CD-ROM Publishing: Review, Developments and TrendsCD-

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INTRODUCTION:

Kuhn (1970) argues that major advances in science are not evolutionary, but revolutionary; they involve an unexpected change in perspective. The change does not abandon the previously valid model of research, but it establishes an alternative approach that often yields better results. Academic based CD-ROM publishing has the potential to influence dramatic changes in perspectives of education and research. For example, the University of California at Irvine has produced a CD-ROM disc called **Thesaurus Linguae Graecae**, a database, when complete, that will contain all the Greek literature from Homer in the eighth century B.C. to close to the sixth century A.D. This disc is an integral part of the Ibycus Scholarly Computer (ISC), a tool which is revolutionizing classical studies research. Researchers, archivists and administrators have been assembling databases of encyclopedic proportions for decades, but the technology for cost-effective, do-it-yourself publishing of these enormous research databases have only just begun because of CD-ROM technology.

CD-ROM information publishing has been the primary domain of commercial publishers. It is they who have successfully raised CD-ROM to its present level of market appeal. Products such as The Educational Resources Information Centre (**ERIC**) database, The **New Grolier Electronic Encyclopedia, Oxford English Dictionary** and **Compton's MultiMedia Encyclopedia** stimulate the imagination of educators, researchers and students alike. Business, government and libraries have been the first to embrace in-house CD-ROM publishing as a cost-effective alternative for distributing and improving access to specialized textual, numeric and image information databases. The support market for in-house CD-ROM publishing has given rise to companies such as Innotech Inc., Meridian Data Inc., Dataware Technologies Inc., Online Computer Systems Inc., OPTIM Corporation, and Knowledge Access International. These companies specialize in providing professional CD-ROM product development services and the sale of complete turn-key systems for supporting in-house CD-ROM publishing.

CD-ROM technology and publishing software is evolving to a point where an individual can actually design,

build and produce a CD-ROM disc with a home computer. At the Sixth International Conference & Exposition on Multimedia and CD-ROM in San Jose, California, Sony and Phillips Corp. announced their "orange book" standard which defines a way for WORM drives to write to CD-ROM format. Users of drives based on this standard will be able to create a CD-ROM with a WORM drive and also play existing commercial CD-ROM discs. JVC Information Products will have available by the fourth quarter of this year, the first 5.25 inch, half-height, write-once CD-ROM drive based on the new "orange book" standard. The new drive is expected to be OEM priced at $1000.

CD-ROM TECHNOLOGY

CD-ROM technology emerged in 1983 as a joint effort of Phillips and Sony, who demonstrated their first CD-ROM drive in 1984. The first commercially available CD-ROM database, Bibliofile, appeared in 1985, and the number of available titles has been increasing exponentially ever since (OPTIM 1990). Carlos Cuadra (1991) has documented the vigorous growth in portable, as opposed to online, databases of all types, including CD-ROM, magnetic tape, Bernoulli cartridge and floppy disk:

> One year ago, online databases outnumbered portable databases by a 7-to-1 ratio. The ratio is now about 3-to-1, and closing fast. These figures do not take into account the growing number of portable databases that are being produced or internal use, rather than for sale commercially. These numbers may be growing even faster than the commercial products...

CD-ROM in particular is responsible for much of this growth, and for several good reasons, not least of which is the medium's prodigious storage capacity in relation to other portable media: "While some high-density magnetic floppy disks hold an impressive one megabyte of data, a similarly sized optical disk usually holds 600 times this amount. (Lawrence 1990)"

A 1990 survey conducted under the auspices of the Canadian Library Association's CD-ROM Interest Group (Fox 1990) disclosed that about a third of Canadian

libraries of all types had already implemented or ordered CD-ROM systems. In the case of academic libraries, this proportion was already 44%. Annual surveys by OCLC in the United States have disclosed substantially higher rates of implementation in that country, approaching 100% in the case of academic libraries. CD-ROM has found many types of applications in Canadian libraries and other organizations (OPTIM 1990):

Memorial University of Newfoundland and the University of Guelph have their entire library catalogue on CD-ROM. Ford New Holland uses CD-ROM for its auto parts catalog. Statistics Canada offers bibliographies, directories and census data on CD-ROM. The Department of Fisheries and Oceans made its internal database of reports on fisheries and aquatic sciences available to the public on CD-ROM.

