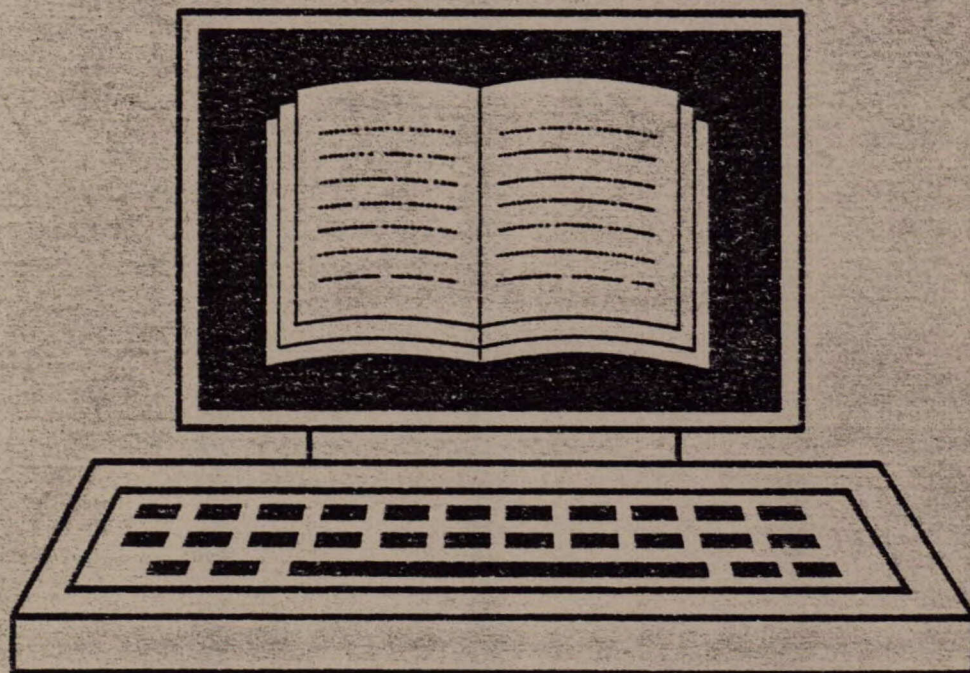# AN ASSESSMENT OF ELECTRONIC PUBLISHING PRODUCTS & INDUSTRY

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Prepared For
The Department of Communications
Government of Canada

Derek Murray Consulting Associates Inc.
In Association With:
Evans Research Corporation, and
Stevenson Kellogg Ernst and Whinney

AN ASSESSMENT OF ELECTRONIC PUBLISHING PRODUCTS AND INDUSTRY IN CANADA

A Report Prepared for the
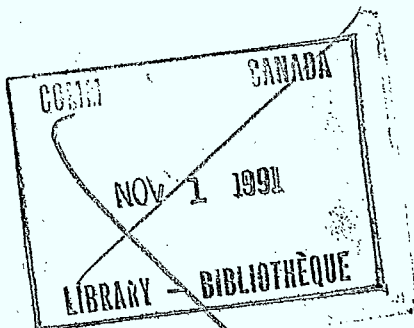Department of Communications,
Government of Canada

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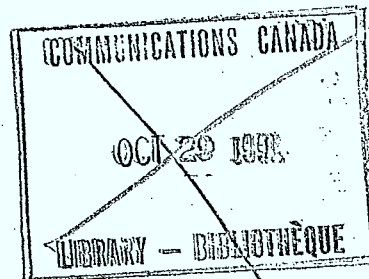
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1.0 INTRODUCTION

This report has been prepared for the federal Department of Communications. The Government of Canada, and in particular the Department of Communications, has regarded publishing as an important component of the Canadian Arts and Culture Industry and have provided support through various policies and programs to the publishing industry.

As with other sectors of the Canadian economy, the publishing and printing industry is undergoing an accelerated rate of technological innovation and adaptation. In some cases this has led to new product development, while in others, it has led to productivity improvement and increased market penetration. Still in other cases technology has advanced so rapidly that market adaptation has lagged behind.

The technological changes occurring in the Canadian publishing industry, and elsewhere, are the result of evolutionary trends of developing, adapting and using appropriate tools to effectively produce information products and services. In the present century, the first major technological adaptation was the introduction of Ottmar Mergenthaler's linotype and the elimination of hand-set type. The next major adaptation to the publication industry occurred in the 1960s with the introduction of magnetic media for the storage of information and computers for line composition, hyphenation and justification. With the introduction of the computer, technological adaptation accelerated to the computer performing publication text selection and arranging as well as full page composition functions. Technology is also impacting on the distribution of published products as well as an increasing interface with other mediums. As an example the Globe and Mail,

as part of its marketing strategy to establish itself as Canada's national newspaper, was the nation's first newspaper to utilize electronic scanning and transmission by satellite to remote printing plants located throughout Canada. With the adaptation of this technology the Globe has virtually eliminated the need for interprovincial transportation of its printed product throughout the country, not to mention a vast improvement in on-time delivery.

At the authoring level, desktop publishing systems are now available at a cost of between $10,000 and $20,000 which includes a microcomputer, software and a laser printer. For individuals already owning computers, this cost is reduced in half. Increasingly, individuals within organizations are becoming their own authors. Such systems greatly reduce the cost of entry into the publishing industry. Obviously desktop systems will have little impact on high quality print magazines, however they have very broad applications for periodical production such as shoppers' guides, newsletters, proposals and pamphlets. Regarding literary publishing, desktop systems can bring the author much closer to the publisher and the integration of authoring and publication systems.

Some of the most promising and perhaps more significant technological adaptations in publishing are those associated with data and information base production and distribution. Numerous articles and books have referenced the "new economy" as being information driven. Sociologists have described the evolving phenomenon of the information society. In such a society, it is possible to link the world economy electronically. For the most part, such a concept of society is being technology driven as opposed to being market driven. The lack of market acceptance and market development have, for the present, postponed and in some cases altered the concept of the information society.

On-line and standalone publication of data and information bases are two "electronic" products currently evolving that do provide some substance to the projected vision of the information society. In many cases, electronic publishing has not led to new product development but rather productivity enhancement. In the case of on-line publishing, new commercial products began to develop in the 1970s and have experienced accelerated growth. More than ever information is seen as having very strategic importance for business market research, corporate planning and competitive analysis all of which require large amounts of information. Further, as the world economy becomes increasingly interlinked, corporations are becoming more dependent on electronic information. At the same time technological developments associated with the rapid rise in the utilization of powerful personal computers are resulting in the integration of distributed data bases with voice, image and text information capabilities. The widespread availability of modems and communications processors have brought data and information bases within reach of a large market. In Canada, Info Globe is perhaps the most widely known on-line published database product. In addition to Info Globe there are over 80 Canadian on-line data bases being supplied by 60 separate organizations in Canada. There is a significant latent demand for niche product/subject areas which focus on specialized areas or topics related to such as health, defense products, technology and chemicals.

The production/publication of data bases is on the verge of new technology adaptation. New technologies such as CD-ROM (Compact Disk - Read Only Memory) will significantly enhance the ability of database producers to store large textual files, graphics and photos. Optical scanners have the potential to replace the inconvenience and labour intensity of keyboard entry in data production and maintenance.

In areas of education and industry training a potential exists for the development of new electronic products. Post secondary education institutions have been faced with tremendous capital and operating cost constraints. Distance education via satellite or cassette have shown potential to provide relatively inexpensive course delivery relative to conventional classroom teaching.

It is currently estimated that there are in excess of 120,000 installed microcomputers in Canadian schools and annual expenditures by Canadian schools on software now exceed $10 million. This rapid investment has given rise to the development of courseware for computer-based instruction. As a result new market opportunities are being pursued by educational publishers and the industrial training industry for courseware development.

With the possible exception of computer-based interactive video disc systems, in most cases courseware has not replaced the traditional classroom environment of "stand-up" teaching. Rather, courseware, for the most part, has been used to enhance traditional concepts of teaching and learning.

Given the foregoing, the publishing industry in Canada as well as in the U.S., Japan and Europe is undergoing a period of rapid and in some cases, major technological changes. Most of these changes can be traced to the impact of the computer and computer peripherals on the publishing industry. The adaptation of publishing to new technologies such as computers and communications systems such as satellite transmission and on-line publishing is largely electronic in nature. As a result the term electronic publishing has become the popularized phrase of the eighties to describe new publishing technologies.

Potentially electronic publishing poses both threats and opportunities for the Canadian publishing industry. A possible threat exists for the typesetting sector and the impact that desktop publishing could have on replacing, in part, the need for typesetting. Regarding opportunities, the publication of data and information bases represent new product markets. Further, there may be parallel opportunities for other Canadian industries such as those producing satellite and communications technologies to receive, transmit and switch published products and information. Canada is already recognized as having some international prominence in the field of communications.

Given the current environment of the Canadian publishing industry and the impact that electronic publishing has or could have on it, electronic publishing has been identified by the Federal Department of Communications as one of its key areas of responsibility and concern. It is largely for this reason that the Department initiated this study.

2.0 OBJECTIVES

2.1 The Purpose of the Study

The purpose of the study is to provide information about electronic publishing in order to formulate appropriate government policies and programs. To be effective, the policies should stimulate and encourage the growth of the industry while reducing the negative impacts and facilitating the orderly adoption of new electronic publishing products, technologies and systems. To meet these goals, the study results must reflect both Canadian and international developments.

Electronic publishing is one of the fastest growing industries in the world. The growth in Canada has also been rapid. Such growth could present industrial opportunities for Canadians and Canadian businesses. Virtually all of the major international players in the publishing industry are strategically developing positions to take advantage of the new technology. As these international companies develop their expertise, the competitive pressure on the Canadian publishing industry could increase sharply.

Certain elements of the conventional printing, type-setting and graphics community may also be affected negatively. The role of government policy is to maximize the competitive position of the Canadian electronic publishing industry and assist other related industries with adaptation to new technology.

2.2 Objectives of the Study

The Department of Communications identified the following
three principal objectives for the study:

- Conduct an assessment of the present status
  and likely future developments of electronic
  publishing technologies;

- Assess various economic, industrial and regu-
  latory aspects of electronic publishing; and

- Analyze its impact on providers and users of
  published material and on related Canadian
  industries.

3.0 APPROACH

3.1 Scope of the Study

While much has been written about electronic publishing, it has not been dealt with in a definitive manner. In fact in Canada, or for that matter in any industrialized nation, electronic publishing has not been defined as a precise sector of economic activity. Statistics Canada, as well as other accepted economic activity measurement system, has not identified and recorded a separate statistical standard for electronic publishing in terms of number of establishments, value of shipments and employment. In addition, there is no commonly accepted definition of electronic publishing. The term literally means different things to different people, industries and associations. There are also considerable differences between the complexity and application of electronic publishing. For example, desktop publishing is within easy grasp both financially and mentally for a sizable segment of the Canadian labour force. The same can not be said for the production of standalone databases and on-line publishing.

