

# CURRENT AWARENESS AND DOCUMENT DELIVERY: THE CHANGING MARKET

David J Brown

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## Introduction

It can be claimed that 'electronic document delivery' and 'current awareness services' are the most exciting, dynamic, volatile and perhaps controversial aspects of the STM information business in the early 1990s.

They represent salvation for those libraries labouring under increasingly difficult financial circumstances, but in so doing threaten the commercial viability of the very journal publishing edifice on which document delivery services depend.

This report looks at each of the following issues in turn:

1. The emerging market stimuli for electronic document delivery
2. New types of electronic document delivery services
3. A life cycle model for document delivery
4. Structure of the supply industry
5. Summary

Before discussing the market stimuli, it would be useful to list some of the key recent

developments which reflect the extent and nature of activity in the electronic document delivery area. The following table shows two things - the size and credibility of the new agencies getting into the business, and also the timing of such involvement with January 1993 being a key date.

**Table 1: List of recent developments in document delivery**  
Current Alerting Services and Individual Article Supply (CAS-IAS)

Organisation	Date (new upgraded) Service Announced
Faxon Research Services	January 1993
Ebsco Subscription Services	May/June 1993
The UnCover Company (formation)	March 1993
Swets and Zeitlinger	January 1993
Dawson (agent for OCLC's FirstSearch)	September 1993
OCLC Dispatch Services	January 1993
RLG's CitaDel (and ARIEL)	June 1992
PICA's RAPDOC	January 1993
BLDSC's 'Inside Information'	January 1993
BLDSC's 'Inside Conferences'	October 1993
BIDS ('Journal Contents Online')	April 1991
('Inside Information')	July 1993
BIDS BODOS (article supply)	September 1993
<u>Other related developments</u>	
Springer Previews	March 1993
Kluwer's ftp	April 1993
UMI's ProQuest MultiAccess System	May 1993
Engineering Information (Article Express and Ei Page One)	December 1992
CODAS (Elsevier and IoPP)	September 1993

This table is not exhaustive of all new electronic article delivery options; it takes no account of the many related schemes which can be classified as being more 'electronic or network journal publishing', where there is no focus on providing a printed article as the cornerstone

David Brown is a consultant

DJB Associates, 17 Chatham Road, Kingston on Thames, Surrey, KT1 3AB

of the publication. These include TULIP (Elsevier), Red Sage (Springer, AT&T, UCSF), CORE (OCLC, Bellcore, ACS/CAS, Cornell), JOCCT (OCLC, AAAS), the IoPP work on their dual electronic and printed journal in material science and engineering, SPIRS, etc. Developments in this area are the subject of a later presentation to the UKSG conference by Fytton Rowland.

In effect there is a large head of steam building up to transmit individual documents from producers to end users in ways which are not primarily through the printed journal system. This begs many technical, commercial and organisational questions - for librarians, intermediaries and publishers.

**Why is this happening now?**

**The market stimuli**

The technical ability to provide electronic documents delivered to individual researchers has been possible for several decades. Senders experimented with an electronic journal as early as 1976; ISI has also been able to provide rapid delivery of documents in response to a citation or database search for the past few decades (Current Contents Online and The Genuine Article, or OATS as it was originally known).

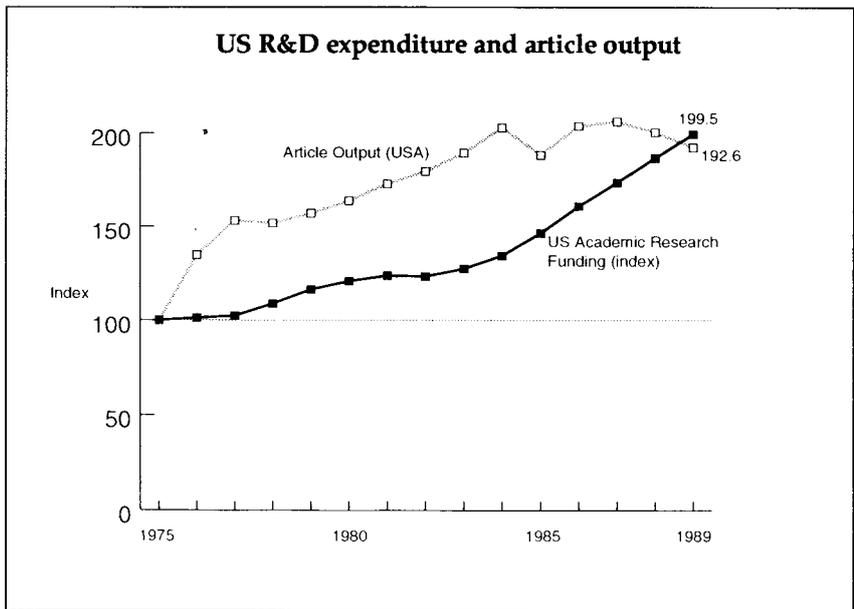
Why does 1993 seem such a crucial year for the launch of so many new services? There appears to be a number of emerging market developments which are leading to the ready acceptance of the individual article as an acceptable artefact over the pre-packaged journal issue within the key buying institutions.

