million by 1985 and $14.6 million by 1990.

> The video disc and video cassette markets are, in a very real sense, likely to be by-products of the original programming market. That is, cassettes and discs offered for sale will be reproductions of programs developed initially for showing on cable. Indeed, both ABC and CBS are anticipating sales in these video aftermarkets sufficient to finance some of their production costs, and, in the case of ABC, to move the network's operations [cultural cable channels] from the red into the black.[5]

While this trend is regarded with some enthusiasm by the major performing arts companies in Canada, they see certain problems. The extension of the market to pay-TV and home video can strengthen the top companies by providing additional revenue and more awareness in the general public. It can, however, lead to much more centralization and focus on fewer international companies -- those capable of mounting the "definitive" work and engaging the super stars. For example, the competition for our National Ballet is that the Royal Ballet could market a "Sleeping Beauty" on Canadian pay-TV as well as on cassettes/discs worldwide. The question is not quality but quantity: how many versions of "Sleeping Beauty" are required?

Home video may make it possible to electronically distribute limited-appeal content in an economically viable way. Domestically, it becomes available to a larger segment of the population, and it could be accessible in all libraries and schools. However, for practical purposes the integration of our national performing arts into our electronic programming industries has been limited to those productions undertaken by the CBC.

## THE FILM INDUSTRY

### GENERAL AND INTERNATIONAL FILM CONSIDERATIONS

While the analysis of videodisc technology is central to this study, it is necessary to examine the impact of both video-cassette and videodisc (home video) on the consumer market. They both involve the dissemination of pre-recorded content direct to the consumer in addition to the established services: off-air broadcasting, cable-TV, theatres and soon pay-TV.

The chapter on corporate analysis reported that several consortia of multinational companies are pursuing this market vigorously. The growth of VCRs in the United States, Europe and in Japan demonstrates significant consumer acceptance of the product as a recording device and as a playback device of pre-recorded material. Home video may grow in the United States so that by 1985 10 per cent of homes will have either a VCR or VDP and by 1990 the figure may be nearly 30 per cent. In Western European countries the equivalent forecasts are from 10 - 20 per cent in 1990. The growth in Canada, it is reasonable to assume, will be in the same order as that of the U.S. -- or perhaps a little less because prices may remain relatively higher.

Movies constitute the bulk of pre-recorded cassette viewing. The initial foray of videodisc into the marketplace has not been overwhelming but it is still too early to forecast accurately its eventual impact. Nevertheless, home video is here and it will grow.

Despite the good 1981 summer, box office receipts in the U.S. are declining; Hollywood (a term more generic than

geographical) must enlarge its customer base. Two avenues are open: pay-TV and home video.

Home Box Office (Time-Life Inc.) dominates pay-TV in the U.S. with 60-70 per cent of all pay-TV homes. Thus the pay-TV distribution process is not under the control of the Hollywood majors. Attempts to dislodge Home Box Office control have been futile so far and an attempt to circumvent it through initiating a new satellite delivery service failed in the courts on anti-trust grounds. The alternative of home video remains available.

Hollywood distributors market their films in accordance with the principal of maximum payment per viewing. Cinemas receive a feature first because the distributor's return is about 65 per cent of box office admission. Until recently, pay-TV was next in line but the subscriber-generated return per individual dropped significantly. Hollywood gets about 35 per cent of the pay-TV gross. Thereafter conventional broadcasting purchases the feature, first for networks and then for syndication.

Recently, However, home video has begun to receive and distribute films at the same time or before pay-TV. The reasons for adopting this approach are as follows:

- The distribution profit centre in pay-TV is in other hands (as it is in broadcasting).
- The total cost to the consumer in the home may average out to the cost of going to cinemas, which for many reasons (admission and other expenses, domestic responsibilities, transportation time and cost, fear of night-time crime (in the U.S.)) are finding it harder to attract moviegoers.
- The immense initial promotional investment directed toward theatrical viewing has little residual value in

pay-TV, except for the pay-TV packager/distributor, but could be immediately beneficial to secondary sale in home video.

- The economics of pay-TV require a menu of offerings in which the subscription price cannot be directly related to an individual film other than in some range of negotiated price, an approach the film industry does not favor.

- The entire menu or monthly package of films draws about 35 per cent of the pay-TV gross, about $.50 per subcriber.

- The ability to increase pay-TV returns is limited without an alternate avenue of release; home video may return $1.00 or more per feature.

- Home video is a delivery approach that is better than theatrical release or broadcasting in terms of freedom from censorship, from content requirements or restrictions. Moreover, it bypasses delivery channel monopolies or oligopolies such as cable, broadcasting and telephone companies or post, telegraph and telephone companies.

The advent of home video points to a slow shift in the hierarchy of the revenue sources, or "windows" of release. All forms of delivery remain parts of a mix in the funding and profitability of product.

Home video may increase the need for more products and perhaps a differentiated product for audiences whose numbers would not justify the costs of feature film or conventional broadcasting programs. On one hand, because of increased demand, content producers may be in a stronger position to fill all the theaters, channels, tapes, discs, and so on. On the other hand, however, the expense of promotion, mass marketing and distribution of product may tend to limit numbers of significant releases. In the motion picture industry, a dozen or so pictures a year make large profits; the remainder do indifferently, or even lose money, but they keep the theaters open. Eventually the

latter may break even or obtain a return through TV and third-world theaters. Home video, however, may herald a new, important source of revenue for good pictures that, for one reason or another, are not top-grossing films.

Videodisc also permits a new kind of interactive entertainment film, which probably would not work well in theaters or in conventional off-air broadcasting. Joint-venture companies working in the LV format (Optical Programming Associates, Pioneer Artists and MCA-Thorn EMI Program International) are trying to develop programs with interactive features. Some examples could be dramas with multiple endings (your choice of "Who Shot J.R.?" or "Agatha Christie" redone).

Work is underway to develop a new high definition TV standard for "film" production and possibly dissemination. It is conceivable that videodiscs using this better format for television picture quality, coupled with a compatible wide-screen TV set, could increase the competitive edge of home video over broadcast or cable for the delivery of feature films.

Some distributors may think in terms of video clubs (like record or book-of-the-month clubs) where the selection is made by the organizers with some choice for the subscriber. Somewhat similar is the "brand name" approach. Rather than promoting the individual titles, the consumer identifies a particular label with a particular type of product. Perhaps in these approaches there lies an industrial strategy.

## CANADIAN FILM CONSIDERATIONS

The Canadian feature film industry grew dramatically in recent years with the help of the Canadian Film Development

Corporation (CFDC), co-production agreements and the Capital Cost Allowance (see Chapter III).

Canada has demonstrated it has the talent, technicians, and resources to produce world-class motion pictures. But to be viable, this product must have both an international and Canadian market. Canadian pay-TV may provide additional important stimulation and revenues. In the case of home video, this market will develop in the U.S. and spread northward into Canada, Hollywood's second largest market. Hence, the Canadian motion picture industry will face the same problems of access to distribution that Hollywood experiences. The provision of mastering and replication of videodiscs in Canada will have little cultural significance if the content is all or primarily foreign.

The basic question is whether the Canadian film industry can profit from the domestic and international home video market. Such participation could be an important new source of income. In recent film negotiations in Europe, home video rights have averaged 10-15 per cent of the revenue in producer's distribution agreements.[6] Ensuring continued Canadian film's growth into the mainstream of home video distribution remains a problem.

Over the years, the National Film Board (NFB) produced innovative and outstanding films of all kinds. Its reputation for documentary films is second to none. The NFB library contains much that has potential in a specialized home video market internationally and more that should be readily available in Canada as disc and tape players penetrate homes, schools and pulic libraries. Moreover, now and in the future, the NFB may be in an excellent position to supply profitably and the demands for content needed for back-up sales of players.

## THE PUBLISHING INDUSTRY

To date, the impact of videodisc or video cassette on printing and publishing in the consumer market has been slight. An initial development is the videomagazine. The content of the few examples which have been produced has been along the lines of Playboy/Penthouse.

Sears has recently experimented with its catalogue on videodisc, complete with Cheryl Tiegs modelling sportswear.

However, the publishing industry -- or at least its major multi-nationals -- are investigating and experimenting with the various capabilities of videodiscs and video cassettes. This is also true of their interest in digital data storage and retrieval systems. As part of the so-called "electronic revolution" or "information society", publishers are moving rapidly to acquire technological and production skills. Some of them have acquired audiovisual production houses in the last few years.

