

## The Electronic Library and Document Delivery: New Options

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### Introduction

Picture a day when you won't need to leave your office or home in order to access the information that's contained in a typical library or even to participate in scholarly and research communications with your colleagues. We're not there yet, but we are making considerable headway in getting information, in its many forms, to the end user.

The concept of the electronic library has been around for a good while. The development and implementation of electronic libraries have come a long way, but we still have a long way to go. Many academic and some public libraries have OPACs (online public access catalogs) or are in the process of developing them. The Internet is making many of these catalogs available to the academic world, opening up a huge universe of information to academia and to the end-user. A recent count indicated over 200 library catalogs available on the Internet; 50% of these are U.S. libraries and 50% are foreign, mostly from Great Britain, Australia, some Canadian and a few from other European countries. Just one example locally is OLLI, based on the PALS software, managed by Georgia State University's computer center. PALS provides Internet access to about 35 University System and other Georgia library catalogs and this number is growing. I'm sure many of you are aware of this system or have tried it. It is managed by Phil Williams at GSU's Computer Center.

In addition to library catalogs, a growing number of libraries have citation or article-level databases on their OPACs. Access to article-level databases is limited due to copyright and contractual restrictions. Loading these databases locally is also a matter of considerable expense. To satisfy the need for article-level indexing and document delivery, a number of publishers and commercial vendors are developing and marketing indexes and full-text article products and making them available to the end-user as well as to libraries. The publishing

world is currently in stiff competition to meet our document delivery needs on an item by item basis. The concept being discussed in the library world is "access vs. ownership" or, as some publishers and library vendors call it, "just in time vs. just in case." The more bibliographic information we have access to, the more critical document delivery becomes; the full-text document might be a book or photocopy of an article, a conference paper, a technical report, or a patent. Most document delivery services are currently geared to journal articles only. Publishers, commercial vendors, and even a spin-off company of a library consortium—CARL—are getting involved in satisfying our information and document needs. It used to be that document delivery was handled by a personal subscription, self-service copying in the library or by traditional interlibrary loan (i.e., when an item not owned by your own library is obtained or borrowed from another library). All of this is the process of changing.

### Electronic Information and Document Delivery Services

The purpose of this paper is to discuss some of the electronic services currently being offered by publishers and vendors, and to provide more detail about CARL, the service Georgia Tech is using extensively. The six electronic indexing and electronic document delivery services I will discuss are:

1. Faxon Research Services Inc.'s Faxon Finder and Faxon Xpress
2. UMI or University Microfilm Inc.'s Business Periodical Ondisc and General Periodicals Ondisc.
3. Adonis, a project in the Netherlands specializing in biomedical journals
4. Article Express International Inc., a collaboration of Engineering Index and Dialog.

5. CARL/Uncover/Uncover 2, a library consortium, Colorado Alliance of Research Libraries—working with a for-profit company—CARL Systems, Inc.
6. ARIEL, RLC's document transmission system.

The following explains further details about these services.

### **Faxon Finder/Faxon Xpress**

The Faxon Finder project is similar to CARL in that it indexes approximately 11,000 multidisciplinary journals, with coverage beginning in January 1990. Faxon Finder can be accessed on EPIC or FirstSearch (both OCLC services) over the Internet, or dial access, or through a gateway on a local OPAC. Faxon gives libraries and institutions the option of licensing their databases or relevant portions of them and loading them on a local system. If accessed on EPIC, search time is \$1 per minute; using FirstSearch the cost is approximately \$1 per search. The full-text document service is expected to be available within a few months through Faxon Xpress; the document handling fee is \$11 plus copyright charges, which average about \$4. Turnaround is 24 hours. The scanned document will be delivered directly to a fax machine or computer fax board. Payment options are credit card or deposit account. The documents are provided through formal arrangements with CISTI (the Canada Institute for Scientific and Technical Information) and a few other secondary suppliers.

### **Adonis**

Developed in the Netherlands, Adonis is a tailor-made CD-ROM collection of electronic full-text journals published explicitly for document delivery. Approximately 500 biomedical journals were selected according to the demand by potential users, specifically the pharmaceutical industry. Currently, one U.S. university library is using the system. Articles can be viewed on a workstation and sent to a laser printer for copying. Searching for an article can be done in seconds. Each week, a subscriber receives more than 10,000 digitized pages on a compact disk. Coverage begins in 1991.