In the absence of a standard, widely accepted definition of the electronic publishing industry, the Department of Communications has identified that the following segments be assessed during the course of the study:

. Traditional Publishing including Books, Periodicals, Journals, Newspapers and Other Areas

. Regional and Remote Printing

. Desktop Publishing

. On-Line Data Base Publishing

. Standalone Data Base Publishing including Optical Discs and CD ROMs

. Software Including Computer Aided Training and Education Courseware Publishing.

3.2 Methodology

Generally all segments of the study followed the same approach:

- A literature review of studies, reports and papers

- Establishment of a working definition

- Technological Overview

- Industry interviews to assess product development, supply and market demand

- Data and information analysis

- Preparation of a final report.

The study begins with traditional publishing as one of the primary objectives of the study is to examine the impact of electronic publishing on the Canadian publishing industry. The economic structure and composition of the Canadian publishing and printing industry is described.

In order to give the reader an overview of electronic publishing, a description of technological adaptation in the publishing industry is provided. This analysis is done from the perspective of the stages or steps in the publishing process. Electronic publishing has impacted on key or critical steps in the publishing process. It is within this context that the study examines each sub-segment such as regional and remote printing, data bases, desktop publishing and courseware in relationship to the publishing industry in general. In this report an overall assessment of the introduction and impact of electronic publishing technology is undertaken. This includes a description of existing and developing technologies, market impact, trends analysis and conclusions as

to what the future holds for the Canadian electronic publishing industry. It summarizes the more salient findings of more detailed and individual studies of each of the specific segments that the study examined. In addition to this overview the following detailed sub-reports are available:

- Regional and Remote Printing
- Desktop Publishing
- On-Line Data Base Publishing
- Standalone Data Base Publishing
- Courseware Publishing

In the case of desktop publishing, the sub report is an actual product itself of a desktop publishing system. All other sub reports, including this overview are the products of a conventional word processing system.

4.0   THE CANADIAN PUBLISHING AND PRINTING INDUSTRY

Printing and publishing in Canada is a separate industrial sector defined by Statistics Canada as a manufacturing activity consisting of printing, publishing and allied industries.   It consists of the following sub-sectors:

SIC 2811 – Business Forms Printing Industries

Businesses primarily engaged in printing business forms, including business and accounting records which include national businesses such as the Moore Business Corporation, Data Business Forms, IBM, R. L. Crain Inc. and Burroughs.

SIC 2819 – Commercial Printing Industries

Industries primarily engaged in commercial printing without publishing.   These are largely local, small to medium sized businesses serving printing requirements of local and regional areas.

SIC 2821 – Platemaking, Typesetting and Binding Industry

Includes establishments that provide specialized services (i.e. platemaking, typesetting and binding) to the printing, publishing and advertising trades.

SIC 2831 – Book Publishing Industry

Businesses primarily engaged in publishing but not the printing of books.   Includes publishers such as Harlequin Enterprises Ltd., Holt, Rinehart and Winston of Canada Ltd., International Thompson Ltd., McClelland and Stewart and McGraw-Hill Ryerson Ltd.

SIC 2839 - Other Publishing Industries

Includes other publishers that do not normally produce books and are not engaged in printing. Examples include shoppers' guides, newsletters, automobile, truck and equipment trading publications.

SIC 2841 - Newspaper, Magazine and Periodical Industry

Includes establishments primarily engaged in the combined printing and publication of newspapers, magazines and periodicals such as the Canadian Newspapers Company Limited, Southam Inc. and Thompson Newspaper Company Ltd.

SIC 2849 - Other Combined Publishing and Printing Industries

Establishments engaged in combined publishing and printing not elsewhere classified.

As shown in the following table, commercial printing, which is primarily a localized industry with virtually no exports and the newspaper, magazine and periodical industries account for a significant portion of the economic activity generated by the Canadian printing and publishing industry. Commercial printing accounts for over 50% of Canadian printing and publishing establishments and almost 40% of the industry's value of shipments and employment. The next largest sector is newspapers, magazines and periodicals, accounting for only 10% of the number of establishments but 25% of industry shipments and 27% of industry employment.

TABLE 1

Canadian Printing, Publishing and Allied Industry
Principal Statistics – 1984

SIC	Number of Establishments	Value of Shipments (000's)	Employees	Salaries and Wages (000's)
2811	178	676,546	8,150	217,493
2819	2,742	3,372,865	43,952	1,043,906
2821	893	816,888	15,145	329,474
2831	177	567,415	4,548	107,405
2839	742	880,521	9,382	204,494
2841	504	2,265,895	31,052	832,374
2849	44	79,251	1,218	25,530
	5,280	8,659,381	113,447	2,760,676

Source: Statistics Canada 36-203, Printing, Publishing and Allied Industries.

As this study is largely concerned with publishing, Table 2 displays only the principal statistics for the Canadian publishing industry which has a value of shipments of $3.8 billion and employs over 46,000 people. The following are some descriptive characteristics of Canada's publishing industry:

Canada's Publishing Industry is Comparatively Small

Table 3 compares the relative size of the Canadian publishing industry with that of the U.S. and Western Europe. The Canadian publishing industry is only 7.6% the size of the massive U.S. publishing industry.

TABLE 2

Publishing and Related Industries Only
Principal Statistics – 1984

	Number of Establishments	Value of Shipments (000's)		Employess		Salaries and Wages
		Total	Average	Total	Average	Total
Newspapers, Magazines and Periodical Industries	504	2,265,896	4,496	31,052	62	832,374
Other Publishing Industries	742	880,521	1,182	9,382	13	204,494
Book Publishing Industry	177	567,415	3,206	4,548	26	107,405
Other Combined Publishing and Printing and Related Industries	44	79,217	1,801	1,218	28	25,530
Totals	1,467	3,793,049	2,671	46,200	32	1,169,803
As a % of All Canadian Printing, Publishing and Allied Industries	27.8%	43.8%		40.7%		42.4%

TABLE 3

Comparison of Canadian Publishing Revenue with Other Countries

(in Billions)

United States	49.1
Western Europe	25.0
Canada	3.8

Source: Statistics Canada and Commission of the European Communities – Electronic Publishing Trends in the U.S., Europe and Japan, 1984 – Learned Information, Oxford and New Jersey.

Newspapers, Magazines and Periodical Industries Dominate Canadian Publishing

Collectively these industries account for 60% of the value of shipments and 67% of publishing industry employment. The average firm size and employment are significantly larger than other forms of publishing such as book publishing.

There is a High Level of Concentration in the Canadian Newspaper Industry

The level of concentration in the Canadian newspaper industry has been increasing over the last 20 years. Southam Communications and the K. R. Thomson Group publish one-half of the daily newspaper circulation in Canada.

Ontario Accounts for Over 40% of Canada's Publishing Industry

By any measure, Ontario contains by far the largest segments of the Canadian publishing industry; 41.2% of the nation's publishing establishments, 43.6% of the value of shipments and almost 50% of

Canadian publishing industry employment. Ontario and Quebec together account for more than 90% of all new book titles published and reprinted in Canada.

The Canadian Book Publishing Industry is Dominated by Foreign Controlled Publishers

In 1982 Statistics Canada indicated that only 12.3% of the domestic market is controlled by Canadian-owned publishers.

The Canadian Book Market is Dominated by Foreign Titles

Industry sources representing Canadian publishers estimate that only 25% of all titles sold in Canada are Canadian titles and 75% are foreign titles. Further, industry sources indicate that in general, the financial status of the Canadian book publishing industry is poor.

Educational Publishing is Dominated by U.S. Firms

A review of Statistics Canada data (1987) indicates that Canadian-owned publishers accounted for 33% of the estimated $122.7 million elementary-secondary textbook market.

The Export Market for the Canadian Publishing Industry Has Been Very Small

In 1983 Statistics Canada data indicated that Canadian exports totaled $80 million of which 81% or $65 million was the result of one product, Harlequin books.

Industry Electronic Hardware and Software Requirements are Dominated by Foreign Suppliers

Virtually all of the Canadian publishing industry's requirements for computers, laser scanners/printers and data information entry,

storage and retrieval are manufactured in the United States and
Pacific Rim countries. In addition industry software is also, to
a large extent, foreign supplied. Opportunities for Canadian
software suppliers are greater than hardware manufacturing for the
publishing industry. However, a drawback facing Canadian software
suppliers is associated with having to penetrate a major share of
the broader North American market in order to effectively and eco-
nomically supply the Canadian market.

Summary

In summary Canadian publishing is a $3.8 billion industry employ-
ing 46,000 people. It is characterized largely by the production
of newspapers, magazines and periodicals. Newspapers alone ac-
count for almost half of the value of industry shipments. Owner-
ship and control of newspapers, magazines and periodicals is high-
ly concentrated with two firms, Southam Communications and K. R.
Thomson Group, publishing one-half of daily newspaper circulation
in Canada.

Book publishing is a relatively small sector of the publishing
industry accounting for 15% of the industry's value of shipments.
A little over 8,000 titles are published annually. Book publish-
ing is dominated by foreign-controlled companies as only 12.3% of
the Canadian market is controlled by Canadian-owned publications
and only 25% of all titles sold in Canada are Canadian titles.
While Canadian education publishers fare slightly better, it is
estimated that 67% of the school textbook market is controlled by
foreign suppliers.

The size and structure of the Canadian publishing industry
represent major impediments to Canada becoming a world leader in
the development of electronic publishing, Canada has tended to
become the technological recipient of other foreign technological
developments in electronic publishing as opposed to a developer.

With the exception of the newspaper industry, for the most part Canadian publishing establishments do not have the market, scale and financial resources to develop electronic publishing technologies. However, that is not to say that there are not such markets that the Canadian publishing industry could address for the development of more specialized electronically published products.

The following chapters examine the nature of the publishing process and how electronic publishing has and could potentially impact on publishing.

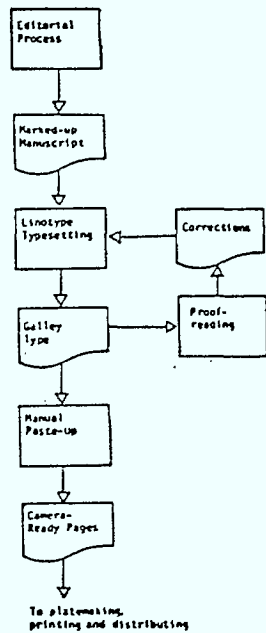## 5.0 PUBLICATION, PRODUCTION AND TECHNOLOGICAL ADAPTATION

In order to fully assess electronic publishing it becomes necessary to examine the nature of the publishing process itself. Technological changes in publishing both in the future and the past are normal evolutionary trends of adapting and using tools to effectively produce information, products and services. Electronic publishing is part of this evolutionary process. By examining this process we can then place electronic publishing within a context as to how publishing is being affected by it and analyze the direction or trends towards which the publishing industry is headed in terms of the next evolution of publishing production and products.