Indicative of the extent of electronic publishing in the U.S. is the following table:

TABLE 23
LEADING EDUCATIONAL PUBLISHERS'
INVOLVEMENT IN ELECTRONIC PUBLISHING

| Rank Based on 1980s Revenues | Publisher | Educational Revenues (in millions) 1980 | 1979 |
|---|---|---|---|
| 1 | Scott, Foresman*** - microcomputer software agreement with Texas Instruments; South-Western agreements with Radio Shack and Apple | $230*** | $221 |
| 2 | Harcourt Brace Jovanovich | 194** | 187** |

TABLE 23 (Continued)

| Rank Based on 1980s Revenues | Publisher | Educational Revenues (in millions) 1980 | 1979 |
|---|---|---|---|
| 3 | McGraw-Hill<br>- various types of courseware, including microcomputer software and telecourses; films of video tape, manuals for computer training | 188 | 182 |
| 4 | Houghton Mifflin<br>- TimeShare Corp. computer software, used to enhance text materials - National marketing began in 1980. | 145 | 142 |
| 5 | CBS Educational Publishing<br>- Prototype programs, continuous monitoring of activities relating to microcomputers in education for classroom management and instruction | 135 | 130 |
| 6 | Prentice-Hall<br>- acquired Deltak, Inc., which has over 2000 video-based training courses in 1979 | 146 | 127 |
| 7a | Scholastic<br>- Scholastic Productions unit formed to seek non-print publishing opportunities for print product - disc projects in works. | 110 | 100 |

TABLE 23 (Continued)

| Rank Based on 1980s Revenues | Publisher | Educational Revenues (in millions) 1980 | 1979 |
|---|---|---|---|
| 7b | Macmillan<br>Macmillan Electronic Media is developing markets in cable and commercial TV and exploring opportunities for creating and marketing educational and reference materials in electronic formats. | 110 | 105 |
| 8 | Xerox (Ginn & Co.<br>Xerox Educ. Pub.) | 90 | 90 |
| 9 | Addison-Wesley<br>Commitments for elementary, high school and college computer courseware; first school materials: mathematics | 76 | 65 |
| 10 | Wiley* | 60-65*** | 55 |
| 11 | Harper & Row*<br>INDAX data base | 60*** | 64 |
| 12 | SRA<br>Instructional materials that can be used with commercially available personal computers | 55 | 55 |

* Fiscal year ends April 30.
** Includes general books.
***Estimate. Breakdowns of fiscal year 1981 sales not available when this table was being completed.

Source: Supplementary Material to Seminar: The Print Publisher in the Electronic World, New York, July, 1981.

The publishing industry recognizes that its role as information provider is quite compatible with the new electronic technologies. For example, on the local level the newspaper is well

situated as the local data base provider for theater and restaurant guides, yellow pages listings, little league and high school scores, local news, real estate listings, and so on. The reporting staff exists. It already enters the editorial and advertising copy into word processors (data storage) which can be easily indexed and made accessible. This suggests that the new technologies, rather than put the newspaper out of business, may extend its reach, services, and profit opportunities. The same analogy can be drawn in almost any area of publishing. It depends on moving with the technology and the consumer's needs. The field trial experiments are now numberless.

Universities and various industries are testing the application of the videodisc, particularly with a computer interface, to educational and training materials and there are many indications of major publishers following these activities and developing their own. Both ABC/NEA (National Education Association) and SRA (IBM) are doing significant work in producing videodisc educational courseware. Control Data is experimenting with interfacing its mainframe computer-based PLATO learning system with videodisc storage. It appears, therefore, that the publishing industry has assessed these learning system approaches to educational material but will not pursue them until the market for players warrants the investment.

Major textbook companies, such as McGraw-Hill and Macmillan, are working on video publishing more in terms of programs rather than learning systems. Both the Encyclopedia

Britannica and the World Book Encyclopedia are developing videodisc adjuncts to their volumes.

Possibly the best illustration of the potential use of video technology by a large publisher is Time-Life Inc. It has diversified extensively into video through its ownership of Time-Life Films, Time-Life Television, Time-Life Multimedia, Home Box Office and various cable and TV holdings. Time-Life Films has distributed BBC programs such as "The Pallisers" and "Anna Karenina." They have also co-produced and distributed the complete works of Shakespeare. Time-Life Multimedia distributes films and cassettes to the educational market which again includes much BBC material such as the "Ascent of Man" and the Sir Kenneth Clark series "Civilization." Probably no other huge publishing company is as well poised to undertake the mass market distribution of videodiscs and video cassettes with programs of an educational, informational, or cultural nature. In the various series of Time-Life books there is a wealth of illustrated material easily convertible for videodisc.

Many publishers, through their expertise in gathering and handling knowledge, their capacity to store and edit this information, and their developed channels for reaching the consumer, are as capable of entering the home video market as most broadcasters and film producers.

In the educational field, Ontario has enacted guidelines for textbook content which may set a kind of precedent for audio visual (A/V) material. Its Ministry of Education, in conjunction with the Ontario Institute for Studies in Education (OISE), is

developing a videodisc learning system that includes the accessory hardware to produce an interactive A/V teaching aid. The educational sector is becoming aware of videodisc developments.

At one time, Torstar, together with Neilsen-Ferns Productions, was examining the possibility of transfering of books to video. In particular, they were interested in the video possibilities of the Harlequin Enterprises properties. This idea illustrates a video production specifically made for home video or broadcast or both. Thus a subscription for "Romance of the Month" would in effect be for a monthly video paperback.

When the mass consumer market is well penetrated by home video devices, the schools will probably follow. This development could provide a larger market for A/V materials and curricular content and an opportunity for expansion in Canadian publishing.

Of vital concern is the possibility that large importation of foreign educational content could develop due to economies of scale. Canadian children now spend about two-thirds as much time watching U.S. programs as they spend in school. It may be appropriate for educational authorities to develop agreements on standards of equipment and the development of content. In this way, although the hardware may remain foreign, the program content could be predominately Canadian in character.

## THE RECORD INDUSTRY

As noted earlier, video music has been slow to develop in North America and appears more advanced in Europe. The ABC made-for-cassette/disc "Physical" with Ollivia Newton-John is the first example of music Home Video providing the original distribution followed by a network TV secondary exposure of a "cleaned-up" version. The transition of the audio record production industry to A/V records would seem to be very advantageous to the industry and an early priority due to its level growth in the past two years. However, there are four problems hampering development.

First, the cost of a video music production is probably at least twice that of an audio production in a recording studio. Second, there are few ways to recover the additional cost of video such as film/TV release when player populations are low and product is perishable over time. Third, the demographics of existing VCR and VDP owners are significantly different from the youth audience for most popular music. Finally, serious copyright problems have yet to be resolved.

This is not to say the picture may not change dramatically. As player penetration grows and the copyright problems resolved, video music may present the record industry with a new price structure for a greater perceived value.

Canada does have a considerable resource in popular musicians and performers. Many are of first rank international stature. Canada also has excellent recording facilities.

Musical video is only in the developmental stage and may provide a new opportunity for the Canadian recording industry.

The number of video "records" is increasing as interest in the media grows. World class record groups have in the past used video as a promotional medium for "Tops of the Pops" TV shows, especially in Europe, and for product promotion to radio programmers, booking agents, etc. This material can now find other use in disc and tape productions. In Canada, acts like RUSH, Ann Murray, etc. have been working with video projects. As well, it is reported first rate recording studios are now becoming equipped for video as well as audio productions. Nevertheless, the obstacles to international success will be similar to those in other media.

# PART TWO

# EDUCATION

## INTRODUCTION

There appear to be two issues central to the use of videodisc for education: the potential for more accessible and flexible adult education and the need for Canadian content.

In many of the schools across the country there are changes that reflect the age distribution patterns within the population. Due to a decline in birth rate and decreased immigration, the number of children in schools is diminishing. However more adults are participating in continuing education activities. This growth in adult enrollment is likely to continue for a number of reasons.

First, adults make up the larger proportion of the population in Canada. Second, because of a tight job market and rapid technological change, many workers find themselves in need of retraining or upgrading in mid-career. Third, any increase in leisure time is likely to increase the demand for education.

Adults have many demands upon their time from work, family or community related responsibilities. Therefore, as learners, they need and will demand flexible learning opportunities. Most educational institutions are responding to these needs by offering regular academic programs and some non-credit courses at times that are convenient. To develop more flexible programming, they offer distance education programs which permit the adult learner to study when and where it is most convenient.

For the adult learner, videodisc systems hold much promise. They offer a sophisticated medium to the educators and greater convenience to the learner. The potential of videodisc to meet the needs of the adult learner should be turned into reality.

An increasing rate of technological change, coupled with a growing number of people in the work force over 25 years of age, means that the demand for upgrading and retraining will increase if Canada is to maintain a competitive position in the international marketplace. The Committee on the Future Role of Universities in Ontario summarizes the problem: "Rates of economic growth are below the levels of previous years. Clearly, new strategies, new systems and new technologies are required."[7] The education system must help to prepare the work force to meet these new challenges.