### **University Microfilms, Inc. (UMI)**

UMI has been involved in the document delivery business for many years. UMI is known for its

dissertation service; they are a depository and indexer for U.S. dissertations and some foreign dissertations. In the last few years, UMI has developed two CD products: Business Periodicals Ondisc and General Periodicals Ondisc (Emory University's Woodruff Library subscribes to both of these). Business Periodicals Ondisc's coverage begins with 1988, using the ABI/Inform business database which indexes over 800 journals. The full-text coverage is for 300 of the 800 journals indexed. When an article retrieved is available full-text, the system tells the user which CD needs to be loaded. General Periodicals Ondisc indexes 450 titles beginning in 1990 and provides full-text for 150 of these titles.

### **EI/Article Express International Inc.**

This resource represents a collaboration of Engineering Information Inc. and Dialog Information Services Inc. It is a document delivery resource for engineering and technical literature. Index searching is done on an EI (Engineering Index) database and ordering is online through Dialog. Fees are \$15 per article up to 50 pages.

### **CARL**

CARL Systems Inc. has implemented a project designed to provide online indexing and self-service document delivery for more than 12,000 multidisciplinary journals. "Uncover 2" is the document component of CARL Systems Inc. in cooperation with the Colorado Alliance of Research Libraries or CARL. CARL was formed in 1978 as a non-profit organization to develop an integrated online library catalog for several research libraries. In 1988, CARL Systems Inc. was formed as a for-profit corporation to provide access to full-text documents for the member libraries of CARL. Uncover is their end-product index/table of contents service. Uncover complements other more subject-oriented databases such as Chemical Abstracts, Management Contents, Humanities Index, etc. The index/table of contents is created as a by-product of journal check-in. This is a fairly novel approach. CARL Systems Inc. checks in member library journal issues and creates the corresponding table of contents and then the journal issues are forwarded to the subscribing library within 24 hours. By the time the journal issues arrive at the subscribing libraries, indexing is already available on their library online catalog.



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Currently, approximately 3500 articles are being added to the database each night. Some of the libraries participating in the document scanning and delivery project are the University of Colorado, Boulder; University of Colorado, Denver; University of Colorado, Health Sciences; Colorado State University; University of North Colorado; Denver Public Library; University of Wyoming; and Luther College (Iowa). As of January 1993, University of Hawaii and University of South Carolina will be participating. The University of South Carolina has already begun scanning the table of contents of their unique journal titles via the Internet to be added to CARL. They will begin providing document delivery in January 1993.

CARL provides gateways in a wide range of local and networked systems. For example, the California State University System provides access through its Uncover gateway for all campuses in its system. The Illinois gateway provides access to most campuses in Illinois. Access can be by private leased lines or through the Internet. The gateway cost for an individual site is \$5000 or \$10,000 if you need it customized to your interface. Group gateway licensing is negotiated based on a number of variables. It is necessary to contact CARL for details.

Another access possibility is through the purchase of a password for \$900 annually. Only one connection is possible per password at any given time. Password holders can access CARL System over the Internet, by dial-up or through other access mechanisms. Georgia Tech currently has one password, but we are considering gateway possibilities. Using the password, searching is simple, providing access by keyword, author or title. Georgia Tech faculty especially like being able to browse the table of contents of a specific journal issue.

Uncover 2, the article delivery component of CARL, began in Fall, 1991. It uses high-tech scanning equipment and fax. In certain circumstances it can deliver an article in as little as two hours after receipt of the order. Twenty-four hours is the typical turnaround time. Orders can be placed over the Internet and charged to a library or organization's deposit account or to a personal credit card. CARL eventually plans to transmit articles on Ariel. The fee per article is \$6.50 plus the publisher or CCC royalty fee, which varies from \$3 to \$5.

### **ARIEL: RLG's Document Transmission System**

Ariel will ultimately be the likely delivery mechanism for many of the document delivery services mentioned above. Ariel is a document transmission system from the Research Libraries Group (RLG). Using commercially available hardware and RLG's Ariel software, users can scan articles, documents, even photographs, transmit the resulting electronic images on the Internet to other Ariel workstations and print them on a laser printer. This system is faster, more reliable, and less expensive to use than fax. It produces images of higher quality and resolution (300 x 300 dots per inch as opposed to 100 x 200 dots per inch on standard fax). Ariel uses data compression to speed transmission and reduce storage requirements. A computer running ARIEL can also be used for other applications such as word processing and desktop publishing.

Ariel has been tested at several RLG universities and is now becoming widely available. Georgia Tech Library is about to bring up its workstation. In Georgia, Georgia State University, Georgia Tech, Emory University, and the University of Georgia will utilize Ariel for document transmission from library to library; perhaps others will adopt it, as well.

There are currently a growing number of new ways to access information. Electronic library catalogs, electronic indexing services, and electronic document delivery options are making information access much more convenient and readily available. It is an exciting time for information providers and users as well.