In the discussion that follows, it should be borne in mind that this analysis focuses on the process of publication and the integration of the human and machine (computers/lasers scanners, optical storage and on-line retrieval/transmission) elements. Major parts of existing traditional publishing have been untouched by electronic publishing and may never be. These elements relate to artistic creativity, and the quality of the final product. Even with high resolution graphics, magazines will continued to rely on photographs and colour separations. The description of the evolving nature of the publishing process focuses moreso on information products as opposed to products dependent upon a high component of advertising and superior presentation such as major magazines. Exhibit 1 graphically displays the evolution of technological adaptation in the process of publication production since the turn of the century. As shown in the exhibit publishing has evolved from a linotype typesetting system to a computer-assisted typesetting system. At present, electronic publishing could largely be described as the development of data-based publishing
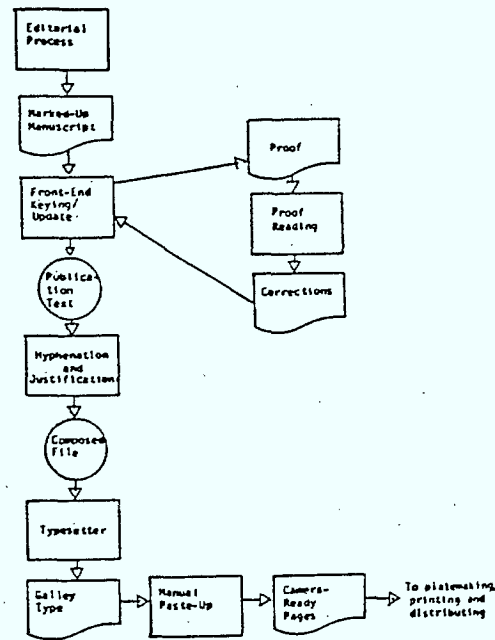
EXHIBIT 1

The Adoption of New Technology and Electronic Publishing in Publication Production Systems
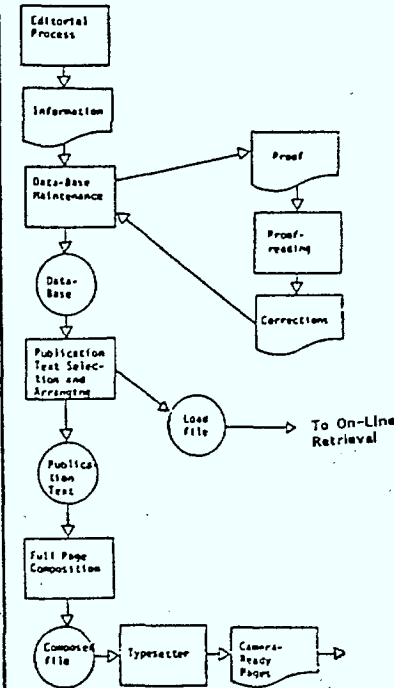
1900	1960	1980	1990
Figure 1	Figure 2	Figure 3	Figure 4
Linotype	Computer-Assisted	Data-Based	Knowledge-Based
Typesetting System	Typesetting System	Publishing System	Publishing System
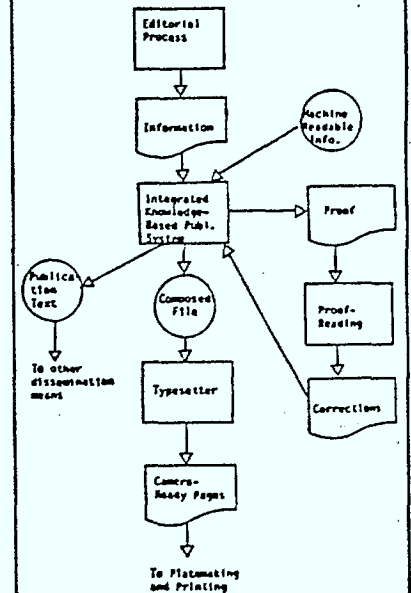
Source: Knowledge-based Publishing: The Future is Now, Robert Kaunitz.

systems. With improved interaction between humans and machines, by the 1990's publishing production could evolve toward a knowledge- based publishing system. Each system depicts the processes involved with publishing whether manual or computerized. The following symbols depict the process and information inputs and outputs of publishing:

 - Represents process

 - Represents information in human readable form

 - Represents information in machine readable form

 - Indicates the relationship between system components.
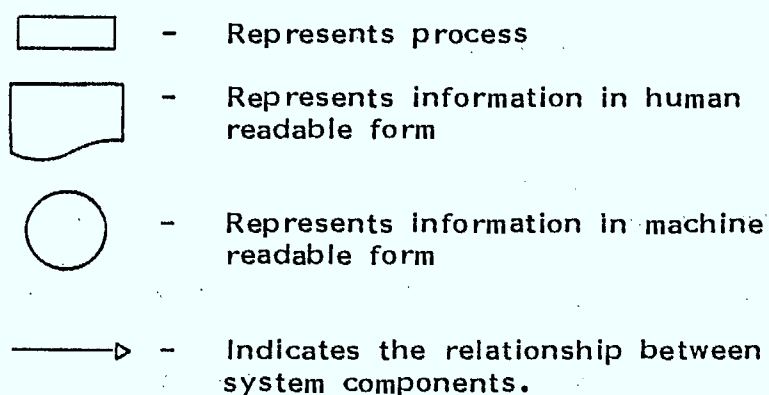
Ottmar Mergenthaler introduced linotype to the publishing industry at the turn of the century. Until the 1960s publishing was very much a human controlled process. With the introduction of the computer, linotype typesetting was effectively replaced with the computer. The computer could control text and avoid the need for time-consuming paste-ups. However, manual entries, via keyboard, were still necessary by humans.

The introduction of the computer and powerful microcomputers are considered to be the real initiation of electronic publishing. All segments of the electronic publishing industry that fall within the purview of this study would not be possible without the computer.

Desktop publishing, by means of a microcomputer integrates the editorial or authoring process with publication. A complete desk-top publishing system can be purchased for $20,000 to $30,000.

With a laser printer, a desktop publishing system embraces all phases in the publishing process from the editorial process to the composed file. With high resolution graphics currently available, desktop publishing is approaching print quality publication.

Desktop publishing has found its greatest application in publishing within organizations such as newsletters, in-house publications, presentations to management and clients and in marketing literature.

For literary publishers, desktop publishing will not replace the traditional publishing steps of typesetting, galley type, paste-up, platemaking and printing/binding. For the most part there has been slow take-up amongst literary publishers of desktop publishing. For literary publishers, desktop publishing can be effective as an input to the publishing process. An author's manuscript can now be submitted to a publisher's computer on a floppy disk. This can enhance the author-publisher relationship.

Desktop publishing will have greater application for educational publishers. It has the potential to cut costs particularly for smaller educational publishers. In terms of presentation of publishing proposals it can improve their competitiveness with larger U.S.-controlled educational publishers who have a significant impact on the Canadian school textbook market.

Educational courseware has become a by-product of electronic publishing. Computer-assisted education and training is having only a limited impact on this market. The classroom setting and stand-up instruction are proving to be resistant to computer-based instruction and to even more elaborate and costly "teacher-less" systems such as interactive video.

The evolution of data base publishing systems is a product of the 1980s that is only just emerging. The optical disc and optical scanning are beginning to replace the need for front-end keying of data and information to the computer. At the "back-end" laser scanning can be used to transmit information by satellite from a publisher to a remote plant in another city, province or country where it can be printed for distribution. Such technology, while costly (an entire remote printing system is estimated to cost $25 million), can greatly enhance a newspaper publisher's position in the marketplace. The Globe and Mail, the first and only Canadian publisher to adopt remote printing, has been very successful with the adoption of this system and has completely solidified its position as Canada's national paper.

The compact disc has been one of the most successful electronic product launches of this decade. While compact discs are currently impacting on the consumer market, the development of compact discs for the publishing industry is only slowly developing. The same factories producing CD audio discs can be adapted to produce what is currently considered to be the most powerful new computer storage peripheral and electronic publishing media - CD-ROM (Compact Disk - Read Only Memory). CD-ROMs are designed to store digital data as opposed to digitally encoded audio information. As a storage media, CD-ROM can double the capacity of existing storage media such as magnetic tape or hard disks.

CD-ROMs are part of a whole optical media which is developing that will eliminate the need for manual keyboard entry while greatly enhancing data and information capacity and accessibility. These products will lead to the emergence of data-based publishing systems.

As part of the evolving data-based publishing system, on-line publishing is now emerging as a commercially successful market that

addresses organizations' needs for strategic information. At present it represents a $44 million market annually in Canada. In Canada, the Globe and Mail's Info Globe is arguably Canada's most well-known on-line product. The proliferation of microcomputers, modems and communications processors has provided on-line publishing with a diverse and growing market. For the data and information base publisher, on-line publishing has greatly expanded the market for information products. Niche markets for highly specific data such as chemical and medical journals present real opportunities for the data base publisher. They also hold potential for new players to enter the market. To illustrate this, Statistics Canada currently has one of the most extensive data bases available in Canada. However access to this data base is inconvenient and costly in terms of time spent by corporate and government users in accessing this information. Statistics Canada is very much a traditional publisher with most of its data and information available in printed format which then must be re-entered into the user's computer. With the adoption of new storage media, Statistics Canada could conceivably offer database services on-line to a large corporate and public sector market. Companies such as Compusearch have seen the commercial market opportunities that are available based on Statistics Canada data. Compusearch is basically adding value to Statistics Canada data by offering market researchers lifestyle cluster analysis of national and regional markets for a growing list of private and public sector clients.

The costs of on-line database publishing are continuing to decline. With improvements in software and line access the market will continue to grow.

The concept of knowledge-based publishing systems represents a possible future scenario for electronic publishing that integrates

machine readable information and publication or what could be termed knowledge-based publishing. Essentially such a system integrates the human and machine elements of publishing as shown in Figure 4. This can give rise to the concept of artificial intelligence.

While electronic publishing has made real advances there are still a number of deficiencies impacting on more widespread use of the technology. Data-based publishing initially placed much greater emphasis on system development that surrounded the computer and machines rather than people who need to control and use the system. Skilled systems analysts and programmers were needed to design data bases and computer procedures necessary to produce the publications. Data entry personnel also required a high level of training. As well, on-line systems for search and retrieval tend to be overly complicated. Software development has also tended to greatly lag more effective system utilization.

Electronic publishing is now evolving towards computer systems that embody a higher degree of information integration which, in turn, is leading towards a concept of a knowledge base. Knowledge-based publishing evolves a fully interconnected network of several elements of information which provide the basis upon which the system is built. Some distinguishing features of this evolving technology are:

. Information is stored in machine readable form

. Multiple uses are possible such as graphics, insertions, typeface styles, non-publications, on-line search and retrieval

. Information entered once correct remains correct (CD-ROM applications)

. The system anticipates user needs

. Ease of access and ability to accommodate new information and utilization

- A system that can learn. Once having responded to a given element type the system will handle every future occurrence and can repeat the command without complicated user entry.

- The system can also incorporate art, graphics, as well as audio and video signals

- A system that allows for creativity in publication or publishing.

The following chapter assesses individual technology segments of electronic publishing in greater detail within a Canadian industry and market context.

6.0 AN ASSESSMENT OF SPECIFIC TECHNOLOGICAL APPLICATIONS OF ELECTRONIC PUBLISHING

In this chapter a summary assessment of the following segments of electronic publishing is undertaken:

- Desktop Publishing
- Courseware Publishing
- Regional and Remote Printing
- On-Line Data Base Publishing
- Standalone Data Bases and Optical Publishing

Readers are reminded that separate reports are available for each of these segments that provide a more detailed assessment.