**Market stimulus**

For the past two decades the amount of published information available has outstripped the ability of libraries to buy even a constant package, let

alone keep pace with the ongoing explosion and proliferation of publications in the sciences.

In the United States, academic research being conducted at universities has doubled in amount during the period 1975 to 1990 in constant value terms. There is a correlation between the physical output of such research and the publication of the results. (This correlation has been disputed by some US research librarians, but the basis for their challenge is itself subject to question.)



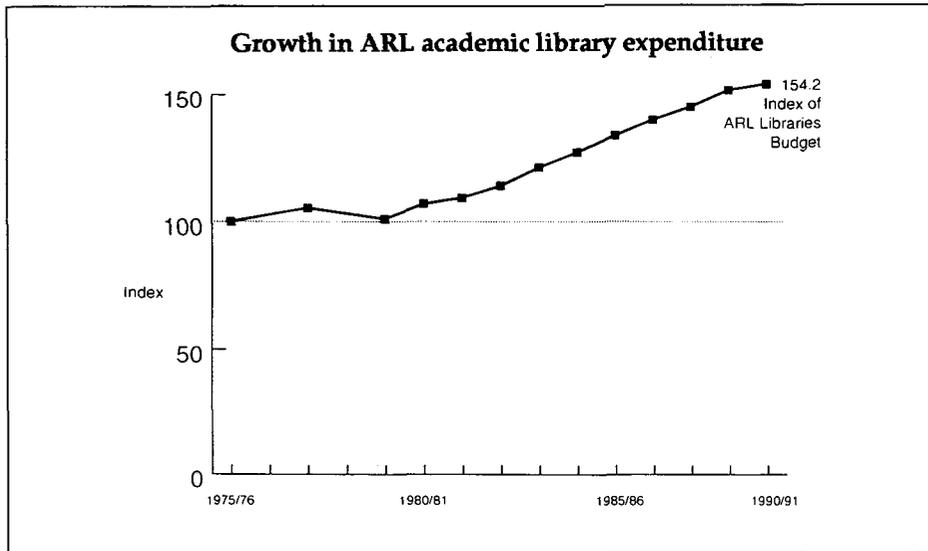
Source: Science and Engineering Indicators, 1991 edition, National Science Foundation Board. Tables 4-2 and 4-3. SCISEARCH data from ISI, 1975 to 1991

The premise is that R&D, begetting published results, has been growing over an extended period in the States, and this can be mirrored in the UK and other western and Japanese communities. On the other hand, the total budgets from the 100 or so university library member institutions of the Association of Research Libraries in the US has only grown by 50% in this same period. Whilst they have committed more of their resources to serials in an attempt to match the growth in available journal material, in other sectors of library management - books, binding, etc. - there has been a corresponding decline in monies available. The ability to fund serials at the expense of books cannot continue indefinitely, a process which many US research libraries have now arrested. The serials budget is in the

limelight, forcing cancellations to be at the top of collection management agendas.

The visible side of this 'frustration gap' is an outcry against journal publishers' pricing policies

- particularly European and notably European commercial publishers. The real problem is that large US research libraries have been unable to obtain sufficient funds from their local chief financial officers to match the growth in research output generated by federal and other research centres.

