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# The Uses of CD-ROM and Other Information Delivery Systems for Libraries: A Publisher's View

## INTRODUCTION

The delivery of electronic information to libraries is increasing significantly in both volume and forms of delivery. These forms of delivery now include online searching, local access systems, and CD-ROM, to name only a few. CD-ROM is a technology, however, that is growing the fastest and has recently generated the most excitement in the library and publishing communities.

This excitement is balanced by some concerns. Such concerns are diverse. This paper, however, addresses one concern in particular. That is, how will CD-ROM and other modern information handling technologies affect electronic publishing programs in general, and therefore by extension, libraries and publishers as well? Although the views represented here are of a publisher of CD-ROM systems, these views are not intended to suggest that these technologies are suitable in all publishing environments, or for all libraries. The comments in this article are simply intended to describe significant developments and trends in electronic publishing.

This article consists of three parts: case history, historical perspective, and speculation. To start, a brief case history of the H. W. Wilson Company's electronic publishing program is in order.

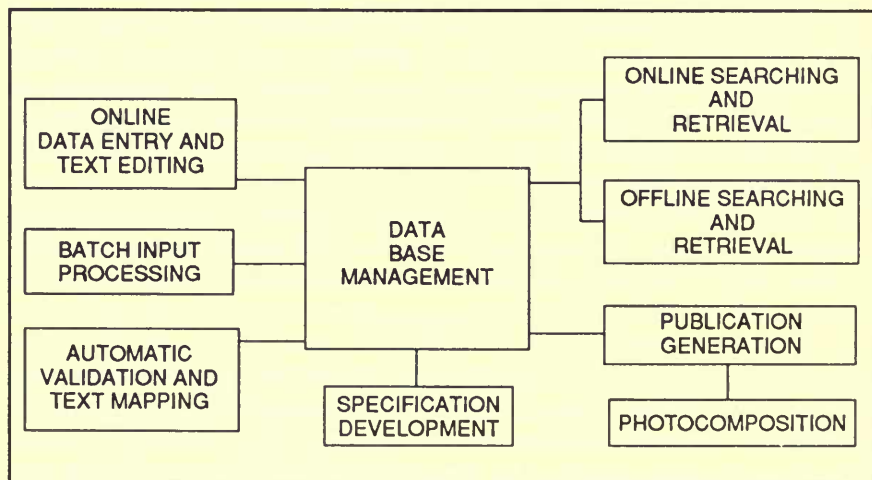
## CASE HISTORY: THE H. W. WILSON COMPANY

Until recently, H. W. Wilson produced its publications using linotype machines and the interfiling of the "lead lines of type." It took the

company a long while to automate, but now all the lead is out of its plants and fully automated methods of acquiring and producing information are in use.

In making this transfer there was a need to develop a comprehensive system of producing, editing, managing, and electronically typesetting this information (see Figure 1). But such a system is only the first step in the use of today's technology, and certainly does not itself constitute a viable electronic publishing effort. As is evident from Figure 1, this automated system provides the basis of not only producing and typesetting information electronically, but also includes an electronic dissemination program. The publishing program includes the use of online systems as well as personal computers and CD-ROM technology. This new, emerging role of the publisher or producer of the information as a more active agent in the electronic dissemination process will be dealt with in this paper.

Figure 1  
The Wilson System



### HISTORICAL PERSPECTIVE: PUBLISHERS—INNOVATION THROUGH CHANGE

Publishers are facing significant changes in the publishing and information industry. Publishers of abstracting and indexing information, for example, are seeing exponential growth in the primary literature, i.e., more information is being produced and therefore more

information needs to be organized. They are also experiencing more competition, i.e., more information goods and services are in the marketplace. Perhaps most significantly, they are experiencing greater and greater demands from their clients in order to meet the changing needs of information seekers. These demands tend to be for more accurate, current, diverse, sophisticated, and especially, economical information goods.

Most publishers who have begun to meet these changes successfully have done so through the utilization of new and more sophisticated technology. This trend will not change. The direction of these technological developments is critical to publishers and libraries alike. The use of more technology in publishing will not only affect the types of information products developed and made available, but also and perhaps more importantly, will fundamentally change the delivery systems for information goods and services.

Technology will effect this change mainly for two reasons: One is that the innovations in information technologies of the past two decades have radically reduced the time and cost of processing information. Second is that, by reducing particularly the costs of processing, information technology will lead to an overall shift toward proportionately more use of markets rather than the highly centralized and hierarchical delivery of information goods and services which presently exists.

There are basically two methods of organizing an electronic publishing effort: through markets or through a central source.