6.1 Desktop Publishing

6.1.1 -- Definition

Desktop publishing (DTP) is a means of automating the pre-printing phase of document production. It promises to bring publishing costs down, speed up communications, and cut total yearly publishing expenditures by as much as fifty percent. It employs microcomputers, peripherals, laser printers, and software to produce professional-looking documents containing text, data and graphics. The low-end laser printer is the technological innovation underpinning the market success of desktop publishing.

6.1.2 -- Technological Profile

At a minimum, a DTP system is comprised of a microcomputer, a laser printer and a page composition software package. The

hardware configuration can be expanded to include scanners and other special input devices. Drawing, painting and graphics software can be added to the basic page composition package. Depending on what is included, the DTP system will cost from $8,000 to $30,000.

In the United States in 1985, American businesses produced over 2,500 billion pages of printed material. By 1990, it is projected they will be producing 4,000 billion pages annually. The appeal of desktop publishing is that of a means to reduce a portion of the enormous expense now incurred in the production of documents. Vendor spokesmen have claimed that desktop publishing has the potential to reduce the publishing expenditures of an organization by 25 to 50 percent, yielding an initial return on investment in the range of 30 to 60 percent.

Several developments in the microcomputer industry have directed the evolution of the desktop publishing phenomenon. In 1984, Hewlett Packard introduced the LaserJet, an 8-ppm (page per minute), 300-dpi (dots per inch) laser printer. Designed for the IBM PC and compatibles, it could print graphic images and text in an assortment of fonts.

As the installed base of these low-end laser printers began to swell, market-driven software developers began investigating low-cost "typesetting" as a potential application. Their intention was to serve the needs of individuals who lacked training in typographic techniques. These packages allowed the unsophisticated user to compose documents with text and graphics. The document would be displayed on-screen as it would appear on hardcopy output of the laser printer.

Among the major microcomputer vendors, Apple was the leader in promoting the concept of DTP. By 1983, it was becoming clear that the IBM PC with the MS-DOS operating system had become the microcomputer standard for business data processing. Apple, therefore, needed to stake out a new market niche for itself. DTP had the advantage that it relied upon capabilities where consumers still perceived Apple to be the leader: graphics and screen resolution. In 1985 and 1986 Apple captured well over 70% of the North American market for DTP hardware.

Cost

While a DTP system involves an initial investment, it still appears to be a cost-effective substitute for conventional typesetting. An information investigation of typesetting services in Toronto uncovered typesetting charges ranging from about $25 to $65 per page for text-only copy, and from $40 to $100 per page for copy that includes both text and graphics. Taking $40 per page as an arbitrary average, the $20,000 DTP system (ignoring such factors as labour, paper and other costs) is paid for after it produces the 500th page of material which previously would have been typeset.

The respondents clearly felt that the DTP systems quickly paid for themselves. Just over sixty percent (60.9%) indicated that they expected their DTP system to pay for itself within two years.

Quality

While financial savings are a key benefit of desktop publishing, the trade-off for some users will be a deterioration in

document appearance. At this point in time, desktop laser printers provide output with a 300 dpi resolution. In contrast, typesetting services start at 600 dpi resolution and go as high as 2400 dpi. The result is a much sharper, cleaner looking document.

Benefits

DTP users enjoy using their technology and are enthusiastic about what it allows them to do. In descending order, the eight key benefits as derived by aggregating user responses are:

1. Lower Costs
2. Quicker Turnaround/Improved Productivity
3. Increased Control
4. Increased Flexibility
5. Time Saving
6. More Suitable Quality
7. Improved Image
8. Increased Creativity

6.1.3 -- Market Structure

Desktop publishing is now one of the hottest growth segments in the computer industry. It is estimated that in 1985, the Canadian DTP market was $50 million (Canadian) and that by 1991 it will be $439 million.

The DTP market is composed of three basic elements: workstations, input/output devices and software. Included in the workstations category are microcomputers purchased specifically to be used in DTP configurations. The vast majority of these microcomputers will have either an Apple or IBM compatible architecture. A small portion (5% or less) of these workstations will have other machine architectures such as that used in the Xerox Documenter.

Lasers and scanners are the two main input/output devices. In terms of market revenues, the laser is the key peripheral unit. Among the respondents to the study survey, only one in five reported having even one scanning device.

Desktop publishing systems are being used for two basic types of applications: general corporate publishing and commercial publishing:

1. **General Corporate Publishing** includes internal documents, reports, proposals, memos, letters, marketing and sales literature, product brochures, fact sheets, customer newsletters, bulletins, forms design, telephone directories, and price lists. They share the common characteristic of not being produced for sale. In addition to text, they often contain other information in the form of spreadsheet tables, pie charts, bar charts, and line drawings.

   Information-intensive organizations such as consulting firms, advertising agencies or insurance companies which must produce many professional looking documents, will make up the largest customer base for DTP systems. In the non-profit sector, government agencies, educational institutions, and industry associations also have extensive corporate publishing requirements.

2. **Commercial Publishing** includes newsletters, newspapers, magazines, and books. According to the Gale Directory of Publications (1987) there are 2,075 commercial publishing sites in Canada, including daily newspapers, weekly newspaper, magazines and newsletters. Statistics Canada reports that in 1984 there were 177 Canadian book publishing operations.

Desktop publishing systems are not of interest to the larger commercial newspaper, book and magazine publishers because of their existing investment in high-end equipment. However, for publishers of weekly newspapers, newsletter producers, and for small or regional book and magazine publishers, desktop publishing represents a viable instrument of cost reduction. Indeed, for some smaller Canadian publishers, the advent of affordable desktop publishing systems provides a window of opportunity for start-up and market entry.

In terms of users, the most popular DTP application is newsletters. Just over half (50.9%) of those surveyed stated they were publishing newsletters. Desktop publishing will have its greatest impact on small publishers, who can use the system to eliminate or reduce typesetting ends, resulting in improved cash flow that will allow smaller publishers to produce more titles each year. Newsletters will become a growth industry under the influence of desktop publishing. In this regard, the democratizing influence of DTP will become apparent as the technology allows Everyman to construct his own soapbox.

The least popular DTP application, in terms of the number of users, is book publishing. Only 6.8 percent indicated they were in the business of publishing books, and on average each published 11.8 books per year. Distribution, of course, is 100 percent external. Book publishers find desktop publishing to be a great aid in making revisions or in producing updated versions of previously published titles.

In terms of production volumes, the most popular DTP application is letters/memos, including internal correspondence, stationary and letterhead. Only 30.5 of the respondents indicated they use their DTP system for this purpose, but on average they generate 307.2 letters per year.

Desktop publishing poses a major threat for commercial type-setters, at least in the short term. One of the major findings of this study is the extent to which DTP represents a migration away from the use of typesetting and other outside services. Almost inevitably, users mentioned that any savings they expected from DTP were in the form of reduced typesetting fees. Given the rising popularity of desktop publishing, it is likely that the typesetting fraternity will experience a shake-out and rationalization over the next five years.

Despite the gloomy outlook, there is still a significant role for traditional typesetters to play. They will be asked to undertake tasks for which DTP systems or their operators are incapable or unsuited. This will occur especially when high quality, volume production, or personal service is required.

6.1.4 -- Market Opportunities

Manufacturing

Less than 5% of the equipment used in Canadian DTP systems is manufactured in Canada. Major barriers exist for Canadian firms wishing to enter the market for either DTP microcomputers or input/output devices. The DTP microcomputer market is split between the Apple and IBM machine architectures. Hence succeeding as a manufacturer of microcomputers for DTP configurations, means first achieving credibility as a manufacturer of either Apple or IBM compatible microcomputers.

Software Packages

Possibilities are better in the software market where success depends heavily on having original ideas and programming skills rather than on being able to invest in state-of-the-art physical plant.

System Integration

Instead of developing its own packages, a software developer can earn revenues in the DTP market by joining several packages together that perform various functions (eg. graphics, page composition and drawing). Then by adding the appropriate hardware, the firm markets a complete, "integrated" solution to the end-user. This has been the strategy pursued by Corel Systems Corporation of Ottawa. Since being founded in 1985, Corel has become the leading DTP systems integrator in Canada. Corel offers a full range of software functions with bilingual capability. Hardware components can include scanners, optical storage drives and LAN servers. Depending on the client's needs, the cost of a system ranges from $10,000 to $30,000.

6.2   Courseware Publishing

6.2.1 -- Definition

Courseware is a loose product concept, related to an aggregation of instructional and educational activities in industry, homes, schools and colleges, using computer-assisted techniques in the teaching/instruction process.

Essentially, electronic courseware is really computer-based instruction not about computers but using computers as an end to learning and teaching. The computer can be used to generate materials such as tests and evaluation forms. The computer can also be used for instruction and educational purposes such as specifying activities to be completed by students, or

providing students with drills and tutorials. Computer-assisted instruction can be independent of the teacher or instructor where the computer manages the instruction and provides the materials as a self-contained completely self-sufficient unit.

Computer-based training is used in industry for specific subject matters such as technical training, i.e. management training.

6.2.2 -- Technological Profile

The development of educational courseware requires two principal ingredients: an authoring language and some form of computer equipment on which the courseware can be presented to the student.

Authoring languages available range from general-purpose "programming-like" languages, developed for either general-purpose or authoring use, through to high-level "fill-in-the-blanks" tools. Complete computer-assisted instruction packages may include components from several levels. In general, the higher the level the easier the lesson is to author. As is the case with many other personal computer-based applications, the trend is towards easy-to-use tools, given that the authors are unlikely to be computer specialists.

Computer Systems for Training Courseware Presentation

For industry, IBM and IBM-compatible hardware has become the de facto industry standard. Although IBM has recently introduced the new PS2, the basic IBM PC/PC Clone standard is

very strong in the corporate marketplace. The Apple MacIntosh is an increasingly accepted standard for graphics applications.

In some industry applications, the training is presented using a combination of computer and other media. In particular, where the training is for computer-related applications, courses are being developed that use multi-media materials, including written text, audio tapes, video tapes and courseware components -- particularly for drill and practice.

Computer Systems for Educational Courseware Presentation

Hardware used in the educational field has been much less standardized than that in industry. Early uses were primarily operated on minicomputer and mainframe systems using multi-user capabilities. Such systems were used in only a limited manner (primarily in community colleges and universities) and are unlikely to grow any further.

The personal computer has become the delivery mechanism of choice. The variety of delivery systems available reflects the fragmentation and limited standardization in the general microcomputer market. In the cases of Ontario and Quebec, government standards have been set for the acquisition of hardware technology. Generally, the Canadian software market has been fragmented. Commercial distributors identify the primary markets as being "Commodore-based" in the East, "Apple-based" in the West, with a limited, but growing market for IBM-based products.

Costs for Training Courseware Development

The cost of producing a major generic industry courseware package (i.e. such as basic electrical theory) is as much as $1 million. This level of cost prohibits many companies from developing generic courseware packages for general sale. Those companies that do are usually restricted to a few titles. The majority of courseware packages cost between $100 and $500 to purchase, although many cost much more. The cost to develop really excellent interactive programs are much higher.