The private sector will also meet some of these needs. For example, there are estimates of $80 - $100 million expenditures in the United States for corporate internal education. Teaching tools such as videodisc systems have shown promise of being more cost effective than traditional methods.

As a medium, videodisc offers the instruction designer a combination of variable methods never before available. These include the individuality of Computer Assisted Instruction (CAI) and Computer Managed Learning (CML) coupled with learner response instruments that range from key-pads to light pens. With a videodisc system, the student can become an active rather than a passive learner.

The portability and potential low cost of the videodisc system will provide the opportunity to learn at home, in school or in the workplace in both urban and rural communities.

## ANALYSIS OF U.S. EXPERIENCE

While direct applications of the videodisc are being developed to meet varied educational needs, much exploration is still theoretical. In the early 1970's, along with the prototype units of videodisc hardware many ideas and discussions arose on the possibilities of the new technology.

Michael Dann, speaking at the 1973 International Market for Video cassette and Videodisc Programmes and Equipment, raised an issue that remains pertinent today: the issue of software development. Noting that by 1976 half a billion dollars would have been spent on hardware development but less than one per cent of that amount on software, he cautioned that "Preoccupation with converting existing material to cartridge, tape, disc, or film threatens to hold back this industry for a decade." Despite this warning, the videodisc industry is only just now getting underway, while its software suppliers scramble to keep up the market's potential.

By 1977-78 several important papers were prepared for the U.S. National Institute of Education, notably: Ludwig Braun's "Micro-computers and Video Disc Systems: Magic Lamps for Educators"; Dustin Heuston's "The Promise and Inevitability of the Videodisc in Education"; and Lester Eastwood's "Motivations and Deterrents to Educational Use of 'Intelligent Videodisc' Systems."

Eastwood provides a comprehensive analysis of the barriers and benefits involved in videodisc technology. His discussion of barriers is prefaced with the statement that the "barriers are

imposing." Any large-scale incursion of technology in education has so far been understood. [8] He lists the educational barriers as

- deterrents due to attitudes and traditions
- difficulties in marketing to educators
- institutional and legal constraints
- inappropriate facilities and staffing
- failings of educational research and development
- the difficulties faced by the educational software production and distribution industry.[9]

In addition he cites economic obstacles in the form of ". . . likely high software costs, cost-reducing engineering breakthroughs needed, and problems that still face the videodisc in the commercial market -- competition, lack of standardization, and copyright battles."[10] He also discusses the technical problems of standardization, reliability, read-write capabilities, and the user-machine interface.

Eastwood makes numerous suggestions for overcoming these obstacles -- concepts which are reflected in the writings of other experts. Four areas for attention predominate:

- the need for videodisc developments to be user-oriented
- the need for co-operation among specialists
- the need for quality instructional design of courseware
- the need for creative exploitation of the technology, especially with regard to the concept of "visual literacy."

The majority of videodisc projects discussed in the literature review appear to originate with the purpose of exploring the potential of videodisc hardware. There was little evidence of projects addressing the user-orientation need.

The Nebraska Videodisc Group describes their mandate as "pioneering the design and development of videodisc programming . . .[and] developing a number of new techniques and procedures that enhance and expand videodisc capabilities."[11] While the variety of programs which the Group has developed reach a wide range of end users, generally speaking, their development has come from the perspective of "what the machinery can do" rather than "what user needs can be met." However, there are exceptions -- certainly the Group's work on behalf of the hearing-impaired has responded to a very real user need.

Another videodisc project which appears to fulfill the recommendations of user-orientation theorists is the ABC/NEA SCHOOLDISC project. In this case the work began with specially selected teacher-consultants who "had one overriding charge -- to use the rich technical resources of a great television system to increase literacy and language comprehension for upper elementary students."[12] Through this approach the project organisers were able to obtain an understanding of the needs and capabilities of students -- the end users of the product.

Bork describes video researchers as "individuals essentially doing solo efforts at writing courseware". The available literature of A/V development lends support to this

view. Numerous projects have been concerned with interfacing videodisc players to microcomputers, all in apparent isolation from each other. Three separate projects are noted in the review which address the feasibility of simultaneous display of computer-generated information and videodisc images on the same screen. Again, these projects appear to have been carried out in isolation, even though two of them took place in the same state, at Utah State University and at the University of Utah. Thus, the theorists' plea for co-operation among specialists and the need for "close contact with one another and . . . rapid communication of findings" does not appear to be answered.

The need for quality instructional design is more universally recognized. By 1975, Edward Schneider of Brigham Young University predicted that "interactive applications will make a real contribution to the quality of education, but not until instructional development becomes a matter of production, instead of experimentation."[13] In late 1978, the National Science Foundation initiated a research thrust "to develop innovative and compelling concepts for teaching and learning in science education".[14] This WICAT study, funded by the National Science Foundation, is an example of effective videodisc instructional design. What is lacking in the review of U.S. activities is more evidence of this sophisticated use of videodisc technology.

Similarly, while the theories of "visual literacy" are gaining recognition, there is little evidence in the literature of videodisc projects specifically designed to explore this

concept. However, this is partly a result of the youth of the technology. Some of the most recent work in disc production shows encouraging evidence of creative exploitation of videodisc capabilities.

The application of videodisc technology in education and training is an endeavor that is barely four years old. In the words of Dr. Leo Leveridge, the "opportunities for significant innovation in communication for education are unlimited."[15]

In a stimulating article found in the March, 1981 Videodisc News, Dr. Paul R. Kent of the University of Texas Health Science Center, challenges the observer to recognize the "conceptual transition" initiated by the videodisc. "This is the third great conceptual transition that technology has made possible for visual media."

Kent describes the first transition as the advent of photography, and the second as the invention of moving pictures.

> The videodisc is the ticket to the third major transition: to interactive video. The media experience is no longer predetermined by the beginning, the end, and everything that goes in between . . . This is a new form of media; it is a new art form; and it requires a new way of thinking.

A similar awareness of the need for new thought is reached from a different perspective by Andrew Molnar of the National Science Foundation. In his words:

> . . . we are approaching the limits of our educational and instructional systems . . . While the information explosion has brought a vast and growing amount of knowledge to our doorstep, we are fast reaching the human limits of our ability to absorb and use it . . . If we are to master information, we must expand human ability to learn and comprehend and we must create new intellectual tools to extend human capacity to reason and to "work smarter".[16]

Molnar goes on to suggest that a relatively new concept may provide some solutions:

> Recent work on the information processing functions of the brain shows that the right hemisphere of the brain primarily performs the specialized functions related to spatial imagery and the left hemisphere processes serial, analytical, or linguistic information . . . Recent research using interactive graphics shows strong positive effects of mental imagery on both learning and memory. Technological systems may be capable of organizing information into a form that can improve learning and extend long term memory well beyond the mnemonic devices used in memory training.[17]

In a paper published in 1977, Richard Ingalls also discusses brain hemisphere research and the emerging concept of "visual literacy." As he explains, "Television approaches the right hemisphere, whereas school approaches the left hemisphere. Were the learning situation to use both hemispheres simultaneously, the learning potential of all students could be greatly enhanced."[18] Ingalls suggests that videodisc technology may provide the means:

> Computer-assisted instruction is primarily linear, or left-brain oriented. Video is primarily visual, or right-brain oriented. Therefore, we will have the capability of video combined with the computer. This combination may provide for its own very unique learning situations which could be greater than video or computers on their own.[19]

Briefly let us review some examples of the educational as opposed to "training" experiments that are currently underway.

As mentioned previously, the ABC/NEA SCHOOLDISC program, announced in January 1980, was to supply instructional materials for grades 4 through 6, with a goal of providing one hour of video material for every two weeks of school.[20]

Dr. Joan Sustik of University of Iowa has a pilot project to use a videodisc system controlled by an external micro processor for a variety of educational areas, including medical applications, dance, architecture and art history.[21]

In 1980 the Museum of Fine Arts in Boston produced a videodisc of 200 slides from its collection. The intent was to demonstrate the use of videodisc as a tool for art history research.[22]

Videodisc is also being used in North Dakota high schools to assist in teaching English literature.[23]

Some of these activities are being evaluated. Results of a WICAT study, sponsored by the National Science Foundation, have shown videodisc to be a powerful new educational tool. In a 22-month comparative study of classroom instruction of introductory biology at Brigham Young University and Brookhaven Community College, the researchers found that "the delivery of science instruction via intelligent videodisc has proven not only feasible, but superior in some situations to traditional college science instruction."[24]

## THE IMPACT IN CANADA

Canadian institutions are discovering the educational application of videodisc technology. The following is a summary of the findings of a limited survey undertaken for this study:

Thirteen per cent of the respondents indicated that their institution was extremely likely to use videodisc in the near future while fifty-three per cent responded that it was likely. On the negative side, fifteen per cent felt it was unlikely that they would use videodisc and thirteen per cent that it was extremely unlikely.