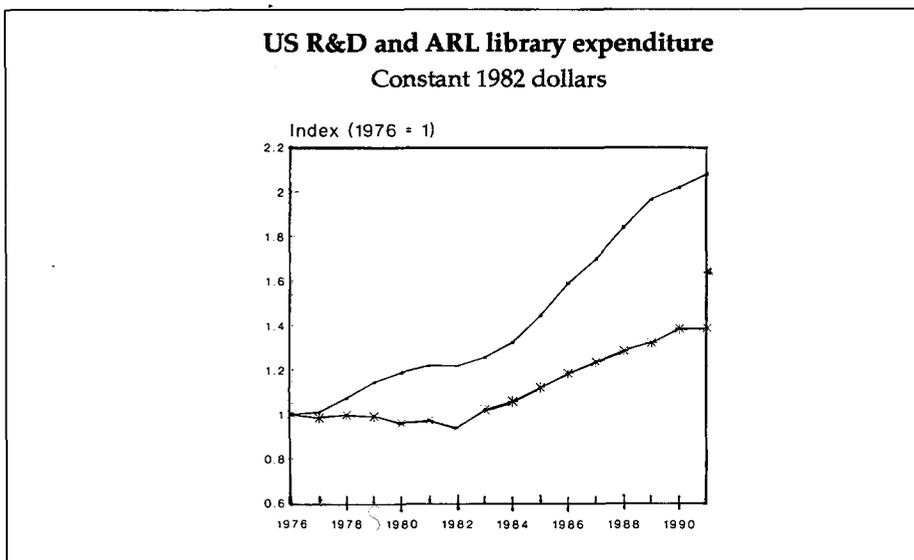


The consequence of these two trends - growth in research material output and a decline in relative library budgets - can be described as the emerging 'frustration gap' in library management, best illustrated by the following chart reproduced from a letter Pergamon sent to its US subscribers last year. I am grateful to Pergamon for permission to reproduce this chart.

for libraries to negotiate for a constant relationship with information supply is suspect. Other centres on campus, able to produce cost/benefit models in support of their case for more investment funds within their departments, take precedence.

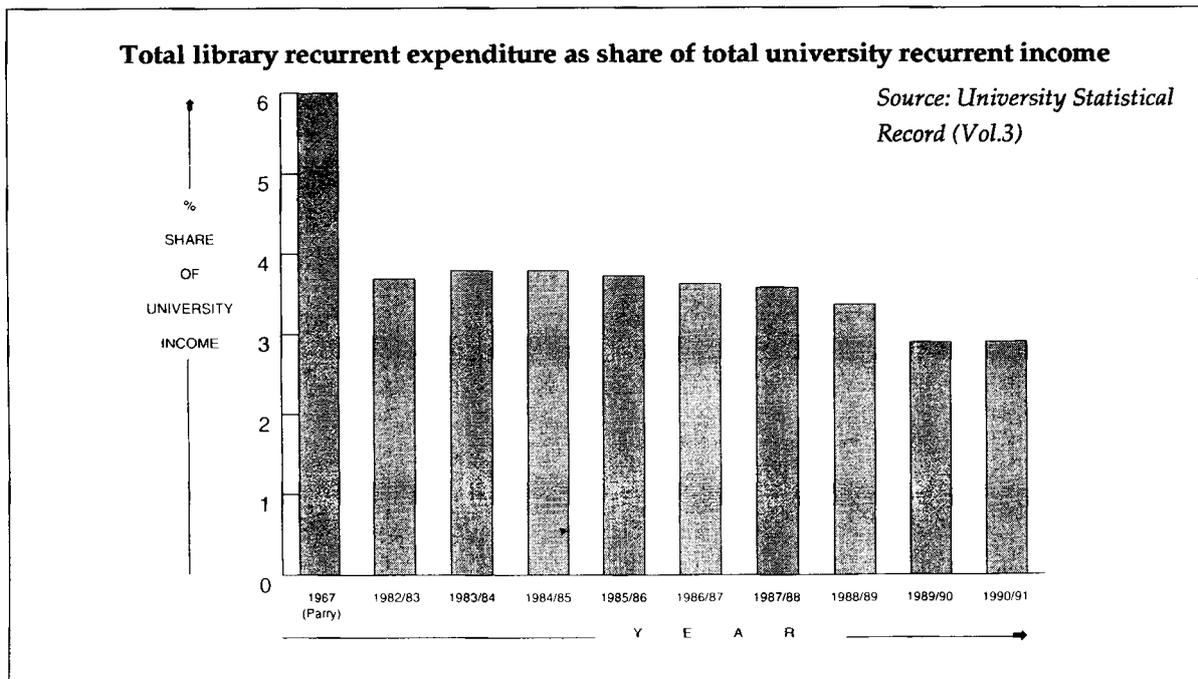
In the UK there is a similar trend among the universities. The shrinking budgets for university