Authoring in-house courseware accounts for most of the money spent on computer-based instruction because custom designed courseware is so expensive to purchase. Computer-based instruction teaches performance and task-oriented subjects well. Since it is almost one-half the cost of conventional training methods, it is a viable way to teach performance or technocratic subject matter.

Computer-based instruction appears to be economically effective when:

- It contributes to lower overhead.

- The rate of change in industry is neither too fast nor too slow.

- Capital/labour ratios are high.

- There are economies of scale to be gained from many trainees.

Costs for Educational Courseware Development

For the education market, an average software package can cost anywhere between $50,000 and $500,000 to develop. A

representative of the Ontario Ministry of Education suggested that the average contract for a package was in the $110,000 range. The timeframe to develop such a package could be from 12 to 18 months -- 4 to 6 months to design the program, 4 to 6 months to program, edit and debug, 3 to 6 months for tests, 1 to 2 months for production. This compares with about 18 months to produce a textbook.

6.2.3 -- Market Structure

6.2.3.1 -- Training

The Canadian Market for Training Courseware is Currently Estimated to be $150 Million

At present $5 billion is spent annually on all kinds of training in Canada. Of this amount some 10% or $500 million is spent for discretionary purposes such as computer software and hardware. Of this amount it is estimated that some 30% or $150 million is spent on computer-assisted training. Growth in the market has been soft.

Courseware products tend to be generic in nature and generally deal with technical subject matter. The costs of producing more "custom" products that are more individually orientated (i.e. management training) are too high to be cost effective.

Users tend to be large organizations. The single largest contribution to the growth of computer-based training is the spread of microcomputers already justified for other reasons. As a result the incremental cost of running a computer-based training program drops.

Training Courseware Development and Supply is Dominated by U.S. Firms

Developers in the corporate training sector are largely dominated by U.S. firms or firms with U.S. parent companies. These organizations are far more capable of investing substantial sums of money to produce generic training materials for the large North American market. They have a distinctive advantage over Canadian-owned and managed companies with more limited resources and certainly a more limited domestic marketplace.

6.2.3.2 -- Education

Canadian Schools are Spending Over $100 Million Annually on Computer Hardware and in Excess of $10 Million Annually on Software

The installed base of computers in Canadian schools now exceeds 120,000 computers. In the 1983/84 school year Canadian schools spent $122 million for computer installation. Annual software expenditures have been in excess of $10 million. It is estimated that the Educational Council of Canada has a database for education software that contains 1,900 entries. However, Canadian educators rely heavily on U.S. produced software in floppy disk format. School boards and individual schools account for the vast majority of software purchases.

The Education Courseware Market is Highly Fragmented

In the education sector, it is likely that, unless one predominant hardware standard is adopted, the market will be too

fragmented to make commercial software development really valuable to the individual developer. No one is willing to project whether such a standard will ever become reality. Until the 1983/1984 school year, school boards funded computer purchases primarily from existing budgets. In the future, however, it is probable that provincial subsidies will contribute substantially to the purchase of hardware and software based on five year plans submitted by the school boards.

The Ontario Ministry of Education invests software development funds so all school boards in the province will have free license to the software. Some 65 to 70 producers are supported by the Ontario Ministry (the 1987/88 budget is in the order of $6.5 million). Almost all are part-time or very small companies. As a result, it is difficult for commercial firms to survive in this market segment in Ontario, unless they are connected to the Ministry of Education.

The Council of Ministers of Education in Canada evaluates software sent from all provinces and maintains a database of software for access by all members of the Council. Although it does not act as a distributor or a supplier per se, the Council is becoming an important link in the distribution chain for educational software.

The most visible presence in the educational market are book publishers and distributors. These organizations, already equipped to sell low cost/medium-to-high volume product to this market, have seized on the courseware business as a logical extension of their main business.

6.2.4 — Market Opportunities

Education

This is the longer established marketplace in product, applications and suppliers. However, new and evolving opportunities continue to appear.

. Elementary and high school programs continue to have a major need for computer-based instruction that is closely linked to curriculum (while some curriculum related work is being done, most of the products being offered are more generic in nature).

. With well over 90% of material on offer being non-Canadian in origin, there is a continuing demand expressed for Canadian-oriented materials (with the qualification that these must be well done and at least comparable in quality to U.S. offerings).

. Since the key problems here seem to relate to methods of evaluation and distribution, there may also be opportunities related to the electronic distribution of courseware for both production use and for evaluation purposes.

. The development of an "electronic" journal for schools to provide information and an assessment of courseware that is available, offering modified (Canadianized) foreign courseware packages where Canadian firms have acquired the rights to modify U.S. Packages for the Canadian market.

Training

The training segment is somewhat less established and more volatile than the educational one. The largest and most hotly competitive segment is that related to training around the use of computers. However, organizations who can effectively move beyond this area are likely to reap significant benefits.

Some of the areas identified have included:

- The continuation and improvement of the use of computer-based training on the training and application of computer systems (particularly in the area of end-user computing).

- Customized training (often combined with video/CD ROM applications) for end users -- both for internal corporate users and retail-consumer markets (in this case using computer-based instruction for both training and marketing purposes.

- "Full range" training development services for business, particularly for the small organization (which will not have its own specialist training resources).

- Varieties of "classroom" training (an existing and growing market -- particularly in connection with end-user computer applications) -- offering opportunities to both specialist training organizations and an additional potential business for computer retail stores.

- Authoring/co-ordination of major training programs for larger corporations (especially in those cases where the finished product will be used by third parties -- such as consumers or distributors/retailers).

- The development of packages intended to assist basic job training and skills upgrading within organizations.

6.3 Regional and Remote Printing

6.3.1 -- Definition

Remote printing involves the transmission of complete pages of typeset text and graphics from a central location to regional or remote sites for printing and distribution to readers. Remote printing on a large scale generally involves the use of some form of electronic data transmission. Although competing technologies such as microwave, land lines, and fibre optics are available, satellite transmission is preferred for reasons of economy, reliability and flexibility.

By collapsing the lead time required to get a publication into the hands of distant readers, remote printing allows a publisher to combine timeliness with in-depth analysis. Other benefits include the inclusion of more late-breaking news, faster and more efficient production, and greater latitude to meet editorial, advertising and distribution deadlines.

6.3.2 -- Technological Profile

Regional printing is not yet a widespread phenomenon. In the United States, where the practice is most extensive, there are only two periodicals and five daily newspapers with remote printing facilities. In Canada only The Globe and Mail has a satellite-based regional printing operation.

The three main elements of a remote printing plant are:

(1) the printing equipment

(2) the laser scanners or facsimile machines for digitizing data, and

(3) the transmission equipment.

In building a plant from scratch, the largest single expenditure is for the press units, electronic pre-press equipment, and peripherals. Reliable estimates place the cost of purchasing and housing this hardware at about $25 million (Canadian). A single high-end laser scanner costs approximately $75,000 (U.S.), making the cost of outfitting a single remote plant with two scanners about $200,000 (Canadian). Satellites are the most commonly used transmission (Telesat Canada's ANIK "D-2" Satellite). Satellite transmission costs include charges for the terrestrial stations at the remote sites, the central office facilities and the leasing of the transponder capacity.

Cost

The cost of such traditional distribution methods as freight and the mail service was not a significant consideration for any of the North American publishers who have adopted a remote printing strategy. According to one source "transportation costs are a minor issue that can almost be set aside".

Performance considerations relative to newspaper circulation were far more important, especially remote printing's capacity to reduce disruptions on the distribution channel. This helps to guarantee circulation, a crucial concern because, "if you're in the newspaper business, you have to deliver newspapers on time".

Performance

In terms of performance, The Globe and Mail found both second class mail and airplane service supplemented by local delivery systems to be unreliable and therefore, unacceptable.

If the press run was late, the Toronto originating flight and all connecting flights were missed. When snowstorms occurred or when airplanes were overloaded with freight or with passengers, newspapers were assigned a low priority and would often be bumped off the flight. The result was missed deliveries, a low level of service, and a correspondingly low level of consumer confidence. In some weeks, The Globe would miss deliveries on three out of six days a week in Winnipeg.

With remote printing, in the last six years the Globe has experienced no major transmission problem and it has never missed a printing deadline.

6.3.3 -- Market Structure

There are two major reasons for establishing remote printing operations. The first, and by far the most important, is to increase revenues. The object of the newspaper business is to build circulation because the more newspapers delivered, the higher the rates for advertising space. Due to the perishable nature of current public affairs information, the only way for a non-local publication to increase circulation is to provide same day, on-time delivery -- to get the news to the public while it is still news. An inability to accomplish this task consistently leads to frustrated customers, canceled subscriptions, and ultimately, reduced revenues.

The second reason for adopting a remote printing strategy is to reduce the cost of getting the publication into the customers' hands. This involves cutting the long-distance freight and/or postage charges. For the North American publications interviewed for this report, justifying remote

locations on distribution costs is strictly incidental to the market-driven rationale. The five major criteria necessary for justifying a remote printing operation are:

1. a national product
2. markets distant from the central editorial offices
3. adequate circulation
4. time sensitivity
5. physical mass of the publication

The two most important elements are a national product, which implies the criteria of distance and circulation, and timeliness.

For Canada, the Globe and Mail is currently the only publication that can meet this criteria, and as a result is the only publication that is utilizing remote printing technology.

6.3.4 -- Market Opportunities

Outside of the Globe and Mail most Canadian daily publications do not meet the basic criteria that would justify remote printing. Most daily publications are too closely identified with their own cities or region. It would require a strategic change in format such as developing a publication like a Canadian version of USA Today or a daily financial newspaper that is more comprehensive than the Globe's Report on Business.

Weekly Publishers

It is very unlikely that a remote printing strategy would be viable for a Canadian weekly such as Macleans Magazine.

6.4 On-Line Data Base Publishing

6.4.1 -- Definition

An on-line data base is a package of information for sale by information retrieval or timesharing services. The customer uses the data base by means of interactive computer terminals and data communications. Data bases may represent a publication, a collection of publications, an index, a file, a catalogue, or a set of statistical or textual reference data.

There are two broad categories of on-line data bases: reference databases and source databases. In the case of reference databases they refer or "point" the user to another source. There can be bibliographic databases containing abstracts of printed literature such as journal articles, reports, books and newspaper articles or referral databases which contain references or summaries of non-published information such as organizations, individuals or other non-print media for further information.

In the case of source databases they contain complete data or the full text of the original source information. This includes the four following categories:

Numeric — original survey data or statistical manipulation of source data

Textual-Numeric — records that contain a number of data elements or fields with textual information and numeric data

Properties — dictionary or handbook type data, typically chemical and physical properties

Full Text — contains the complete text of an item such as a newspaper article.

6.4.2 — Technological Profile

On-line database publishing was first developed in the 1960s with the timesharing and information retrieval systems. However the on-line industry really only began as a commercial industry in the early 1970s. At present there are an estimated 81 publishers of Canadian on-line databases.