### **Technical Environment**

It goes without saying that technology is the catalyst for these new systems. The need for documents hasn't really changed but we have new building blocks to use in new ways, making new and innovative services possible. In examining technical requirements, we should look at both sides of the document delivery transaction: the provider and the user.

The provider of the information has to have interface software between the requestor and the

system, image or text retrieval software, a transmission mechanism of some sort, and a high-capacity data storage system.

The documents to be provided can be stored online, or stored in paper and scanned as needed. If the provider sends an article through Ariel, chances are the item isn't stored online. Usually, the hard copy item will be located, scanned and sent over the network, unlike previously when it would have been photocopied and mailed or faxed.

Other systems, like Uncover 2, rely increasingly on large numbers of documents stored online. This minimizes human intervention and makes for a more automated, and generally much faster, way to get documents.

Articles are stored online in one of two ways, as ASCII files or as image files. The decision of whether to store text as ASCII or image files is critical. A page stored in ASCII uses about 2 kilobytes (2,000 bytes) of storage. The same page, stored as an image file, might take up a whole megabyte (1,000,000 bytes). This is 500 times the amount of storage of the ASCII text, although it can vary, depending on the degree of resolution, and if and how the data are compressed.

When you consider the enormous amount of storage that thousands of journal articles would consume, you can begin to see the magnitude of the storage requirements that CARL and some of the other vendors face.

Here, too, evolving technology is coming to the rescue. Magnetic disks, on which we have relied heavily, are no longer the only possibility. CD-ROMs and increasingly effective CD-ROM networking systems are common. Distributed systems offer possibilities when combined with software such as Gopher. WORM disks offer particular advantages for storing documents generated locally. Newer solutions include such options as Epoch, a system that intelligently interchanges data between magnetic and magneto-optical disk storage. In the next decade we will see such innovations as optical cubes, which promise extremely high storage capacity and fast access. As document delivery systems grow, terabytes of data will not be uncommon, and a reliable, cost-effective system of storage and retrieval will be essential.

On the other end of the transaction is the user. Regardless of whether the user is an individual or a library, some basic equipment must be in place. With most systems, a computer is required to order and receive the document. Of course, the more memory and capabilities it has, the better. Either a modem or network connection is needed. Most of these systems mandate a fax machine, or a fax card and a good laser printer for optimum quality. A high resolution monitor is usually a requirement for viewing documents onscreen.

### Three Prototype Systems

I'd like to discuss a few experiments that suggest uses for document delivery that differ from our traditional interlibrary-loan model. Some of these systems look and feel somewhat like electronic publishing. For the purposes of this paper, however, we are making the distinction that document delivery depends on there being a primary, hardcopy document, often published first. On the other hand, electronic publishing implies that the primary publication of the item is electronically, and it may never be published in more traditional media.

#### San Diego State University's Electronic Reserve Book Room

Supplying students with course reserve materials is a familiar activity in every academic library. Reserve materials—whether books, copies of periodical articles, class notes, sample exams, or whatever—are typically tightly controlled, with check-out limited to several hours or overnight. Demand can be great for a single copy of an article or book, but most libraries cannot afford to purchase multiple copies. Copyright restrictions make multiple photocopies problematic. In spite of restrictions imposed by copyright law, however, San Diego State University staff estimate that 85 per cent of the use of Reserve Room items is to make photocopies. Much of this copying is probably in violation of fair use. To address these problems, SDSU developed an automated system that circumvents the limitations of the manual reserve-room operation.

A student entering the reserve book room area is confronted with a cluster of six workstations. The workstations include a color monitor, keyboard



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with a roller ball, and a laser printer. A menu presents several options. A needed item can be searched by author, title, call number, professor's last name, course name or number. If the desired title is located, the student may print out either the first page of the article, or the entire article. He also has the option to return to the main menu, where he can make another selection or exit the system. The printer is activated by a debit card similar to those used in many campus photocopy services, and the student is charged 10 cents per page.

The troublesome area of copyright is handled nicely by ERBR. A portion of the money collected by the print function is used to reimburse publishers. San Diego State is dealing directly with publishers and sending quarterly checks based on a monthly report produced by the system.

It has taken some innovative use of new technologies to create the ERBR. Items are being scanned into an image database held on a WORM drive jukebox. Eleven WORM cartridges provide a total online storage capacity of 10 gigabytes. Two file servers, the scanning workstation and the client workstations are linked together by a Novell 386 Ethernet LAN.

San Diego State staff estimate that it takes about 17 minutes per item for complete processing. Some of this is processing activity that is necessary even in a manual operation: assigning a call number, placing the item in a folder, adding a date-due slip and so forth; entering the bibliographic record and establishing a course record in the Library's online system. The largest segment of time, however, is consumed by the coding and scanning of the item.