Markets coordinate the flow of information goods and services through the coordination of different individuals and organizations. Market forces will tend to regulate this flow through the traditional economic gauge of supply and demand. In a market environment, information products may tend to be easily linked to other products to meet complex market demands more efficiently. Thus, the consumers of information products may acquire specific information goods from a variety of sources, and make choices based upon the best combination of product attributes to meet individual needs.

A central source, on the other hand, tends to provide information goods through a single channel or chain of distribution. Although in many cases two legal firms are involved (i.e., a producer and a vendor), the producer of the information licenses a vendor to disseminate the information, and the vendor takes primary, if not exclusive, responsibility for those information goods. Managerial decisions, not necessarily market forces, determine the design, price, and availability of the product. Buyers generally do not select a supplier from a pool of vendors, but rather from one or a few select vendors.

There are, of course, variants of these two basic approaches, but

most electronic publishing programs today tend to use the “centralized” approach. Electronic publishing efforts in the future, however, may be able to make a much more market-oriented approach through the use of the technological developments which have taken and are taking place today.

### **Online Search Services—A Characterization**

The key characteristics of online search systems in the period 1970-85 are as follows:

- Highly centralized database services usually operated by a single organization, at a single data center, generally running on a single mainframe computer. All of the data and software resides at the data center location.
- Data centers usually supported by standard “unintelligent” terminals through a limited number of telecommunication carriers (sometimes owned by the vendor). These networks support character transmission rates of 30 to 120 characters per second.
- Scope, searchability, and design of the data base and information sources generally decided by negotiation between publisher and vendor. Price, currency, and frequency of update also tend to be managerial decisions of the vendor which may have been influenced through the negotiation process.

### **TECHNOLOGY AND ORGANIZATIONAL FORM**

The choice of organization is primarily an economic decision which depends in large measure on four key factors: production costs, coordination costs, product complexity, and asset or database specificity.

Production costs are intended to include all of the development, editing, manufacturing, distribution, packaging, marketing, handling, fulfillment, and other costs associated with the delivery of an information good.

Coordination costs, on the other hand, take into account all of the transaction costs in developing the information good. These costs include, for example, the costs of gathering information about suppliers, the market, and so forth; the costs of negotiating contracts; the costs associated with coordinating the work of people and machines operating in different companies; and all costs associated with the transfer of goods between producer and supplier.

### Interrelationship of Production and Coordination Costs

The interrelationship of production and coordination costs, as indicated in Figure 2, affects the choice of certain organizational forms and favors certain organizational forms at different levels of expenditures. For example, production costs for the publisher are higher if the publisher produces the product alone, but the more suppliers and distributors a publisher needs to utilize, the higher the coordination costs. This may explain, in part, why publishers have heretofore tended to offer their electronic products through a highly centralized method.

Figure 2

Relative Costs of Markets and Integrated Efforts

Organizational Form	Production Costs	Coordination Costs
Markets	Low	High
Integrated	High	Low

In the 1970s, and certainly by 1980, most publishers had already absorbed the high automation and production costs associated with the development of information goods for their printed products. Electronic typesetting was and is widespread in the industry, but electronic publishing was considered in many cases a byproduct of the print production process. Production costs had already been assigned to and absorbed by the printed product. The costs of database design, storage, online access, testing, and marketing for an external searching system, however, were formidable and outside of the traditional strengths of publishers. A substantial investment of coordination costs was required by both a publisher and a vendor to make these databases available. Thus, many publishers opted for one service only. In the early days of online searching, it was not uncommon to find exclusive database licenses between publishers and vendors.

### Other Factors Affecting the Choice of Organization

Other factors which further influence the form of organization are asset or database specificity, and product complexity.

Database specificity is intended to describe the uniqueness of the information good, and thus provides an indication of how difficult it could be to process a publisher's information resource or database by a third party. Some factors which might make this difficult are, for example, a highly complex data structure, unique hardware require-



ments, difficulty in transporting the data from one data center to another, or the inclusion of uncommon character representations such as typesetting codes or other special characters.

Product complexity, on the other hand, provides an indication of the amount of information needed to specify the attributes, functions, and features of the service to be provided. Obviously, the more access points, search rules, and other functions required in an information service, the more complex the product.