When respondents were divided into public and private sectors, it became clear that there was a higher level of interest among the institutions falling into the latter category.

Private sector institutions reported less likelihood of involvement. The positive responses were primarily from the military and business with no interest indicated by any of the trade and vocational schools contacted.

In terms of current activity, development of videodisc applications in Canada appears to parallel the U.S. activity in that it is the military and university institutions which are leading the way.

The Ontario Institute for Studies in Education has embarked on a two-year project, the Interactive Computer-based Videodisc System for Skills Training, which has been funded by the Ontario Ministry of Colleges and Universities. The project courseware for training a machine lathe operator is being developed by a project team comprised of twenty people associated with OISE and additional groups from cooperating agencies and field trial participants. It is anticipated that this project, if successful, will place Ontario in the forefront of the videodisc field. The large number of agencies involved in the development will ensure a higher level of awareness of the potential of the medium.

Both Sheridan College and the Canadian Forces Base Trenton have videodisc hardware and are currently exploring possible uses. Respondents from Sheridan felt that the technology was suitable for many courses but especially for distance education. The training potential was of particular interest to the military, both for groups and for individualized instruction.

Knowledge of the technology and its capabilities is greatest with individuals who are personally rather than professionally interested. Stated another way, at the time the

motivation for becoming knowledgeable about videodisc technology usually comes from the individual rather than from institutional or corporate policy.

Continuing education was recognized by 45 per cent of the sample as a potential application. Again, as in the case of technical awareness, after a cluster of responses in the "top three" potential applications, all other possibilities were noted by one-third or less of the sample. There was an average of three applications mentioned per respondent.

There was an interesting divergence of response with regard to the two general areas of application -- training and education. Those who supported videodisc for training applications tended to be very enthusiastic. "The disc technology allows immediate evaluation of students in skills training which requires drilling" was noted by one respondent. "Industry can use the disc more than educators as it is best adapted for training. Educators are not 'trainers' as education is too 'free form.'" This comment by an educator is representative of the conflicting opinions concerning the application of videodisc to education. Some respondents thought the disc would add to the teacher's and student's productivity; others thought that the disc would make the teacher superfluous.

Some of the earliest videodisc projects have involved exploring the technology's potential for education of the physically handicapped. It is apparent that there is little or no Canadian awareness of this important activity. Only four respondents suggested this area; three of these were representatives of school boards and one represented a public library. None of the provincial ministry representatives made any comments in this regard.

A majority of representatives from public libraries, school boards, publishers and community colleges envisaged that the technology would permit greater extension of their institutions' services to the public. For example, a spokesperson for the Book Society of Canada suggested that "disc would be an extended use of what the publisher does well already . . ."

Institutions involved in adult education and distance education had a positive approach to the use of videodisc technology. For example, representatives of the Ontario Educational Communications Authority suggested that the disc's " ease of distribution would mean a wider spread of correspondence programs and skill training . . ." and looked forward to the delivery of adult education by disc as a continuation of their work in computer-managed-instruction and computer-assisted-instruction.

There appears to be considerable interest in the new videodisc technology and its potential for education and training, but few institutions are actually involved in active evaluation or development. Because the majority of the institutions contacted are at a similar level of awareness and interest, a common mechanism for information sharing and collaborative development may be an optional method to advance Canadian utilization of educational applications of videodisc technology.

In the face of a new technology with tremendous programming potential, there is an imperative need to protect the Canadian cultural identity. Canadian developed videodiscs about Canadian issues should be available to school systems and the general public. As a nation we are already inundated by American film and television programs. The school systems are suffering from financial constraints and publishers may not see the Canadian scholastic market as sufficiently lucrative to warrant development. These two potential producers of Canadian videodisc programs may be unable or unwilling to allocate the resources needed for development.

It is crucial that some mechanism be determined to ensure that Canadian culture and education are preserved by the development of Canadian programming.

# PART THREE

# TRAINING

## INTRODUCTION

The military and intelligence agencies were probably the first to use the videodisc technology for training purposes. They continue to pursue a great deal of experimental work in that area. The first major public introduction of the technology was the 12,000-dealer General Motors Videodisc Network which replaced an earlier "Mini-Theater" A/V 8mm-film network. The GM Videodisc Network is based on the DVA 7820 player and Zenith Color TV in unit cabinet which can be wheeled from area to area. The content is used to assist in direct selling, and sales and service training. It varies in the amount of interactivity permitted the viewer. This is a "stand alone" system in so far as the sophistication of the playback and interaction requires no more computer programming power than is located in the player.

Many of the training applications, as noted in the previous section on Education, may use an outside computer and a less technologically advanced player, such as the Pioneer VD-1000. Even the early Hughes Aircraft TMIS (Training and Maintenance Information System), which was based on the Thomson-CSF player, incorporated extensive outside computer and system software. These systems have been developed to incorporate responses by light-pen or touch-sensitive screens. The user can now follow such instructions as "correctly trace the fluid flow in an automatic transmission" -- without the necessity for keyboard entry and its tedious verbal communication.

This question of stand-alone or augmented systems has been the topic of recent research.

In industry and the military, the videodisc helps to maintain uniformity and quality of instruction. The Computer/ Videodisc Learning System was used by the American Heart Association to train great numbers of people in the techniques of cardio-pulmonary resuscitation in the face of a high turnover of volunteer CPR trainers. Multi-branch business also has a high turnover of initially unskilled help and can use videodisc technology to bring new entrants up to adequate competence with the minimum of expense in managerial time.

In the area of industrial training, the videodisc will only proliferate if it can demonstrate cost-effectiveness in the task of instruction and in competition with other A/V media.

## STAND-ALONE VS. COMPUTER INTERFACED

In training applications, the capability of interaction between the learner and the content is considered valuable. The student can proceed at his/her own speed, be tested in progress, reinforced on the results, and directed to more practice, alternative learning sequences or additional material for enrichment. The sophistication of these capabilities relies on the amount of computer software and therefore "memory" needed to control the training experience.

The two players designed for industrial training are the DVA 7820 and the Sony. The former has a 1K memory or 1,000 programming steps and the Sony has 4K or 4,000 steps. It is possible to program multiple memory "dumps" but the practical limit seems to be 2 or 3 on a disc side. Most of the research work in American universities has used the cheaper consumer optical laser player interfaced with an outside mini-computer. This is the approach taken by the Ontario Institute for Studies in Education.

The contention of the manufacturer is that "on board" memory is sufficient for practical industrial training applications; leads to a standardized delivery system which is not dependent on a host of add-ons and interfaces at each location; and is compatible with any other corporation's learning system that uses the same hardware. The educator's position is that the additional expense of the industrial model is almost equal to interfacing a much more powerful mini-computer which can lead to the further addition of text overlays, easier software

updating, and "user friendly" features such as light pens, touch sensitive screens, and voice commands.

The only study on this problem found in the literature was based solely on working with various configurations and did not make an economic or outside user analysis. It concluded:

> Although we have been enabled to deliver almost as complex a program with a stand-alone videodisc player as with a computer-interfaced player, we have had to sacrifice the flexibility that is essential to developing quality interactive programs. We would also have to limit the length of presentations in exchange for the user-friendliness we need. For both reasons we will continue to give the main emphasis of our development efforts and experimental programming to systems in which a relatively inexpensive external EDP (electronic data processor) dedicated to executing interactive educational programs is interfaced with a videodisc player and in which sound is provided to still frames by audiotape.
>
> Manufacturers would be well advised to concentrate on developing low-cost, high quality, durable optical videodisc players designed for easy interfacing with commonly available, inexpensive microcomputers and other external EDPs, rather than adding to the cost of their players by enhancing the power of their built-in EDPs, which only duplicate some of the functions of the computers that are required anyway to meet educators' and industrialists' special needs.

It should be noted that the consumer model most applicable to an external computer, the Pioneer LaserDisc, is being brought out in a new model which does not have a remote control jack. Interfacing would require opening the player and voiding the warranty.

While the educator's point of view is well taken for sophisticated training which more closely parallels the advances in CML (computer managed learning), the manufacturers are much more interested in an industrial "mass" market. For many typical training applications, the "on board" computer memory appears

adequate. However, in more advanced training, particularly in simulations, two or more VDPs may be required simultaneously, a processs requiring control by an external computer.