INDUSTRY GROWTH

The Optical Publishing Association (Columbus OH) estimates that CD-ROM revenue from inhouse and commercial publishing and drive sales to be at least US$571 million in 1989, up 41% from US$406 million in 1988 (CD-ROM 1990). "By 1993, according to market researchers Frost & Sullivan, the combined European market for optical disk drives and the optical media will reach US$900 million, up from US$37 million three years ago. (Lawrence 1990)"

According to information in TFPL Publishing's annual CD-ROM Directory, the number of companies involved with CD-ROM activities has risen from 48 in 1986 to 736 in 1989 and 1,840 in 1990.

AVAILABLE CD-ROM TITLES

A survey of commercially available CD-ROM titles was conducted in mid-1990 based on the major printed directories to the medium and using comparative data from three previous annual studies (Nicholls 1991). As of mid-1990, 1,025 commercial CD-ROM titles were identified. At the growth rate that has prevailed over the past few years, well over 2,000 titles are likely available at this time.

Almost half of the titles identified were source databases (containing full text, numeric data, computer software, images or similar data) with indexes/abstracts and directory-type databases accounting almost equally for the other half. The overall proportion of indexes/abstracts on CD-ROM has been declining steadily since 1987, while the proportion of source databases has been rising steadily.

The general/humanities, social science and natural science subject areas are represented almost equally on

CD-ROM. Social sciences actually have a somewhat greater share, due to the business and legal databases that (along with medicine) account for 30% of all CD-ROM titles.

The majority of CD-ROMs (63%) are updated annually or even less frequently. The relative proportion of frequently updated titles, (quarterly, for example) has been declining steadily since 1987. This trend is related to the rise in the numbers of source databases, which require less frequent updates than index or abstract databases.

Of all CD-ROM titles, 93% will run on an IBM PC/XT/AT/PS2 or compatible system, while only 13% will run on the Macintosh. Actually, 6% of the titles were designed to run on both platforms, and this proportion is now rising very rapidly. Similarly, although only 15% of the titles incorporated multimedia content, this proportion is rising steadily. In the near future, multimedia titles in the new related optical formats CD-ROM XA, CD-I and DVI will also begin to proliferate.

STANDARDS

Standards were a serious problem until the recent adoption of the ISO 9660 standard, as well as the appearance of the Microsoft CD-ROM Extensions (MSCDEX) to DOS. It is now possible for industry observers such as Nancy Herther (1991) to view standards in a different light: "Standards continue to be the factor buttressing and fostering growth for CD-ROM." Nevertheless, other observers such as John Dvorak (1991) points out that hardware compatibility problems definitely remain so far as 486 machines are concerned.

Software proliferation has raised another type of standards problem, the lack of consistent search interfaces. More than 100 search software packages are now employed on CD-ROM products, although a core of 15-20 of these account for perhaps 60% of all available products. Although it is not clear that a standard interface is actually desirable (at least not until we find a standard user and a standard database) this situation certainly has raised problems of several types:

After the tenth disk I wondered if the vendors are missing the point. Gads. Each one has a different file format and a different search engine. Each vendor wants you to dedicate a subdirectory and a bundle of megs to a given disk, and each disk requires a screwball path statement, a driver, or some memory-chewing crapola to operate properly. If you routinely used more than a few CD-ROM disks, your system would be chewed up by ancillary files and memory hogging TSRs. (Dvorak 1991)

These problems pose a particular challenge to multiple database workstations, public-access CD-ROM services and end-user instruction. The networking of CD-ROM databases also carries its own problems; however, when networking is practical, it can suffice to greatly simplify user access, addressing many of Dvorak's expressed concerns.