The early technological environment associated with on-line databases was largely a mainframe to dumb-terminal configuration. Access to these databases resident on the mainframe was provided on-line between the terminal and the mainframe on which the data was resident. All analysis of the data was done on-line on the mainframe CPU since the terminals were mostly incapable of downloading segments of data for analysis off-line. As a result of these technological dimensions usually only larger organizations with an installed mainframe computer system and terminal network were users of centralized, mostly proprietary, databases during this first development phase.

Developments related to new storage media, advances in communications networks, better and more intelligent software and in particular the development of powerful personal computers have all impacted on more widespread development and use of on-line data bases. Effectively these technological developments put mainframe computer power within reach of a wide group of users, via their own desktops.

Changes in Hardware Technology

There are three basic aspects of hardware technologies which are creating an impact on database publishing. These are:

. Data Storage Technology
. Data Entry Technology
. Computer Processing Power, Especially PC-Based Power

New data storage technology such as CD-ROM, digital video discs, OROM, laser card, write once/read many times (WORM), which are described in the following sections dealing with optical publishing, and new high density magnetic discs, are among those data storage technologies which could have a major impact on centralized database publishing. Of these various new technologies it appears that CD-ROM is likely to have the most dramatic impact because of its ability to store large textual files, graphics information and photos. Most on-line database producers are expected to publish at least part of their data in CD-ROM format. CD-ROM (and other related new storage media) offer the advantage of high density data storage at low cost providing centralized database vendors the opportunity to offer new products and/or the same product at a lower price, as a means of attracting new customers.

Changes in Data Entry Technology

Converting data from standard print on paper format to machine readable form via keyboarding has been one of the most inconvenient aspects of database maintenance.

The alternatives to data entry via keyboarding are by means of optical scanners, image scanners and audible entry equipment. The growing use of this technology can be attributed to the ever increasing volume of data which must be entered as well as the cost and inaccuracies associated with manual data entry.

Software technology is critical to successful database publishing. Software is used in the management of numeric text and graphics and is the major factor influencing the user's perception of the ease and functionality with which information can be obtained from published databases.

When public access on-line databases became available in the early 1970's, the users were primarily information specialists who learned the specific commands needed to operate the software. In the early 1970's, there were only about a dozen on-line databases in total.

Today there are more than 400 major vendors of database services and over 3,400 individual databases. The problems of being fluently conversant with all of these systems are significantly greater than they were in the early seventies. Most on-line database search specialists will individually only master commands for 5 to 10 databases. Problems of data access are even more serious when attempting to get "end users" to directly search for their required information on their own.

The development of frontend and intermediary technology is of particular help to novice and infrequent users of on-line databases who are unwilling to memorize the detailed specifics required of on-line searching. They are micro computer-based software packages which help establish search questions and strategies. Intermediary systems are usually menu driven search process guides, linked to a single database, which prompt the searcher by suggesting terms to use in the search process.

Database Networks and Gateways

On-line vendors have responded to the proliferation of databases through the creation of gateways. These gateways direct users to one or more on-line databases resident on different computers through networks managed through a gateway system computer. There were 52 gateways in existence in 1987.

6.4.3 -- Market Structure

By every measure possible the world' on-line database industry has grown significantly since 1980. Once consisting of little more than a dozen public access on-line databases in the early 1970's, the on-line publishing industry now offers over 3,400 data bases to the public.

The Cuadra/Elsevier Directory of On-line Databases lists 81 Canadian on-line databases. These databases are supplied by about 60 separate organizations in Canada. Canadian produced databases represent 2.3% of the world supply of on-line public access databases.

On-line database industry revenues doubled in Canada between 1980 and 1986 from 22 to 44 million dollars per year. The Canadian on-line industry serves 22,000 subscribers. It is likely that Canadian on-line industry revenues will double again by 1990 or soon thereafter. In spite of these impressive growth statistics, however, on-line publishing still only accounts for about 2% of all computer service industry revenues in Canada.

While a relatively new industry, it has already experienced a major restructuring through merger and acquisitions to eliminate redundant marketing, cost rationalization of broadening the market base and to develop economies of scale.

There are now about 440 on-line database companies in North America including syndicated research and reporting service companies. Of these 400 companies, 80 are owned by 5 large parent companies and account for almost one-half of total industry revenues. The 6 largest corporations in the on-line database industry are Dun and Bradstreet, International Thompson, McGraw-Hill, International Data Group, Mend Data Central and IMS.

The major on-line database producers and vendors in Canada are InfoGlobe, a division of the Globe and Mail, the Conference Board of Canada, I. P. Sharp, Statistics Canada, Dialog, and Data Resources Incorporated, a division of McGraw-Hill. Each provide services to at least 20% of the on-line database subscribers in Canada. Six of the 15 larger on-line database producers/vendors in Canada are Canadian-owned and controlled companies.

In 1985 about 95% of the on-line market in Canada was represented by large corporate and government users. Discussions held with selected industry representatives during the course of this study indicated that large corporate and government organizations may now account for perhaps only 66% of the on-line users. Medium-sized companies ($10 - $40 million in annual sales) now appear to account for about 22% of on-line users. There is still a significant market potential for on-line services to small and medium-sized companies.

6.4.4 — Market Opportunities

Market growth in the industry, overall, has slowed somewhat since 1983. The number of on-line users has not kept pace with the increased supply of database services.

Forecasts would seem to indicate that the Canadian on-line industry will achieve total revenues of between $70 to $100 million by 1990. These growth projections are expected for the following reasons.

- continued strong demand for textual data

- increased sales of PCs and modems

- declining costs of accessing on-line databases

- improved products and technologies making databases easier to use and more productive

- the development of more industry specific vertical market databases

- the push for increased office automation

- more aggressive marketing by Canadian database vendors.

Canadian database producers see their best opportunities lying within subject areas pertaining to Canada. Several industry officials interviewed for this study felt that it would be difficult to sell Canadian data to other countries such as the U.S. since there did not appear to be a large demand for on-line published material in Canada.

The following areas were specifically referenced as potential opportunities for new product development:

. on-line data on education in Canada

. additional on-line products for banking and financial markets

. development of niche databases focusing on special interest areas such as AIDS, hazardous wastes, and advanced technology.

. image databases such as medical x-rays, satellite images, picture files, etc.

. geographic databases including maps and other geography information in Canada which can provide data in geocartographic formats.

Technolgical development could also greatly expand market opportunities for the on-line industry. This could include the development of artificial intelligence software where the end user will be able to make an enquiry in natural language, have the AI software identify both the goal and the scope of the research and then access databases from many different locations.

Artificial intelligence (AI) software has grown from information processing theory and has become a topic of much research in the past decade. The great advantage that AI software brings to on-line database publishing is its capability

to deal with the contextual aspects of information, matters of pure content as well as accepting and comprehending natural language in handling information requests. Once effectively developed AI software will significantly increase the number of end users capable of doing their own database searches. It could also significantly improve the effectiveness of search results.

AI software will likely be used to input data as well, adding new information to the system and automatically indexing the information in the database for future access based on patterns of enquiry and domain area knowledge.

AI technology will have an impact on conventional databases from both the producer's and the user's perspective. AI technology will make it much easier for producers to structure, update and maintain their databases. It will simply become possible to manage much larger databases with lower labour costs because of automatic indexing, and automatic abstraction. It will also become easier to greatly increase domain subject coverage by linking separate databases into integrated systems using AI technology.

From the user's perspective AI technology will make large complex databases more easily accessible because interface systems will require less technical skill of end users and will provide greater expertise to assist in the search for relevant information. This will in turn increase the market demand for use of conventional databases.

6.5   Standalone Data Bases and Optical Publishing

6.5.1 -- Definition

Optical media that is currently available for database publi-
cation is a relatively new technology. Unlike other segments
of electronic publishing that have been examined in this
report, a specific market/industry for standalone database
publishing using optical media is only just forming.   As a
result it becomes impossible at this point in time to analyze
its market impact.   Rather the discussion that follows focus-
es on the technology itself and an analysis of its applica-
tion and potential market opportunities.

6.5.2 -- Technological Profile

Currently there are a number of optical media available that
are being used or could be adopted for use in publishing
standalone databases. Essentially they are all computer per-
ipherals, integrating computers with the process of publish-
ing.   An inventory and assessment of these technologies was
carried out.   The following sections describe some of the
more prominent technologies that are emerging in the market-
place.

6.5.2.1 -- Compact Disc - Read Only Memory (CD-ROM)

Of the various media available for optical publishing, CD-ROM
is the most advanced of the publishing technologies to date
in terms of commercial development, market introduction, ac-
ceptance and the establishment of industry standards.

Compact discs (CDs) appeared later on the market than optical
videodiscs.   While the videodisc was first shown in 1973 and

made available commercially in 1978, CDs were shown in 1980, and released commercially in 1983. In spite of this lag, however, sales of CD players to the public have already surpassed sales of videodisc players. The CD player has been described by a number of sources as one of the most successful launches of a consumer electronic product ever, with several million players sold within two years of its introduction.

Part of the reason for this is that compact disc systems are all standardized on the format and digital recording techniques designed by Phillips and error detection and correction systems jointly developed by Phillips and Sony. The main aim of the standard is to achieve total compatibility so all CDs produced to the standard can be played on all CD players designed to meet the standard. The standard is popularly known as the 'Red Book'.

Within two years of the launch of the first commercial CD disc player, Phillips showed a CD-ROM (Read Only Memory) player which was a direct adaptation of the CD system for publishing and data processing applications. Both CD-ROM and CD-audio discs are produced using the same physical mastering and replication processes.

CD-ROMs are designed to store digital data whereas CDs were designed to store digitally encoded audio information. The result is that the CD-ROM "Yellow Book" standard has made provision for more accurate addressing of data and for an extra level of error detection.

The principal advantages and disadvantages of CD-ROM technology are as follows:

Advantages

1. High Storage Capacity

One CD-ROM disc possesses the capability to hold 550 megabytes of data which is the equivalent of 250,000 pages of coded text, or equal to what could be captured in a stack of 1,500 floppy discs.

2. Low Cost

CD-ROM technology is based on a mass-produced audio medium and hence, disc and media costs can be kept low.

3. Standardized Formats

The computer and information industries have cooperated to develop a file format which should enable CD-ROM designs adhering to that standard to be read by a range of different operating systems running on different computers which are in turn linked to different CD-ROM drives.

Disadvantages

1. Extended Turnaround Time

The data preparation, premastering, replication, checking, packaging and distribution cycle is a complex one and turnaround times are inevitably long. No publisher, at present, is considering a more frequent than monthly update cycle. The implication of this is that in many cases, material published on CD-ROM could be eight weeks old by the time it is available to the user.

2. Technology Change is Rapid

Even in context of the fact that there exists an industry-wide standard for CD-ROM production, the CD-ROM is a computer peripheral and the PC market is extremely volatile and competitive. While this results in cost reductions in hardware, widening the market for CD-ROM products, it can also pose the publisher certain problems as the computer and software companies continue to update operating systems and hardware ever more rapidly in order to gain competitive advantage.

3. Relatively Slow Access

Since CD-ROM is based on the CD-audio Constant Linear Velocity format, it exhibits slow access time and hence, databases and retrieval software must be designed to overcome this limitation.