## EFFICIENCY OF THE VDP FOR TRAINING

As yet, no cost benefit analyses of the VDP in a training mode appear in the literature. However, many studies in the area of computer-assisted instruction and mediated learning in general have demonstrated cost effectiveness.

General Motors has conducted some subjective evaluations with its dealers on the GM Videodisc Network System. These are basically comparisons with the earlier Mini-Theater network and in some cases reflect identical content on which was transposed directly from the 8mm film to the disc. With respect to the most popular and least popular operational characteristics of the Videodisc, network dealers and salespeople generated the following matrix (Table 24).

TABLE 24

POPULARITY OF OPERATIONAL CHARACTERISTICS

| | Extremely Useful | Very Useful | Useful | Not Very Useful | Not Useful At All |
|---|---|---|---|---|---|
| "Instant Access" | 88% | 11 | 0 | 0 | 0 |
| Fast Forward/Reverse | 33 | 33 | 11 | 22 | 0 |
| Slow Motion | 33 | 22 | 44 | 0 | 0 |
| Variable Speed | 11 | 11 | 55 | 22 | 0 |
| "Step Frame" | 22 | 22 | 56 | 0 | 0 |
| Product Quiz | 33 | 44 | 11 | 0 | 11 |
| Quiz Answer Replay | 33 | 44 | 11 | 0 | 11 |
| Index Categories | 88 | 11 | 0 | 0 | 0 |

Top ranked categories are underlined under each heading.

Note: While Product Quiz and Quiz Answer Replay (branching sequences) are ranked top in the Useful category, they are also ranked top in the Not Useful At All category.[26]

TABLE 25

PERCEIVED QUALITY OF INFORMATION OR TRAINING SALESPEOPLE AND MANAGERS
(Excellent responses)

| | Mini-Theater | | Video Center | |
|---|---|---|---|---|
| | Sales | Mgrs. | Sales | Mgrs. |
| Quality of Product Information | 30% | 11% | 45% | 44% |
| Quality of Sales Training | 27% | 11% | 44% | 22% |

TABLE 26
EFFECTIVENESS OF MINI-THEATER AND VIDEO CENTER WITH CUSTOMERS

| | Mini-Theater | Video Center |
|---|---|---|
| Highly Effective | 26% | 41% |
| Effective | 37% | 44% |
| Somewhat Effective | 28% | 7% |
| Not at all Effective | 5% | 1% |

Source: These tables are reproduced from "Practical Applications of the Optical Videodisc" by John Hardigan, unpublished paper presented at industry conferences.

Symtec, Inc. of Southfield, Michigan developed the following cost analysis of their videodisc learning system. A $10,000.00 (U.S.) system would have this configuration:

| | |
|---|---|
| 48K Apple I | $1,395.00 |
| Apple II Disk Drive & Ctl | 598.00 |
| Light Pen* | 250.00 |
| VideoData Processor* | 1,500.00 |
| VideoDisc Controller* | 150.00 |
| Color TV | 300.00 |
| Pioneer Laser Disc | 750.00 |
| System Software | 2,500.00 |
| System Authoring Program | 2,500.00 |
| | $9,940.00 |

*Symtec produced

The highest cost of the Interactive Video approach is that of producing the videodisc itself. Second in cost is the computer software and the considerations for overall educational program designs. Typically, materials and services to produce a videodisc featuring, for example, 8 minutes of motion and about 50 still art pictures would cost between $25,000 and $75,000. For some disc production, depending upon the producer, the difficulty of filming and other such considerations could reach over $100,000. To these costs, the computer program could range between $2,000 and $3,000 all the way up to $30,000 or more; again depending upon difficulty. Then, a coordinated interplay of educational methods to insure these factors act in concert must be developed. Numerous companies exist which can provide overall production supervision. Typically, charges for this service range between $10,000 to over $30,000.

The total cost to provide the materials required to make a videodisc and computer program can be as little as $40,000 to as much as $250,000. To this cost, one must add the disc mastering and duplication charges. Mastering can range from $3,000 to $8,000 and duplicates are between $7.50 and $25.00 per copy depending on number of copies required. If the total computer and videodisc production cost and mastering costs reach $80,000, and a user has 1,000 locations to service, the amortized production costs are $80 per location per program. To this, add $20 for copies of both the video and computer discs and you get a $100 cost per station per program. Further, if a program requires 2 hours for each student to complete the material using a 5 day, 40 hour week, the cost per user is only $.10 each. Even if we add in the depreciation of the hardware over a 8 year period at $5,500 per system, the cost per user is only $.21 to $.42 per user hour.

Using user cost per hour figures of $1.00 per hour per student including hardware depreciation, the using organization could fund a library of as many as 6 different programs per year.

Even at a smaller scale per user costs are reasonable. Consider only 10 stations of a total cost of $100,000 and a library of 56 programs costing $500,000. With five year depreciation of the hardware and one year expense of the software, total cost is $520,000 or less. Operating on a 5 day, 40 hour week with 50 weeks per year and assuming each play is 2 hours in length, the cost per play over a 10-station network is only $52 or $26 per hour. Such a system could handle 10,000 users per year at a one play per user per year basis. To expose each user to all 5 programs, the capacity is 2,000 people per year, each receiving 10 hours on the system at a cost per head of only $260.

All of these examples make no attempt to consider economies in programming or videodisc preparation and further assume a hardware cost of $10,000 per station. Given some yearning toward economy of production and quantity pricing

for the hardware, it may be possible to reduce these costs by half.[26]

The assumptions used above seem reasonable and indicate the ranges of costs involved in software designs for highly interactive training packages.

## SELECTED CASE STUDIES

The number of experiments and demonstrations of videodisc that apply to training are too lengthy to list. A few examples (not cited earlier) will probably serve to indicate the range of activities.

### ELECTRONIC WARFARE TRAINING

The U.S. Naval Personnel Research Development Center is investigating the use of microprocessor-based training systems at remote sites for a variety of Navy tasks. One specific project is an interactive video learning system to train Navy Operations Specialists in tracking targets on a radar scope. While subjected to enemy interference, they must correctly identify the types of jamming and carry out appropriate corrective actions. Presently the program uses a Betamax videotape player but will evolve to videodisc after "debugging." The first results indicate a significant gain between pre-test and post-test measures, very positive student attitudes, an absence of media problems, and low maintenance problems. However, there was a rapid skill decay and a failure by most trainees to extract key features of jamming types.[25] This indicated a need for frequent refreshers and for presentation revision.

### TRAINING AND MAINTENANCE INFORMATION SYSTEM (TMIS)

The basic TMIS configuration consists of a cathode ray tube (CRT) display, keyboard, microcomputer, dual floppy disc drive, line graphics generator, videodisc drive and the operational

software. Hughes Aircraft claims that this becomes a cost effective instructional system which combines instructor, reference library, simulator, examiner and refresher course in one self-contained portable unit. In the maintenance role, it can replace the task of poring through thousands of pages of manuals by responding to the initial request and, using a series of queries, can direct the technician to the appropriate repair sequence. "System theory, flow charts and other unnecessary data don't intrude and compete for space and reading time."[26]

IMAGETICS

Emerson Electric, Sony and Imagetics have combined to develop a videodisc learning system. It is marketed by Emerson using a Sony industrial VDP interfaced with a microprocessor and a light pen. Imagetics provides a patented training methodology based on enhancing the mental images acquired by the student as a result of the learning experience.

A sample program has been developed to train an Armoured Cannon Vehicle crewman to perform the pre-operation check, start the power on procedure, operate the system, employ the M-36 sight and gun controls, arm the system and fire.

Earlier Imagetics flight simulation training for Boeing and British European Airways (BEA) was developed but not on videodisc. In the case of BEA the Imagetics methodology was said to have produced a 36.5 per cent reduction in training time and better retention of learned skills. The videodisc is claimed to be the "missing link" that allows the widespread application of the training methodology. [29]

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## CHAPTER VII

## SUMMARY OF IMPLICATIONS TO NATIONAL DEVELOPMENT

### CONSUMER MARKET - RESULTS & CONCLUSIONS

By 1990, perhaps one in three American homes will have home video; in Canada there will be somewhat fewer, (about one in four or five homes); and in other OECD countries, home video will have varying levels of significant penetration. It is expected that possibly 70 per cent of VCR owners will be using pre-recorded content (PCR). (All owners, naturally, will have pre-recorded discs.) It follows, therefore, that rental, rather than ownership, will be significant. In all probability, Hollywood may release content for home video before or concurrently with pay-TV.