libraries can be seen in the ten year trend of data reported in *University Statistical Record* (vol 3). This shows that, after allowing for changes in reporting patterns in the last few years, the proportion of a university's total budget spent on the library has declined from 4.03% (in 1980/81) to 3.32% (in 1990/91). It is this trend which is being scrutinised



Sources: *R&D Science & Engineering Indicators - 1991, National Science Board (Appendix Table 5.1)*  
*Library Expenditure - Association of Research Libraries (ARL) Statistics*

within Sir Brian Follett's current review of libraries on behalf of the Higher Education Funding Councils. (The 6% figure in 1967 was the level which the Parry Report felt to be the



required proportion needed for effective academic library management.)

In the US and to some extent in the UK there are suggestions that the amount of contract research which is brought in should be 'top sliced' to support the library. There is no evidence of the sort of gearing which would be appropriate.

In the meantime, research libraries are suffering on both sides of the Atlantic. The consequence is highly relevant for document delivery systems. It is producing changes in library management practices. Several instances of this new approach will be looked at.

**Access versus holdings**

The traditional policy of libraries seeking to acquire anything of relevance to its research workers, and cataloguing it for posterity, has suffered from financial pressures.

Though libraries have responded to the overall problem by shifting more of their resources into journals, the cumulative effect of the run-down in other budget items has meant that even this is no longer possible.

Under these circumstances libraries are moving into an 'access to' mode for information collection. Rather than invest large amounts of their increasingly precious materials budget in supporting the more esoteric journals (which have

questionable usage), the requirement for these items is being met 'on demand'. This has coined a 'just-in-case' versus 'just-in-time' collection development policy, with money for the embryonic 'just-in-time' items being channelled from the 'just-in-case' (books and journals) budgets.

As such, document delivery is a beneficiary. It is a procedure which allows the library to respond to tangible and immediate information needs for a specific item both quickly and without encumbering significant long-term journal acquisition funds. It is at the heart of on-demand information collection.

**Increased technological awareness within libraries**

Another relevant trend within libraries is that they are increasingly joining forces with the campus IT and computer departments to create a new combined unit which will offer additional local information services to researchers and undergraduates. Programmes such as Mercury at Carnegie Mellon are an example, as are the many Campus Wide Information Services (CWIS) which integrate the local hardware infrastructure with a range of new information software services stored both locally and remotely.

This process of 'convergence' between library and IT departments also provides a fertile ground for supporting new electronic document delivery services, particularly those which are interrogated and ordered through networks and LANs.

UnCover Company) which has set the unofficial standards for the rest of the new entrants to meet.

The main features of the new electronic document delivery services are:

**New management skills within the research library**

The adoption of 'life cycle costing' for materials acquisition and retention has also demonstrated the real costs of keeping unused journal issues available on shelves or even in remote stores 'just-in-case' they are ever demanded. It has highlighted the long term costs of journal acquisition, a cost which transcends the annual subscription fee alone, in some cases by a significant factor. If these journals are then barely used, and the library's budget problems continue, the likelihood of journal subscriptions being trimmed increases.

Various models have been proposed which indicate that usages (whatever that means) of more than six per annum from a title are necessary before a subscription is tenable. Until that level is reached, document delivery is expedient.

The combination of these new management techniques within major research libraries has provided a positive backdrop to the many new electronic document delivery services which are being introduced.

**The new types of electronic document delivery services**

In the old days, document delivery and interlibrary loan were slow, laborious and often expensive in terms of hidden costs.