4. Poor Development of Graphics

CD-ROM technology lacks development in the direction of graphical memory representation. Most current CD-ROM systems deal only with coded textual materials.

6.5.2.2 -- Recordable Digital Optical Discs

Recordable digital optical discs allow users to record data on the discs themselves in-house. These discs are often called WORM (Write Once Read Many Times) discs. The name, however, is somewhat misleading. Data may be recorded more than once. In fact, storage could be carried out over a

number of years until the disc is full. It is not, however, possible to overwrite data onto a sector that has already been used, or to erase and re-record data on the same sector. This characteristic makes WORMs an ideal archival medium, likely to replace magnetic tape in a number of applications as a data archiving medium and, in some applications, microfilm, as a way of storing facsimile scanned images of documents.

6.5.2.3 -- Erasable Digital Optical Discs

Erasable digital discs can best be viewed as a third generation of optical discs which will give users the ability to not just record data on the discs but the ability to erase and re-record data many thousands or even millions of times on the same track sector, just as they can with magnetic media today.

The latter facility is essential for many active computer applications whose files must be retrieved, modified and re-written on a regular basis and the majority of operations and applications software packages assume the use of erasable media. Hence erasable optical disc suppliers will be aiming to compete directly with both flexible and rigid magnetic discs for a share of the computer storage peripheral market.

6.5.2.4 -- OROM - Optical Read Only Memory

The key advantages of CD-ROM as a publishing medium are standardization, high storage capacity, the availability of mastering and replication facilities, and relatively low cost

hardware. However, there are two drawbacks associated with CD-ROM technology which may leave it vulnerable to OROM for certain applications. One is the relatively slow access times of as much as 1 to 2 seconds in current CD-ROM drives. A second drawback is that the CD-ROM is 4.72 inches in diameter and hence it is not compatible with the emerging 5.25 inch WORM discs and prototype 5.25 inch erasable optical discs.

A number of companies, the first of whom was IBM, floated the concept of a 5.25 inch read only optical disc, called OROM or Data ROM. This new medium could operate in the 5.25 inch optical disc drive environment which is capable of accepting read only, write once, or erasable optical discs. Thus, not only would ROM be compatible with future optical media standards, but it would possess a faster access time and data transfer rate. Such a medium would be easily adaptable to higher storage densities as they become feasible and would serve the high-end computer marketplaces where multi-user access was a requirement.

In the long term, CD-ROM and OROM will settle into their own niches in the optical storage media marketplace. In commercial publishing application, the emphasis will be on low cost workstations, standards and the widespread availability of mastering and replicating facilities and data penetration facilities. CD-ROM is already meeting these requirements for technical publishing applications. As well, from many technical publishing applications where CD-ROM is in competition with existing paper and microfiche-based systems, the key requirements will be low cost work stations and low replication costs for the media. In other words, the CD-ROM media will not likely to be challenged by distributing commercial databases, reference works and images to PC users.

However, OROM will be a high-end product meeting the data distribution needs of mainstream computer users. For software distribution and the distribution of raw data and graphics libraries for use in particular computer systems and for a number of in-house data distribution applications, OROM looks potentially attractive.

6.5.2.5 -- WORM Discs

Two key application areas exit for WORM discs - as a data archiving medium in competition with magnetic tape and for the storage of facsimile scanned images of documents in competition with microfilm. Current twelve inch WORM discs and forthcoming high storage capacity 14 inch discs from Kodak and others will be used in large centralized systems. There will be little overlap here between WORM discs and CD-ROM systems as in many applications, textual and image databases will be captured and maintained on large WORM discs and then sub-sets of the databases will be downloaded onto a CD-ROM for distribution and sale.

There are a growing number of 5.25 inch WORM drives coming onto the marketplace too and although these will be used to provide PC users with data archiving facilities and as part of PC-based personal filing systems, one of the key application areas for such WORM discs could be the distribution of selected in-house databases and here WORM discs could compete with CD-ROM systems, depending on the number of end users and the need to update the information.

6.5.3 -- Market Structure

6.5.3.1 -- In-House Publishing

The trend within large corporations has been towards centralized data and information systems which are then downloaded

to system users on personal computers. The introduction of CD-ROM technology "bucks" this trend with downloading data and information onto CD-ROM and then distributing it to corporate users. This will allow users to spend as long as they like accessing the CD-ROM database. Given CD-ROM's enhanced storage capacity it will allow users access to much greater data and information. Essentially it leads to a "user-driven" system as opposed to a "data-available" system. However there are disadvantages in using CD-ROM for on-line applications:

. Turnaround Time - data has to be sent outside to have discs mastered

. Lack of in-house skills to handle and update data

. Initial installation costs are high.

6.5.3.2 -- Technical Publishing

A prototype of a CD-ROM-based repair manual is now in existence. This manual is intended for the use of airline mechanics who must closely follow FAA guidelines in any repair procedure. The multitude of parts that make up a modern jet, coupled with the complicated procedures for installing some of them make optical media ideal for this application. The vast textual information can be efficiently indexed and the numerous graphic data can be comprised to maximize disc usage and minimize access time. The primary input device, as it now stands, is a keyboard with a number of programmable keys or 'macros'. Future modifications might include a pointing device which would prove useful in stepping through illustrated parts breakdowns. A voice recognition system that could respond to commands such as "zoom", "scroll", or "next" would also be desirable.

6.5.3.3 -- Commercial Publishing

Commercial publishing can be defined as an application in which a publisher identifies the market for a particular set of information, organizes that information, and then makes it available for a fee. Commercial publishing can be broken into a series of smaller categories which include:

- Software Distribution
- Graphic Data Bases
- Data Base Publishing
- Specialized Information Services
- Reference Works
- Backfiles of Serials

Software Distribution

One of the most attractive applications for CD-ROM will be as a software distribution medium. As today's software becomes more and more complex, the manuals and other documentation are becoming tremendously unwieldy. CD-ROM could be used to distribute the operating system, the application software, the user manuals, tutorials and all other related information. A number of companies are offering software libraries on CD-ROM for PC users.

Graphic Data Bases

Although there are still problems relating to the storage of graphics on CD-ROM, their resolution will allow a number of interesting applications.

One potential use of optical media in the graphics arena is in the distribution of font libraries to printers and publishers with their own desktop publishing systems. As thousands of typefaces exist, they may be scanned and stored in memory so that they may be retrieved for use at the laser printing stage. The amount of memory consumed by one high resolution piece of type is considerable and only CD-ROM would allow large type font libraries to be offered in electronic publishing systems. Large in-house uses of electronic publishing systems could build up their own libraries of unique scanned graphics, including logos, scientific symbols, chemical structures, architectural symbols, and computer flowchart symbols through a system utilizing a scanner, a piece of facilitating software, and a WORM disc.

Another very interesting graphics application area for optical media would be map information. A map data base could be used for computer assisted navigational systems in planes, military vehicles and cars, and for utility companies who could then overlay their pipes or telephone lines and issue their service engineers with CD-ROM drives and monitors so that they could locate broken water mains, etc.

There are four possible impacts which CD-ROM can have in the online database publishing industry. These are:

(1) CD-ROM can be used as an alternative to an existing medium in an established application, i.e. a database is published on CD-ROM rather than made available online;

(2) CD-ROM can be used alongside an existing system in an established application, i.e. a data base is published on CD-ROM and made available online. At best, this significantly expands the market for the data base and at worst, it will fragment the market and simply increase the overhead of the online publishing industry;

(3) CD-ROM can be used to create new applications combining sections of existing databases or distributing new data bases; or

(4) It may not be used at all.

At present, CD-ROM has not yet found its niche in the on-line industry. Applications have been largely experimental or custom in nature.

Specialized Information Services

Specialized information services can be seen as an attempt to target specific groups of professionals, analyze their information requirements and produce specialized libraries comprising all the reference type information that these professionals need to carry out their work efficiently.

Some of the most promising application areas for specialized information services would appear to be medical, legal, financial, scientific and technical areas where works all need access to vast stores of recorded information. In the future these and other new publishers will begin to transfer firstly the index databases to CD-ROM and eventually, much of the full text information itself so that users will be able to search both the index and full text information on CD-ROM via low cost computer terminals.

Reference Works

Reference works are simply more widely used information services such as existing published directories, general encyclopedias, dictionaries, telephone books, travel guides and government statistics.

A Canadian company has developed a CD-ROM package which contains the addresses of 500,000 Canadian businesses on one disk and seven million household addresses. The file can be accessed via name, telephone number, or postal code, with the ability to print mailing labels from the file. This product will have a range of applications in the direct-mail market.

In the Government sector, many economic statistics, census data, or consumer survey data may be made available at a premium on CD-ROM so that marketing departments and researchers could process the data and incorporate it into modeling systems.

Backfile/Collection Distribution

The former five application areas within the commercial publishing sphere, relate to cases where the information distributed on CD-ROM would be actively used and processed by the end users and hence the CD-ROM product would have potentially considerably greater value than the equivalent printed product.

This last application area refers to a specific area which consists of publishing of backfiles of journals and newspapers and the publication of collections of government reports.

Microfiche is often used as a means of distributing facsimile images of the pages of services and reports usually purchased by company information centres to service requests for specific articles and reports. Typically, the indexes to the material are available online so users can conduct a search, identify the specific articles they are in need of, and

request copies of those articles. To satisfy the request the library retrieves the microform, prints out the article or report using a reader-printer or copies the microform if it is a large report and sends the printout or replicate micro- form to the user. In large information centres, and in cen- tralized document supply centres where demand is high the use of two or three systems is cumbersome and time-consuming. Hence publishers and document supply centres are experiment- ing with new techniques for distributing images of articles and reports electronically either on CD-ROM or via facsimile networks.

Although many plans are in place and a few prototype systems exist, there are several technical problems to be overcome before large collections of images can be distributed commer- cially on CD-ROM but it appears that the publishers and docu- ment supply centres see sufficient advantages in such a sy- stem to invest considerable amounts in their time develop- ment.

For the short to medium term, at least, professional applica- tions will constitute by far the largest market for CD-ROM systems because these are the applications where productivity gains can be easily measured and paid for and where the ne- cessary base of computer expertise lies.

6.5.3.4 -- The Library Market

The library market was one of the first potential market areas to be targeted by the optical publishing industry. A number of CD-ROM-based products which are aimed at librar- ies currently exist.

Library Automation Systems

One of the first and most obvious applications for CD-ROM systems in the library market was the distribution of bibliographic databases.

Data Base and Reference Material on CD-ROM

Traditionally, there are three categories of libraries - public, academic and special. Special libraries refer to company libraries and information centres, libraries in public sector organizations including government departments, libraries in research establishments and professional associations and practices, and lastly, large national libraries. Special libraries are likely to represent the most lucrative market for CD-ROM databases, just as they are the heaviest users of online databases. These will be followed by academic libraries and finally by public libraries.

6.5.3.5 -- The Educational Market

There are a number of different potential application areas for optical publishing which fall within the educational sphere.

Applications for CD-ROM publication in the administrative area of education will include catalogues of audio visual aids and educational products for distribution to education authorities, distribution of educational databases, distribution of educational statistics, databases on courses at university, and careers information databases. CD-ROM can also be used to generate test questions.