Kalba-Bowen Associates reports from a survey on American VCR owners' preferences that, "while current and classic movies currently dominate PRC sales and rental markets, the increasing availability of more entertainment, educational and informational programming will also appeal to consumer tastes." The researchers found that outside the general movie category, the most desired categories of non-movie entertainment programming were programs starring major recording artists, performances of major stars,

and recordings of theatrical events. They also noted that while the owner preferred to rent cassettes rather than buy (2 to 1), the greater the interest in a particular program category, the greater the interest in buying the cassettes.

The role of videodisc in home video is not as certain but most of the projections still appear optimistic. About 150,000 players of all kinds are now in use. LaserVision has been in the market for about two years and RCA since March 1981. The VHD will be introduced in June 1982 to the United States market. LaserVision (Magnavision, LaserDisc) is geared toward the present VCR owner demographics and will be in price competition with the VCR machine. RCA, with its lower-priced Selectavision is going after the mass market -- the 75 per cent of U.S. homes without cable and without interest in either the complexity or features of VCRs and LaserVision.

Prior to the RCA launch, the company claimed it would sell 200,000 CED players under its own name and 50,000 under Zenith. The March 1981 target of 26,000 was met but the ultimate target failed by half. Analysts' views range from predictions of complete failure to "wait and see." The real boom may not be apparent until 1983. Recent industry news letters report RCA sales of discs per customer has exceeded pre-launch expectations.

Both LaserVision and SelectaVision have the corporate backing to sustain a long campaign. If RCA withdraws from the

marketplace, LaserVision's sales approach to marketing based -- on the higher-priced, many-featured, more adaptable player may triumph slowly. A 60/40 guess is that RCA will remain in the competition and emerge by late 1982 or early 1983 in a dominant position. There seems to be little middle ground -- either the SelectaVision will succeed spectacularly or it will fail.

This uncertainty does not drastically affect the study results of the consumer market. Pre-recorded content in home video will become pervasive. If SelectaVision does not become the dominant North American consumer standard, there might be freer access to replication and distribution. RCA, which first indicated it had no plans for custom pressing at least until 1984, is now rumored to be considering an earlier date in 1983 or even late 1982.

It has been estimated that the impact of consumer video on the big three American networks will result in a decline in prime-time television usage from 86.5 per cent to 60.4 per cent. Similar reductions could occur in Canadian homes where video has the clear potential to enjoy the long tradition of wholesale acceptance of U.S. programming and the entrenched public appreciation of American entertainment values. Consequently it appears imperative that Canadian entrepreneurs and the creative community seek out areas in which to compete, both at home and internationally.

Initially, four kinds of programming produced well in Canada may have home video market potential: popular music,

children's programs, educational programming, and special-interest programming such as productions related to natural history or culture. Significant domestic penetration of these areas in Canadian programming via home video could provide a strong domestic base for export marketing as this type of subject draws considerable interest from consumers in other countries. Musical video production, which could be used to promote Canadian artists and musical groups, could bring important spin-off benefits to the Canadian audio recording industry.

Additionally, as Canadian film and broadcasting producers already make feature presentations for theaters, pay-TV and conventional broadcasting, they also should provide material for home video replication and distribution.

To achieve a significant share of the essentially brand new home video market is a special challenge for Canadians. The multinationals are utilizing old and established resources for content (most of which is American), but new deals and procedures are coming into existence. In order for Canadian programming to break into the market, to cut costs and duplication of effort, and to avoid fragmentation of the domestic market, a single distributing and marketing corporation is needed to serve education, public and private broadcasters, independent producers, the performing arts and the cultural industries generally.

In the absence of a common national marketing and distributing corporation, however, Canadian producers of programming would still require reliable access to effective national and international distribution (the lack of which has persistently plagued several Canadian cultural industries). To achieve this goal, local distributors and retailers must have market information about home video and more informative forecasts of Canadian activities in this area -- before the technology actually achieves significant consumer acceptance.

Although there is Canadian programming attractive for home video markets, much of it is tied up by contractual barriers. The Canadian Broadcasting Corporation and the National Film Board now distribute pre-recorded content to the public, but their efforts are unco-ordinated and under-funded. Lacking the essential resources of promotional campaigns, these agencies they are not geared to exploit the home video market. The private sector producers have a backlog of material and a capacity to produce more that through effective distribution should find a market in home video. If a strong national distribution scheme is set up, it follows that Canadian-produced content will have re-inforced strength on the international market.

Canadian electronic manufacturers have shown little or no interest in the domestic manufacture or even assembly of mass market players. They no doubt consider there are better alternatives for utilizing their capacity and capability.

A third important consideration, however, is the replication of discs in Canada. Apart from the obvious benefits to the economy and employment, a domestic manufacturing capability may be needed by Canadian producers -- especially for the production of relatively small runs of discs aimed at audiences with special interests.

Three Canadian groups have expressed interest in mastering and replicating videodiscs. Such an investment is doubtless a high risk one because of the demonstrated difficulties in achieving efficient mastering and replication processes. DiscoVision Associates has turned over mass replication to Pioneer in Japan. Other than RCA, DVA is the only company that has actually succeeded in mass-producing discs. Philips, 3M and Sony have still not demonstrated a replication ability beyond small runs under laboratory-like conditions. IBM's involvement in Disco-Vision Associates replication plant was reported at $116 million cash in 1980 alone.

In summary, there are two basic considerations. The first is whether there is a fundamental need for one or more "instruments" in the public or private sectors (or both) to undertake the following tasks:

- distribution and promotion of all Canadian products
- acquisition and dissemination of necessary information for Canadian producers
- provision of financial services, equity participation and/or loans in support of home video aspects of production.

This matter will clearly require extensive consultation with governments, agencies private industry and unions.

The second consideration is the need for a definite evaluation of the requirement for and feasibility of mastering and replication in Canada.

# INDUSTRIAL TRAINING & EDUCATIONAL MARKET

## RESULTS AND CONCLUSIONS

### INDUSTRIAL MARKET

At present, the optical laser videodisc is rapidly gaining a foothold in the A/V training market. The two industrial players in distribution -- the DVA PR7820 and the Sony -- are equipped with a microprocessor which permits such advantages as interactive instruction, random access, and branched learning techniques. While these capabilities have not been fully exploited in production to date, a sector of A/V industry is rapidly moving into LV videodisc for corporate use. After careful analysis of previous A/V devices and 1/2" VCR they have concluded that the videodisc is cost-benefit effective. The crossover point seems to be about 150 to 250 units in a corporate videodisc network.

So far, General Motors and Ford have adopted DVA and Sony respectively. Other corporations reported to have made an agreement (or about to conclude one) are McDonalds, Burger King and American Motors. The U.S. military will also be a major client.

The videodisc appears to be gaining acceptance in those training applications where there is a high turnover of young and unskilled personnel who must rapidly be made competent without undue use of managerial time; or in situations where the introduction of new techniques and procedures is predictable and frequent. This training approach assures a high degree of central

control and common standards, and it usually obtains good results.

Videodisc manufacturers and A/V systems houses do not regard the public educational market with of much interest. Although many experiments demonstrate the versatility and effectiveness of the LV videodisc, the industry sees little potential in this market for a long time. This is not because of the technology but because of the school systems. School boards and systems are too decentralized to be able to produce the course-ware economically; they have limited budgets; and there is a resistance to more A/V technology.

Research findings indicate that there are Canadian industry and government needs for the technology. The Department of Employment and Immigration and the Department of National Defense are potential users. All told, the federal government, in a cursory estimate, might beneficially use 2,000 machines. No estimate has been made of the private sector's needs. For the most part, Canadian branches of U.S. companies will probably follow the lead of head offices.

The independent production industry in Canada gets the majority of its business in servicing the industrial and institutional A/V market in Canada -- to the extent of over $500 million. Given the trend by industry to introduce videodisc network systems, the Canadian producer must gain the expertise to produce and supply the software. At present there are only one or two companies with a "track record" in videodisc production.

Since the first main users of videodisc will be the multi-branch, multi-national companies, this should be the market objective of our A/V industry. It should be expected that at the very least, Canadian versions of U.S. videodisc productions will be produced because of the two basic and distinguishing differences in Canadian needs, -- bilingual content and metric measurements. General Motors of Canada has found it advantageous to produce completely original content for its 600 dealers and not simply to adapt U.S. designed content. In fact, some of this Canadian-made content is rated so highly as to be considered for "reversioning" by the American dealers.

EDUCATION

The literature revealed that a considerable amount of work is being done in the United States on the educational and training uses of videodisc. A wide range of potential applications is being explored, from language tracking to instruction for the hearing-impaired. However, there does not seem to be any co-ordination of efforts to achieve a set of national goals or to prevent a duplication of effort.

Judging from the sample of Canadian institutions contacted during this study, videodisc technology as an aid to education is apparently well understood. However, there is no similar level

of understanding of the full capability of the videodisc player and the implications for instructional use. Neither are the differences between the consumer, the educational and the industrial models clearly understood. There is no doubt that for a number of contacts the study sparked considerable interest in learning more about the technology.