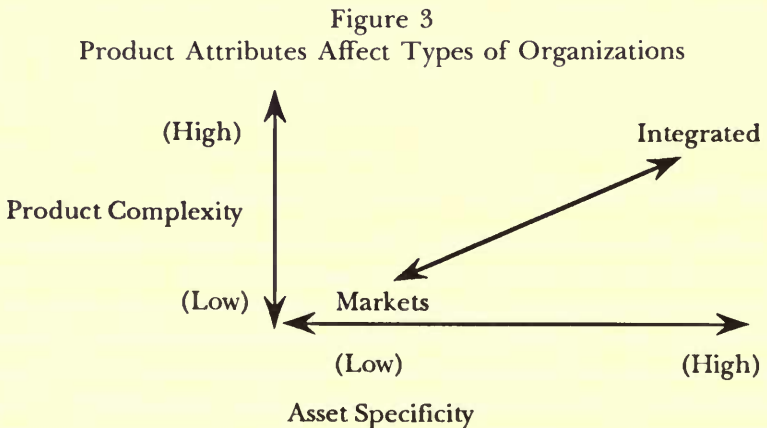
### Relationship of Asset Complexity and Product Coordination

As one looks at the relationship of these factors, one can find how these factors may have influenced the choice of organizational form (see Figure 3).

When both the information resources (assets) and the products which are to be derived from those resources are highly specific and highly complex, the centralized approach is more desirable, since the publisher or its agent is best able individually to deal with these complexities efficiently and in a cost-effective way. As more suppliers are introduced, the costs associated with the peculiarities of the data and the product are replicated.

When data can easily be transferred to suppliers and when these suppliers can easily manipulate this data in a variety of ways, a market approach is easily effected, and the high costs of data conversion and processing are reduced.

To reference the online industry in the 1970s and 1980s, the production systems which publishers used to typeset their printed products tended to be highly specific to an individual publisher. As a



result, publishers had little capability to provide their information resources in a standard or flexible form. Second, database products tended to be as varied as the number of databases offered. The outputs of individual production systems, data structure and form, and the access and searchability of the data itself were all very different for each database.

Relatively low production costs but high coordination costs, in conjunction with the very specific information resources and complex data structures, naturally and logically changed to a highly centralized approach in the period under consideration.

### **New Directions**

What is different today and for the future? Information technology will continue to provide an impetus for change in the publishing industry. CD-ROM or optical disc is a significant technology for publishing, but it is by no means the only significant information handling technology which needs to be discussed for the future. In fact, CD-ROM technology, in order to be successful, by its very nature must be used in conjunction with other technologies in order to provide effective new information products.

The discussion of the future directives and uses of CD-ROM has been divided into three areas: Technology, Systems, and Economics. Each of these is changing in ways that will significantly affect the use of optical disc technology specifically, and the development of information systems and services generally.

#### *Technology*

In the area of technology, three key technologies are considered for their effects on electronic publishing: Computational Capabilities, Storage Media, and Communication Capabilities. To illustrate the advances in each area since 1970, Figure 4 describes a cost comparison for 1970 and 1987 in the per unit cost of these technologies for each of these years.

What are the implications of these dramatic cost reductions? First, the same technology that launched the online industry is now available at a fraction of the cost. This means that the technology for providing information goods and services is available to many more organizations. More publishers and other organizations are able to afford the basic tools of electronic publishing programs. Second, technology keeps developing. For example, PCs continue to increase on the price/performance curve, and this beyond even the comparisons offered in Figure 4. The IBM Personal System/2, Model 30 introduced recently

Figure 4  
Price/Performance Comparisons: 1970-1987

	1970	1987
Computational Technology (CPU instructions per second)	\$3.00	\$.15
Storage Technology (per million characters)		
Magnetic Disks	\$2,500	\$19
CD-ROM (Master)		\$ 6
Telecommunications Technology (per million characters transmitted)		
Dial Access	\$1,000	\$200
Leased Line		\$ 10

will be replaced by a machine which has nearly 100 percent more throughput and is projected at a cost reduction of 25 percent. It is also an increase by 200-300 percent of capacity from the PC/XT and AT machines with comparable cost savings of nearly 50 percent. Another example of developing technology is the erasable optical disc, which provides high density optical storage on a reusable basis. A third technological development is the expansion of communication networks. For example, CONNET was announced a few years ago. It is a cooperative project between Southern New England Bell and Telenet where, with the use of X75 software, one can connect to a Telenet mode from anywhere in the state of Connecticut for little more than a local telephone call.

#### *System Direction*

As these technologies advance, systems design continues to become more powerful and sophisticated. This development enables these systems to provide more information, faster and far less expensively than present information delivery systems.

Systems are being developed around networks which utilize intelligent personal computers in conjunction with mainframes, creating a so-called micro/mainframe connection or a local area network (LAN). In such a networking environment, local information can be processed easily and inexpensively without significant telecommunications and computer costs. Such designs are capable of accessing a larger centralized data resource on the system when needed and on a far more economical



basis. Many of the front end search systems, post-processing software, and so-called hybrid CD-ROM systems have effectively utilized this principle.