MULTIMEDIA FORMATS

Meridian Data, California based developers of CD-ROM publishing systems, with sales of US$7.2 million in 1989, expects that about a quarter of their clients will begin using their new CD-ROM XA development system, introduced in 1990. (Meridian 1990) The multimedia industry is expected to develop similarly to CD-ROM: "two years following the sale of production units to developers, the end user market should emerge." (Meridian 1990)

Multimedia applications require more powerful (and expensive) hardware than text-based CD-ROM applications. The cost of a multimedia workstation with a 386 microprocessor, 40Mb hard disk, optical drive, VGA card and audio capability, estimated to be about US$3,000 in 1992. (CD-I 1990)

CD-ROM IN LIBRARIES & INFORMATION CENTRES

It is clear, particularly as earlier barriers to implementation have disappeared or decreased in importance, that libraries have implemented CD-ROMs extensively and will do so more extensively yet. Libraries were one of the earliest markets for CD-ROM products and continue to be one of the largest, as Nelson (1991) observes:

> It is no wonder that libraries lead the marketplace in CD-ROM product acceptance. Once they understood the potential of this precocious six-year-old technology, librarians resolutely tackled the several impediments - especially its high price tag - to full implementation of CD-ROM into library processing and public services units. In doing so, they have rightly been accorded recognition as technological innovators.

It is also clear that these systems have received an enthusiastic acceptance by library patrons and end-users, and that the technology is not likely to be displaced in the near future by some alternative new medium. What remains unclear is whether the libraries and information centres should take the initiative to establish inhouse expertise and facilities to assist with "do-it-yourself" CD-ROM publishing. The potential for these applications are universal and just beginning to emerge.

The face of academic computing is changing; it is now very much data driven. The most basic computer-oriented tasks that teachers and researchers must now involve themselves with is the collection, analysis, annotation and organization of information. Richard L. Nolan suggests that we are in a economic transition, one which is taking us from being an industrial economy to an information/service economy. Nolan (1990) argues that higher education must add information technology to its strategic equations for the 1990's. Wether you agree with Nolan that we are in the midst of a new industrial revolution, fuelled by information technology, there still remains an overwhelming awareness of the importance that must be given to information literacy for our future economic success. The American Library Association's 1990 G. K. Hall Award for Library Literature, was awarded to Patricia Senn Breivik and E. Gordon Gee for their book, "Information Literacy: Revolution in the Library." The concept of information literacy involves examination of how information seeking an evaluation skills intersect with the need to understand and use information technology including software; systems design and hardware; access to information beyond that typically stored or accessed by libraries; understanding the complex interaction among stored or remotely accessed information; and finally one's own production of new information.

Libraries and information centres have the opportunity to be the facilitators of inhouse CD-ROM publishing technology; however, useful and innovative applications must originate from all members of the academic community. For example, the following is a sample of CD-ROM applications that might originate from academic settings:

Archaeological artifacts databases comprised of video images and full-text annotations. Rare or significant local collections protected in backroom museums could become transportable and accessible for research and instructional purposes around the world.

Documentation, research and instruction of native heritage. Databases comprised of scanned images, poems, songs, legends, symbolic writing, full-text analysis and audio tracks.

Geographic information databases which cater to municipal and rural communities where Universities and College reside. Virtually all information which has an underlying spatial aspect to it is a candidate. For example, Master's level projects which create geographic image/text databases related to local urban planning issues, commerce, recreation, tourism, health, pollution, housing, population, etc. may find CD-ROM an ideal medium.

Full-text databases comprised of large transcription projects involving international collaboration of scholars and editors. For example, the international scholars working on the transcription of the complete works of Jeremy Bentham (1748-1832).

Preservation and improved access to local history through the construction of specific photo image and full-text news databases. Students in history and journalism may find their compilation and presentation of full-text and image based research to be more effective, accessible and better suited for secondary analysis.

As the cost of inhouse CD-ROM publishing continues to fall and the tasks associated with inhouse publishing become even more pedestrian, we will see a proliferation of CD-ROM information, research and instructional products from academia.

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