One of the major barriers for optical based educational courseware for use in primary and junior schools is the problem that CD-ROM and Compact Disc-Interactive (CD-I) based programs will largely be suited for highly interactive individual instruction rather than classroom teaching. The type of courseware that could prove attractive would include educational games whose responses from the class or a small group would lead to visual responses on the screen and, as an audio visual aid, slide sequences with audio commentary and questions and answers which again lead to different slides being shown and different audio commentary.

The secondary school environment is more conducive to individualized instruction or programs geared to small groups. These systems could be installed in libraries, audio-visual laboratories, and in computing departments. Educational games and modeling systems may be attractive in this area while, in the library environment, encyclopedias and phonetic dictionaries will likely be feasible.

Acceptance of optically-based technology in the educational marketplace will likely depend on the success that CD-ROM and CD-I have in the consumer marketplace.

In the higher educational sector, the potential for optical products grows even further, particularly in areas where training courses are expensive and involve the use of expensive hardware and consumables, i.e. medicine, chemistry, electronic and mechanical engineering. In these environments, it will prove cost effective to use simulated systems where the students are motivated to use self-instructional learning materials. The visual content in many training programs is crucial so that for any headway to be made in this area, combination CD-ROM and videodisc systems will likely have to be used.

6.5.4 — Market Opportunities

At this point in time it is extremely difficult to predict the full impact that optical publishing will have on the standalone database industry and the publishing industry in particular. In 1984, the North American market for data storage was estimated at $15 billion, with optical disc systems capturing only .7% or $105 million. For 1988 it has been estimated that the market has doubled to $31 billion. Various estimates as to the optical disc capture of the current market range from 1% to 15%. Taking the mid point of these estimates (7.4%), the current market for optical storage would be $2.2 billion. The Canadian market would be less than 10% or approximately $22 million.

The optical publishing industry is not well developed in Canada. While there are a number of firms possessing the potential to manufacture optical media, very few firms produce the hardware necessary to read that media in this country.

The major players and potential players in the Canadian industry are:

. Praxis Technologies Corp.
. Laser Disc Technologies
. Cinrom
. Americ Disc
. Reteoco Inc.
. Corel Systems Corp.

The first four firms are manufacturing plants that exclusively manufacture CD discs for the consumer market. In the cases of these plants, there are no immediate plans to manufacture CD-ROMs for computer and publishing applications.

The last two firms are producing products for the publishing market. Reteoco is the only Canadian company that has initiated production of CD-ROMs. This firm is developing CD-ROM storage application markets for newspaper back-issues, telephone/postal code lists, real estate and parts directories.

A smaller firm, Corel Systems Corp., is offering a system which includes a personal computer and WORM drive. Other systems firms that are developing the optical storage market include System House which has a division dedicated to optical-based systems and applications and whose clients include the U.S. Navy.

In general, Canadian firms are not well positioned for a large measure of success in the hardware manufacturing area. Various firms in the United States, the United Kingdom and Continental Europe and Asia have a large edge over Canada in this aspect of the industry.

There remains, however, one opportunity of the "hard" side of the optical publishing industry. This opportunity relies on the fact that there exists a fairly large established CD-audio disc manufacturing capacity in the country. With a minimum of retooling all, or portions of, these plants may be converted to production of CD-ROM media. This is not likely to happen in the short term, however, as most disc manufacturing plants in the country are at or near capacity. As demand for CD-audio levels, however, or as supply in various other producing countries increases, any loss of production may be offset by manufacture of CD-ROM media.

On the "soft", or service side of the industry, Canada possesses a great deal of potential. Reteaco Inc. is a good example of what may be achieved in the Canadian market in terms of data preparation services. With the vast amount of government and private sector data bases in existence, there will be a large demand for data preparation services as CD-ROM becomes a more and more accepted information storage medium.

Another area in which Canadian firms could likely succeed is the development of access software. Again, as the CD-ROM medium becomes increasingly acceptable and the installed based of CD-ROM drives reaches a comfortable level, competitive attention will turn to making these systems easier and easier to use. User-friendly software access systems will be in high demand assuming the technology continues to grow. The ultimate extension of user-friendly access software will be front-ends driven by artificial intelligence.

7.0 CONCLUSIONS

Canada's Publishing Industry is Small

The Canadian publishing industry is comprised of almost 1,500 individual businesses, employing 46,000 people with sales of $3.8 million. It is largely characterized by newspapers, magazines and periodical publishing which account for 60% of industry shipments and 67% of industry employment. Book publishing is a relatively modest industry with sales of $567 million annually. Together the entire Canadian publishing industry is less than 8% the size of the U.S. publishing industry.

Book Publishing and Educational Publishing are Dominated by U.S. Firms

Given the size and geographic proximity of the U.S. publishing industry it is not surprising that only 12.3% of the Canadian market is controlled by Canadian-owned book publishers. Canadian publishers do comparatively better in publishing educational texts and materials, but still only account for 33% of the elementary-secondary school textbook market.

Industry Electronic Hardware and Software Requirements are Dominated by Foreign Suppliers

Virtually all the Canadian publishing industry's electronic hardware requirements such as computers, scanners and printers are supplied by U.S. and Pacific Rim countries. While there is a greater supply of Canadian software products, size, economies of scale and consumer product awareness have resulted in the U.S. being the dominant software supplier. In general, the Canadian publishing industry tends to be a recipient rather than a developer of publishing hardware and software.

**Electronic Publishing is an Evolving Technology that has
Resulted from the Introduction of Computers to the Publishing
Industry in the 1960s**

In this century, the first major technological change in the publishing industry occurred with the introduction of linotype typesetting systems at the turn of the century. With the advent of the computer in the 1960s, linotype typesetting was effectively replaced with the computer which could control text production and the initiation of electronic publishing.

The two most prevalent forms of electronic publishing are desktop publishing and database publishing. At the individual level desktop publishing, by means of a micro computer, integrates the editorial or authoring process with publication. The cost of a complete desktop publishing package, which includes a computer, scanner and laser printer, is less than $30,000. Its most prevalent use is as an in-house publishing medium.

With the inclusion of a modem, the desktop publishing system can be linked (on-line) to mainframe database publishing systems or alternatively standalone data and information bases that are available in CD-ROM formats.

Database publishing systems are products of the 1980s that are only just emerging. The Canadian on-line publishing industry is already serving some 22,000 subscribers with both textual information (as in the case of Info Globe) and data (Statistics Canada, The Conference Board of Canada and Data Resources Inc.).

Optical discs and optical scanning are just now beginning to replace the need for front-end keying of data and information into the computer and at the "back-end" laser scanning can be used to transmit information via satellite from a publisher to a remote printing plant (such as in the case of a national publication like the Globe and Mail).

Artificial Intelligence Will Have a Major Impact on Electronic Publishing

Database publishing as a separate industry has enjoyed strong growth but problems still remain in terms of a broader impact. These problems are associated with both production and access to data and information bases. Essentially more "intelligent" software is needed for database producers to structure, update and maintain their data bases and to improve accessibility for the user that requires less technical skill. The development of artificial intelligence (AI) software will allow entry in a natural language. There will be much greater integration of machine and human functions in publishing. The great advantage that AI software brings to database publishing is its capability to deal with contextual aspects of information, matters of pure content as well as accepting and comprehending natural language in handling information requests. It is a system that can learn. It will make large complex data bases more easily accessible as interface systems will require less technical skill of end users and greatly enhance research capabilities.

The Current Canadian Market for Electronic Publishing is Estimated to be $376 Million Which is Expected to Grow to $842 million by the End of the Decade

At the outset of this document it was indicated that electronic publishing is a descriptive term that loosely covers the applications of computers and computer peripherals to the process of publishing. As yet there is no credible statistical source that delineates electronic publishing largely on an individual basis. The following table provides an estimate of the current and projected Canadian market for each segment of electronic publishing. Remote printing has not been included. At present only the Globe and Mail uses this technology in Canada.

TABLE 4

The Canadian Electronic Publishing Market
1986/87 to 1990/91

Electronic Publishing Segments	1986/87 ($000,000's)	1990/91 ($000,000's)
Industrial Training Courseware[1]	$ 150	$ 150
Educational Courseware[1]	110	110
Desktop Publishing [2]	50	450
On-Line Data Base Publishing[3]	44	88
Standalone – Optical Publishing[1]	22	44
Total	**$ 376**	**$ 842**

1) Includes both hardware and software purchases. The market for industrial courseware has been soft and no growth is projected. For educational software, present purchasing levels are assumed to continue.

2) Includes hardware and software purchases.

3) Includes only revenue from publishing.

Currently, courseware (both industrial and educational) is the largest market for electronic publishing. However, by 1990 desktop publishing will be the largest single market application of electronic publishing in Canada at $450 million. While smaller, it should be remembered that publishing represents mainly revenue from publishing activities while courseware and desktop publishing represent mainly revenues from equipment sales (computers, scanners, printers.) As a result, electronic publishing as a manufacturing activity is relatively small in Canada.

Opportunities for Canadian Electronic Hardware Manufacturing are Limited

In virtually every segment of Canada electronic publishing hardware is supplied principally from the U.S. For equipment such as computers and computer peripherals this is likely to remain the case for the foreseeable future. A possible exception to this is the manufacture of compact discs. At present only one company in Canada is currently manufacturing CD-ROM platters. However, there are four other plants in Canada currently manufacturing CD audio discs, that if market circumstances warranted, could switch to the production of CD-ROM medium for publishing purposes.

Canada's Best Opportunities Will Likely be in Software Production

While market projections for data base publishing are promising, software is a real constraint to achieving more widespread impact. The development of artificial intelligence software, while largely at the theoretical stage, holds significant promise to enhance the production and accessibility of data and information bases. Canada has a growing artificial intelligence and natural language processing community which could be positioned to take up the challenge of linking the concept of artificial intelligence with optical media data access such a CD-ROM.

Projects Such as the Proposed Jean Talon Project Could be Very Effective in Stimulating a Truly Canadian Publishing Industry

At the present time the Government of Canada, through the Secretary of State and Statistics Canada, is considering development of what is referred to as the Jean Talon Project. This project is

modeled after the British Broadcasting Corporation's £2.5 million Domesday Project which electronically reflected the State of Britain in 1986 through interactive video technology application. This publication commemorated the 90th anniversary of the completion in 1986 of the Norman Domesday Survey of England. Two video discs contain thousands of TV screen pages incorporating 40,000 photographs, 22,000 maps, statistics and small area or regional databases. Software is available on the disc for retrieval and display of the data on microcomputer. Support for this project was obtained from BBC Enterprises and private sector funding from Phillips Electronics and Acorn Computers. Private sector interest was sparked by finding new applications for electronic publishing technology.

Such a project for Canada could create a window of opportunity for the Canadian electronic publishing industry. It could be used as a demonstration project for the development of new software such as artificial intelligence applications. For Statistics Canada it could represent a commercial market opportunity for new data delivery services. Potentially such a project could also impact on Canadian courseware production.

AN ASSESSMENT OF ELECTRONIC PUBLISHING
PRODUCTS AND INDUSTRY IN CANADA

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