Canadian educators have already undertaken several disc-based projects. An example is OISE's $1.2 million project to prepare a videodisc learning system using a consumer player and a unique microprocessor with a Telidon terminal.

The majority of respondents clearly articulated the barriers to acceptance and utilization of discs within institutions. This is perhaps indicative of past experiences in education, when new technology failed to reach its promised potential.

Cost was also considered to be a major deterrent in view of the current financial situation as was the lack of standardization. Education represents a relatively small market which cannot afford the split induced by incompatible hardware and software systems.

A third deterrent is competing technologies, particularly videotape. Most educational institutions have substantial holdings in tape and/or film and changing technologies is not a viable option in a period of fiscal restraint.

Finally, many institutions cited a lack of courseware as a

further reason not to invest in videodisc equipment.

Responses were mixed with respect to the identification of a role for Canada in terms of the development of hardware, software or courseware, but there was definitely a sense that Canada could, and should develop courseware. Many felt there was a need for some form of leadership and support from the government. Many respondents would like to see Canada involved in exploring the use of videodisc but were aware that resources would not be available within individual institutions to undertake this kind of activity, given the current economic climate.

Instructional designers require special expertise to achieve good results from educational videodiscs. Therefore, if Canadians are to participate in the educational videodisc marketplace people must be trained to exploit the medium to its fullest potential.

Integration of other Canadian strengths into instructional videodisc has not received proper attention. Telidon hardware and software either in application to integrated instructional systems or as an adjunct to courseware preparation deserves investigation.

The overview obtained from the review of the literature and the data analysis suggests that it is important for the federal government or national institutions to support and co-ordinate

experimentation and evaluation of videodisc technology in education and training. Without support, educational institutions, which are suffering from fiscal restraint, may be unable to mount exporatory projects, or may mount a number of small projects which will not substantially contribute to the body of knowledge or the utilization of the technology. Without some co-ordination, scarce resources may be wasted as individual operations will likely work in isolation from one another and thereby perhaps duplicate each other's efforts.

## INFORMATION STORAGE AND RETRIEVAL

### GENERAL

Should video systems be able to meet their expected performance claims, the potential sales could be very large in Europe, the United States, Canada and other OECD countries, with possible markets in the third world. Modular and custom designed video systems could meet the large-scale storage and retrieval requirements in banks, trust companies, insurance companies, governments and archival operations.

A number of large companies are working on storage and retrieval disc systems for large and small-scale uses. With the possible exception of RCA, most systems are still in various stages of development. Research indicates that from the level of current commitment, few of these companies can provide a commercial product in less than three years.

There are a number of problems challenging these companies. First, the cost of recording a disc is still relatively expensive. Second, the process must be done off-site. Third, efficient and relatively easy revision and updating capacity has to be developed. Fourth, digital technology must produce a truly high-resolution picture quality, to provide good detail in visual content.

Institutions and agencies wishing to make their holdings more accessable to the public may also need an interface between digital high-density storage and the public user, perhaps through

telecommunications links to high resolution screens or possibly by videodisc and a TV type screen.

## CANADIAN OPTIONS

To meet her own information and retrieval needs, Canada has three choices:

- to buy the technology from foreign manufacturers
- to induce foreign manufacturers to develop systems in Canada and in so doing to involve Canadian computer and electronics firms
- to acquire hardware and necessary licenses so that Canadian high technology firms can develop specialized uses which incorporate videodisc hardware.

In the first case, Canada might be able to standardize certain systems for government use and achieve some economies, but, by and large, the Canadian market would remain fragmented, and there would be no spin-offs for Canadian industry. As well there would be significant import costs and dependence on foreign sources.

The second option offers Canada the opportunity to develop hardware in Canada. The computer and electronics industry would benefit, and Canada should enjoy some share of export markets. However, there would likely be a substantial cost to persuading multinationals to set up or licence operations in Canada.

The third option would provide for the incorporation of videodisc hardware with Canadian high technology expertise and achievement. The second and third options are not mutually exclusive.

## CHAPTER VIII

## FEDERAL GOVERNMENT VIDEODISC PROJECTS OR APPLICATIONS

### INTRODUCTION

Many of the branches, departments, or agencies of the federal government which participated in this study are actively exploring the potential advantages of videodisc technology for their specific concerns. These activities illustrate by practical example various present or projected applications of videodisc, whether for pre-recorded content delivery, education and training, or information storage and retrieval.

This chapter is a summary of reports by many of the participants inclusive neither of the activities of the study or the federal government in whole. A number of other departments and branches which were not involved in this particular study are pursuing initiatives using the videodisc and some government explorations have been noted elsewhere in the report.

## THE CANADIAN BROADCASTING CORPORATION (CBC)

The Corporation has identified three special problem areas or interests where videodisc technology may provide solutions:

- archival and operational or archival application
- information storage and retrieval applications and
- program delivery and sales.

### ARCHIVAL AND OPERATIONAL/ARCHIVAL APPLICATION

The CBC produces film video and audio tapes which, after broadcast and other operational use, may go to the Public Archives for permanent storage. Initially, such film and tapes are for immediate operational use and may be re-used in whole or in part as rebroadcasts or as excerpts in new programs. Existing programs are also an important research resource. Such material must be durable and accessible throughout its active life and thereafter should be in good condition for possible transfer to the Archives of Canada. Each use of film and tapes, however, results in some deterioration and quality is lost as a result of reproducing copies by means of analog technology.

Perfected digital videodisc technology would permit the storage of program masters on non-degradable discs and of subsequent reproduction or direct-to-air playback, without noticeable loss of quality. Additionally, this kind of videodisc

system could permit rapid access to programs maintained in a dense storage medium. However, the adoption of digital videodisc systems will have to take place in concert with the replacement of analog equipment by digital systems generally: a transitional process still some year hence.

A disc approach, therefore, would have considerable appeal in terms of durability, ease of use and, of course, storage density. Shelves in both networks are presently packed with 2 inch Quad tapes in every regional location of the CBC. It would take approximately six months to find out precisely how many there are, how many of these are in regular operational use, and how many are destined for archives which are, perhaps, being inappropriately and inadequately stored in the meantime. The density, ease and durability of digital video would represent a quantum increase in quality, efficiency and longevity of these audio and video materials.

## INFORMATION STORAGE AND RETRIEVAL

The CBC also holds huge quantities of operational, research and administrative data and information -- all of which present problems of storage and access. At least half of the Corporation's administrative and clerical staff time goes to the management of this material. One estimate of space requirements alone is 10-15 per cent of CBC real estate holdings.

Therefore, a major administrative challenge is to develop a coherent and efficient management information system for all of this data and information with computer interface throughout the Corporation. The videodisc elements of a management information system would not have to be of broadcast quality.

PROGRAM DELIVERY

The CBC has an important interest in the growth of the retail videodisc market both for consumers and institutions and in the interactive videodisc market for educational and training uses. The English Services Division is studying the creation of a "universal program library" which would have an in-house facility for the production of masters. This library would make available various programs for CBC stations and affiliates.

The CBC is also interested in the potential of the videodisc as a vehicle for further non-broadcast distribution of programs. CBC has delivered program material to the public, to learning institutions, interest groups and public libraries on videotape, audio disc and tape, as well as program transcripts in print. CBC Merchandising is examining the feasibility of distributing programs on videodisc as one of several approaches to generating new sales revenues for the Corporation.

## CONSUMER AND CORPORATE AFFAIRS (CCA)

The Patent and Trade Mark Documentation and Registration Branch has investigated and leased access to a videodisc/computer system used by American authorities to record patent designs (some 700,000 international patents on eight discs). The computer capability provides access to descriptions of patented devices and the videodisc provides pictures of the working diagrams, models, samples, and so on. The branch is investigating the possible development of a system to record and access Canadian patent information.

Additionally, Consumer and Corporate Affairs Canada participated in the videodisc project to foster the distribution of information regarding this new technology. The department's particular interests with respect to videodisc lies in the areas of product standards, copyright and its relationship to other information technologies (including videotex).

DEPARTMENT OF NATIONAL DEFENCE (DND)

DND interest in videodisc technology lies primarily in the field of training and secondarily in storage and retrieval. This latter capability is a low-priority item until such time as a digital encoded videodisc becomes an economical reality. At present, however, with its freeze-frame, variable motion, electronic address and computer interface capabilities, the videodisc provides a new dimension in conventional learning, remote learning and individual or self-paced instruction.

Early in 1982, DND will start a project to evaluate the use of videodisc technology in all aspects of training in the Canadian Forces. The project has five objectives, each dependant on the results of all the others.