Currently the system is available only within the ERBR cluster in the Library. The ideal, of course, is to have the information available remotely to students in their dorm rooms, computer labs, or apartments. SDSU plans to extend the service in this manner when technical and other barriers permit.

### Instant Math Preprints

Nicknamed IMP, Instant Math Reprints demonstrates that students are not the only group who stand to benefit by selectively-aimed document delivery systems. These systems have the capability of vastly speeding up the dissemination of scholarly

information. In sci/tech libraries, we're painfully aware that by the time a journal is printed, received and processed, the information is old news. Professors and researchers exchange information among themselves on an informal basis, but the 'outsider'—whether a student or a librarian or whoever—is not a part of the loop.

Yale University has developed a system of electronic dissemination of preprints of new publications in mathematics. IMP provides access to current research and writing by mathematicians from Yale, University of Texas at Austin, Oklahoma State, Washington University in St. Louis, and the University of Paris. They contribute abstracts of their preprints, which are stored in an Internet-accessible IBM mainframe at Yale. The abstracts can be searched by numerous keys: author, title, author's address, date, terms used in the abstract, keywords suggested by the author, and the Math Reviews subject classification code. Users can also search by status of the preprint, whether a pending publication, a preliminary draft, class notes, draft of a new book, and so forth.

Upon finding an abstract of interest, the user may choose to access the full text. The full text of the articles is stored on computers at the contributing universities. The articles can be downloaded across the Internet by anonymous ftp. This part of the project has met with mixed success. Katherine Branch, head of the Science Library at Yale, observed that "the special communications software [TN3270] and the peculiar keyboard mappings required to use the IBM mainframe... present significant hurdles." For many potential users, Branch thinks that acquiring the TN3270 program was probably the major barrier. Even though it was available without cost and included instructions for the ftp function, many people seemed to be confused about how to do things like unpack and install the program. It is likely that some potential users never got as far as the log on. In addition, contributors expressed significant misgivings about copyright and ownership of intellectual property.

Nevertheless, partly as a result of IMP, the Association of Research Libraries is exploring rapid dissemination of preprints. In May, ARL held a meeting of librarians, scientists and other scholars to

discuss the wider possibilities of electronic distribution of this type of material.

### **TULIP: The University Licensing Program**

The University Licensing Program is another innovative project stretching the limits of document delivery. The Dutch sci-tech publishing giant, Elsevier, is sponsoring a series of parallel pilot projects to explore instant online delivery of journal articles. Under the collective name of TULIP, the goal is fully automated, seamless delivery of image files of journal articles across a network to academic users. The pilot project includes about 35 journals in the field of materials science and engineering, for a total of about 754 issues and 94,000 pages over the course of three years.

Elsevier recruited a dozen or so universities with a track record in information technology innovation. They have been asked to devise a method of disseminating the journal articles over their campus networks. In most of the versions of this project, ASCII-text abstracts or tables of contents are loaded onto a computer for searching. Should the user identify articles he wishes to view or print, bit-mapped files of the complete articles can be downloaded to the user's workstation.

At the different sites, the project will run over different campus network infrastructures, using varied access methods and tools. The economics of the project and user behavior will be evaluated. Variety is an important aspect of the project. The object is not just to show that it can be done, but to explore what works best.

Some of the institutions may experiment with alternative storage technologies or even find ways to permit users to download information on demand from a remote storage facility—perhaps from Engineering Index, also a participant in the project.

Several universities, including Georgia Tech, Carnegie-Mellon, Cornell, MIT, University of Michigan, the University of Tennessee, University of Washington and Virginia Tech are expected to have systems available within the next 6 to 12 months for their user communities.

### **Conclusion**

Without a doubt, there are limitless opportunities for faster, more personalized and more convenient delivery of documents to academic customers. The line we have drawn between publishing and delivery is, in some cases, growing hazy, and will continue to blur. The controversy about copyright and intellectual property rights will continue. The economic situation will remain fluid, and libraries and universities may have the opportunity to influence a shift in the burden of paying for information.

In closing, I want to tell you a story about my son Daniel. When he was a preschooler, Daniel often came to work with me when I had something quick to do on weekends or evenings at the library. He became very familiar with the Systems Department of the Tech Library, which was a room filled with computers and terminals and other fascinating equipment. One day, Daniel and I were walking through a shopping mall and passed a computer store. Daniel stopped in his tracks, pointed and announced with great excitement, "Look Mommy, a library!"

By the time he's in college, I hope Daniel will be able to tell the difference between a library and a computer store. I also hope that he'll have easy access to a world of libraries and information resources from his dorm room or computer lab or wherever there is a computer and a network connection.

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