Within this system network orientation, there is also a concerted effort among major computer manufacturers and suppliers to permit computers to transfer data easily across systems and across manufacturers' models. The computer industry has begun discussion on a common computer protocol interface which is being supported by the major manufacturers, and which has as its goal a standard method of transferring data for all computers. The gateway systems and the intelligent networks which have already begun to emerge will greatly benefit from such developments. Publishers, moreover, may find it increasingly feasible to maintain their information resources in their own systems, while also increasing dissemination efforts through a variety of networks and gateway relationships.

Finally, systems are becoming richer in the types of information that can be provided. With the increased capability of optical discs and the proper standards to utilize them fully, multimedia systems are emerging. These are information services which provide not only textual and numeric information but also video, graphic, and audio information. Systems are increasingly being designed to simulate different views of the data. In other systems, speech input and touch screens are being introduced to reduce or obviate the need for keying information and/or the knowledge of specific system commands and syntax.

#### *Economic Directives*

Perhaps the most significant factors influencing the changes that will occur to information systems have to do with the market and the needs of information seekers. These factors are primarily economic.

Electronic access to information is increasingly being demanded by audiences different from the traditional online users. These new and potential users, however, appear to be far more price-sensitive to information goods than the traditional online consumers.

What complicates the development of new information delivery systems further is the ability of traditional institutional clients to finance the consumption of these services. Although the cost of information goods may be decreasing and the value of the information services increasing, public, private, and corporate monies are being stretched further and further for information acquisition. This stretching appears to be particularly true for the public and voluntary sectors, especially public, school, and university libraries.

In short, the need for access to information is widespread, but the single greatest obstacle to the use of electronic publishing systems by

new markets is the high cost of those services. Publishers will continue to be challenged by this economic directive in how they produce information and new information products. The most significant costs to a publisher are still the intellectual costs associated with the acquisition, organization, and editing of the information. Duplication of effort by and among publishers will also be costly. As publishers seek to develop new information products in order to meet new client needs, they will seek new partnerships with other publishers. These partnerships will undoubtedly be difficult to forge, but the benefits to publishers and libraries alike will be substantial.

### **Optical Discs—Conflict/Confluence**

Optical discs, and the CD-ROM technology specifically, must be considered within the broad context of these economic and system trends. A major question for publishers is how to integrate these technologies into their existing publishing programs, both printed products and existing online database services. Similarly, how should libraries view and use these new CD-ROM-based services? In effect, will CD-ROM replace or complement existing information delivery systems, or will it be a short-lived technology?

The major advantages to the CD-ROM technology are three: first, CD-ROM provides publishers the ability to disseminate their services in new ways; second, this new method of distribution provides new value through improved methods of access while providing greater use of data already created; and third, the manufacturing costs associated with CD-ROMs are relatively inexpensive. The advantages to consumers are that more information and more sophisticated systems can be acquired through the use of this technology and that these systems offer a tremendous economy of scale, unlike their online counterparts, and are also far less labor-intensive.

What are the disadvantages or dangers to CD-ROM publishing? To the publisher, these dangers center more around the changing technologies than in the CD-ROM itself. One disadvantage is that publishers must make added investments in system development, training, and support services for these systems. These activities and investments are not traditional strengths of publishers. A second problem is that in a changing technological environment, publishers will constantly be challenged in how to manage the transition of their businesses from older to more advanced technologies.

Although libraries and other consumers of these products will generally benefit from advances in information technology, there are at least two areas of concern: cost and performance. The acquisition cost

of these systems is higher than existing services. Unlike online services where one can acquire and purchase only that information which is needed, CD-ROM systems require ownership of the entire database. Although there is a savings in labor to support these new systems, there is also a shift from labor-intensive activities to the capital-intensive activities of acquiring and maintaining these new information technologies.

The issue of system performance also needs to be monitored carefully. The ability to meet the needs of clients in a timely and responsive manner is critical to the success of any system. CD-ROM can only be measured on how well it increases the price/performance ratio of information delivery systems.

### CONCLUSION

There is a high demand for change in the publishing industry, and these changes are being driven by technology and economic concerns. As the technology advances, it appears that information goods and services will be delivered in a more market-oriented environment. In this environment, consumers of information will have a much wider variety of options in the consumption of information goods and the characteristics of these goods. Finally, CD-ROM is an important and significant first step in these new evolving technologies, but present CD-ROM systems must be viewed within a broad context of a market orientation to information delivery.