The first phase of the project will develop a rationale for the application of videodisc technology to the instructional process in the CF. The introduction of media into a training environment often leads to many questions regarding the usefulness of the particular medium to specific training requirements. Therefore, the advantages of videodisc in the overall training environment will be subject to careful scrutiny. The result will be a clear definition of the rationale for employing videodisc technology in a particular learning setting, whether in the formal classroom or on-the-job training.

This accomplished, the DND study will move on to determine the capabilities of the different levels of videodisc learning systems that would meet the training requirements within the CF. The intent is to determine whether, in particular modes, videodisc technology (with and without microcomputer interface) will enhance or provide new learning opportunities offered by no other delivery system.

The third step will develop an approach to the design of instructional materials and techniques for training packages prepared for vidodisc technology. The proposal is to explore in depth various learning techniques in the process of preparing a videodisc and to determine the capabilities of various levels of videodisc technology. Evaluation of the interactive techniques for subsequent incorporation into the system will be based on user trials employing sample population trainees.

The fourth objective is to prepare a videodisc with instructional material to exhibit the advantages of the videodisc approach in the school setting as well as in on-the-job training environments. Using the results of the first three objectives, this phase includes the preparation of a videodisc employing all the known techniques to promote learning and explore the capabilities of the disc.

The program's final objective aims to integrate videodisc with a Computer Assisted Learning (CAL) terminal to exhibit the potential this media mix has to further extend the applications of CAL in the training environment. It is proposed to integrate videodisc with the CAL system in two steps: first, the technical aspects of designing the interface between VDP and terminal and an appropriate touch-sensitive panel over the display will be explored; second, the best use of this new audio/visual dimension when designing CAL courseware will be determined.

In large measure, the pilot project above will decide future DND activity in videodisc. For example, it is difficult to validate the programs (and therefore the videodisc as a medium) for instructional delivery because of the inability to edit discs. This leads developers to seek techniques for testing videodisc material prior to having it mastered. The DRAW System (Direct Read After Write) therefore, is a particularly attractive development of interest to DND in the future.

In addition, the small size of a VDP is viewed as a desirable innovation which has unique DND applications in the aspect of remote learning in confined quarters such as on board ship.

The emergence on the instructional scene of videodisc technology has brought to light many questions regarding the most advantageous use of this medium. The Canadian Forces has many

areas where the potential of a properly configured and programmed videodisc learning system could offer solutions to training problems. This project will greatly help the Canadian Forces to determine answers to their questions about videodisc technology and to chart a course for the future.

## NATIONAL MUSEUMS CORPORATION (NMC)

Videodisc technology can be applied to the three basic elements of museum activity: exhibits, collections and research. It is not surprising, therefore, that some large facilities such as the Library of Congress, The Boston Museum of Fine Arts, The Peabody Museum and the Public Archives of Canada have extensive videodisc projects.

## MOBILE AND PERMANENT EXHIBITS

The museum community uses mobile exhibits extensively to display donated objects to a wider public. However, since a large mobile van display is an expensive endeavor, the size of such mobile exhibits is somewhat limited. Videodisc systems could supplement these exhibits by providing the visitor with photographic representation of a variety of similar artifacts, especially of those objects which cannot travel because of size, value or fragility.

Static or permanent exhibits within the museum structure require a great deal of preparation, and must fit within a theme of the exhibit hall. The use of videodiscs at selected locations within the museum can provide additional information to the visitor. On the same equipment a visitor may be allowed to play a learning game. For example, a visiting student could be quizzed on information given in the exhibit. The flexibility of videodiscs for exhibit applications is quite remarkable.

## COLLECTIONS

Museums house many types of collections which grow each year, including photography, manuscripts, videotapes, audio recordings, films, and slides. The care and management of these collections becomes more difficult as they expand. The capacity of a storage-type disc to record 104,000 frames of data enables the curator to place whole collections on one high-speed recall unit. Coupled with the existing mini-computer or National Inventories Program (NIP) computer, the disc becomes a formidable tool to promote more effective, cost-efficient management of various collections. Updates and duplicates of information can be effected in the same way as changes of data on the present NIP system.

## RESEARCH

A good museum has the capacity to research, and to a major extent, validate artifacts within its care. Visitor and scholar alike should have access to artifacts and documented findings. Research stored on videodisc permits rapid access and quality reproduction of acquired information. Visitors could spend much

less time searching and more time learning with such an effective system.

Videodisc systems can also provide other institutions with copies of detailed information on holdings. In this way members of the whole museum community can benefit from immediate access to each other's research, collections, and documentation. This program of information distribution could operate on a cost recovery system or even additional revenues.

During the next few years it is anticipated that museums will begin to take advantage of the potential offered by videodisc systems. However, the process of switching from existing systems will occur once stability, improved cost-effectiveness and reliability are proved. Present projects on videodisc are demonstrating those characteristics.

## NATIONAL LIBRARY OF CANADA (NLC)

NLC has acquired a videodisc system which includes a micro processor computer. This equipment, together with a monitor, amplifier, modem, and 5-1/4 inch-disc drives is being used in a videodisc demonstration project. The project is to produce a disc to demonstrate the videodisc capability for storage and retrieval of materials, as well as to provide NLC with primary experience with this technology. The target date for the demonstration disc is in spring of 1982, and various tests and demonstrations will follow. The Public Archives are providing the project with technical assistance.

Investigation of videodisc potential is also part of NLC's proposed Bibliographic Communications Network Pilot Project which will run over a two-year period during 1982 to 1984. This project will test the utility of new telecommunications technology for bibliographic data interchange. New technology in this context includes value-added network services, electronic mail, videotex and videography. (Videography is the combination of videodisc and computer/communications technology).

## NATIONAL RESEARCH COUNCIL (NRC)

The Electrical Engineering Division of the National Research Council plans to replace a Carousel Random-Access Slide Projector with a videodisc system in support of NRC's Computer Assisted Learning (CAL) programs. The first step will be to transfer the material from the Learning Ability Tests slides to videodisc; subsequent steps will include the recording of archival and index information.

The NRC sees videodisc as a very compact system that provides quick search and access to video and audio material which is easily displayed by the NRC's NATAL II authoring language.

## NATIONAL FILM BOARD (NFB)

The NFB is preparing to release a number of titles to the public in home video. The Board already has titles available for sale to educational and institutional users on three formats of videotape: U-matic, Beta and VHS. This collection includes the entire active catalogue of Board titles, government sponsored films, Canadian travel films, and some CBC television productions. Most sound tracks are available in either official language, in several native languages, and some are available in a few foreign languages. The Board expects to release videodisc versions of selected titles when there is a substantial volume of videodisc players in Canadian homes and institutions and when there is access to disc replication facilities for custom pressing.

Together with a number of government departments, the Sponsored Film Division is currently assessing the feasibility of videodisc for information distribution and its potential for interactive training or informational applications and uses. Similarly, the Montreal-based production branches are conducting a small number of experiments with specialized interactive discs for story-telling and science programs.

The Still Photo Division will also explore the information storage and random access playback capabilities for videodisc technology in an experiment to create a new display and dissemination method for their collection.

## PUBLIC ARCHIVES OF CANADA (PAC)

The Public Archives of Canada has been very active in the development of videodisc technology for information storage and retrieval, specifically for archival applications. The Archives undertook a pilot project in September 1978 that resulted in the production of a demonstration disc and system. The videodisc player was incorporated or interfaced with computers in order to index, search and recall material on a random access basis.

The Archives has presented numerous demonstrations to other departments and agencies and has provided advice to the House of Commons on a possible project to record the daily broadcasts of the House on videodiscs with random access capability. Additionally The Library of Parliament has sought advice on a videodisc system to record the printed Hansard.

Public Archives will continue to determine the requirements of a videodisc system to service all its branches. This work will include a study to prepare a long-range plan to implement such a system. After transmission of the call-up order at a reference terminal station the system would have a minimal thirty second delay capability of display. Other characteristics of the system include the capability to produce Polaroid prints, 35mm positive or negative slides, or 4 X 5 transparencies of the material shown on the video screen of the terminal.

## CONCLUSION

From the above, it is clear that federal government institutions have strong individual interest in applications of the videodisc technologies for education and training, and for storage and retrieval of information. The Canadian Broadcasting Corporation and The National Film Board share this interest in internal information management and archival storage but also look to videodiscs and videocassettes as potential content delivery systems to reach audiences and augment future revenues. As well as applauding the archival and data potential, the National Library of Canada, the Public Archives of Canada and the National Museum Corporation are interested in using this new technology to make their collections more accessible to the general public across the land.

All of this activity suggests some concern with compatible standards in the various applications so that economies of scale and ease of access are preserved.