In response to the new market demand, a new document delivery paradigm was introduced by CARL Systems Inc in 1988/9 (since become the

**Table 2: Main features of electronic document delivery services**

Features	Commentary
Current awareness/alerting	Table of issue contents
Comprehensive coverage	Minimum of 10,000 titles
Document backup support	Traditional docdel centres
Access to a network	Dedicated and open networks
Easy search engine	Menus and windows
Acceptable price range	\$10-\$15 per article
Online ordering (credit cards)	Price and passwords
Speed of delivery	24 hours by fax
Royalty payment	CCC rates of \$4-\$7
Statistical reports	Tracks usage patterns

**Current awareness/alerting services (CAS)**

The new services trap the table of contents from selected journals by double offshore keyboarding (BLDSC, Faxon), onsite keyboarding (UnCover) or scanning and OCR (Swets, KNUB-Brabant University). The aim is to achieve a rapid turnaround in the database creation - within days of receipt of the issue by the processing unit, the article identifiers will be available as an online searchable database.

**Comprehensive coverage**

Most services include 10,000 to 12,000 titles - the core of all research journals published worldwide. Whilst BLDSC acquires 53,000 titles, for example, only the top 10,000 are felt to reflect the real needs of users for a docdel service. UnCover plans to increase its coverage to 25,000. ISI has

traditionally adopted a highly selective policy for including its core 6-7,000 titles on its database.

### **Document backup support (IAS)**

At present the national libraries represent the main source providing the actual articles, and many of these have links with the CAS suppliers.

Besides the national libraries, there are several large publishers active in this area, including ISI, UMI and Ei together with DIALOG (Article Express).

There are also individual libraries active - in the US there is a group called FISCAL representing libraries which provide articles for a fee.

This remains a manually-intensive process. Several IAS providers are seeking rights from publishers to store their material in electronic form through direct contracts, thereby avoiding pitfalls of copyright infringement. Such electrostorage of items will save time and costs in accessing the full article and printing it out either locally or transmitting it through the network. Slow progress is being made in this area as commercial journal publishers seek an effective strategy to make sure that the commercial basis of their editorial operations is not compromised.

Another difficulty is the low 'repeat order' rates for article requests - some 5-10% of total first requests - which reduces the cost effectiveness of implementing automated document delivery processing for the bulk of article requests received.

### **Access to a network**

With the networks becoming ubiquitous, heavily used and now being made more powerful, the use of such networks to search and order articles from the CAS-IAS suppliers is both an attraction and a necessity. CARL's early success was to have a large number of libraries dedicated to using CARL's wide range of database offerings through its own network. It soon saw that the gateways to Internet brought in a large additional new market for its UnCover services.

Some services are experimenting with the network to deliver the article - The Research Libraries Group's ARIEL software allows documents to be transmitted through Internet.

UCL is experimenting with this software in the UK.

### **Easy search engine**

No complex boolean search is necessary to search essentially for a combination of authors or keywords in title, or else to recreate a table of contents for a particular issue on the screen. The successful services offer a menu approach, with easy on-screen ordering of articles.

### **Acceptable price range**

There is no consensus as to how much individuals are prepared to pay for an article but it appears that \$10-\$15 represents a reasonable window in the US. It compares favourably with the 'real cost' of interlibrary loans which - though ostensibly free - do carry an administrative overhead at both borrowing and lending libraries.

### **Online ordering**

Part of the 'one-stop' shopping system approach is to enable individuals to buy articles through the online catalogue (CAS) as and when they need them. In a library environment this may be through deposit accounts which the library will have arranged with the CAS-IAS service; increasingly there is a feeling that researchers working at home, in a remote laboratory or conducting research outside normal library opening hours, may be willing to pay \$10-\$15 for an urgent article. CARL Systems Inc has discovered that during its first full year of operation between 40% and 50% of all article requests received were paid for by credit card. With Engineering Information the proportion is about 30%.

### **Speed of delivery**

Most services guarantee delivery of a fax (group 3) image of the article within 24-48 hours of the order being placed.

### **Provides royalty payment**

Docdel services in the US often pay publishers directly the royalty per article set with such agencies as the Copyright Clearance Center. These average \$4-\$7 per article.

Though the traffic on articles through such CAS-IAS services is still only small or barely starting, at least this will generate a revenue stream which did not exist at all under the old days of national library document fulfilment and interlibrary loan schemes, where documents were supplied royalty free under the 'acceptable use' clauses of national copyright legislations.

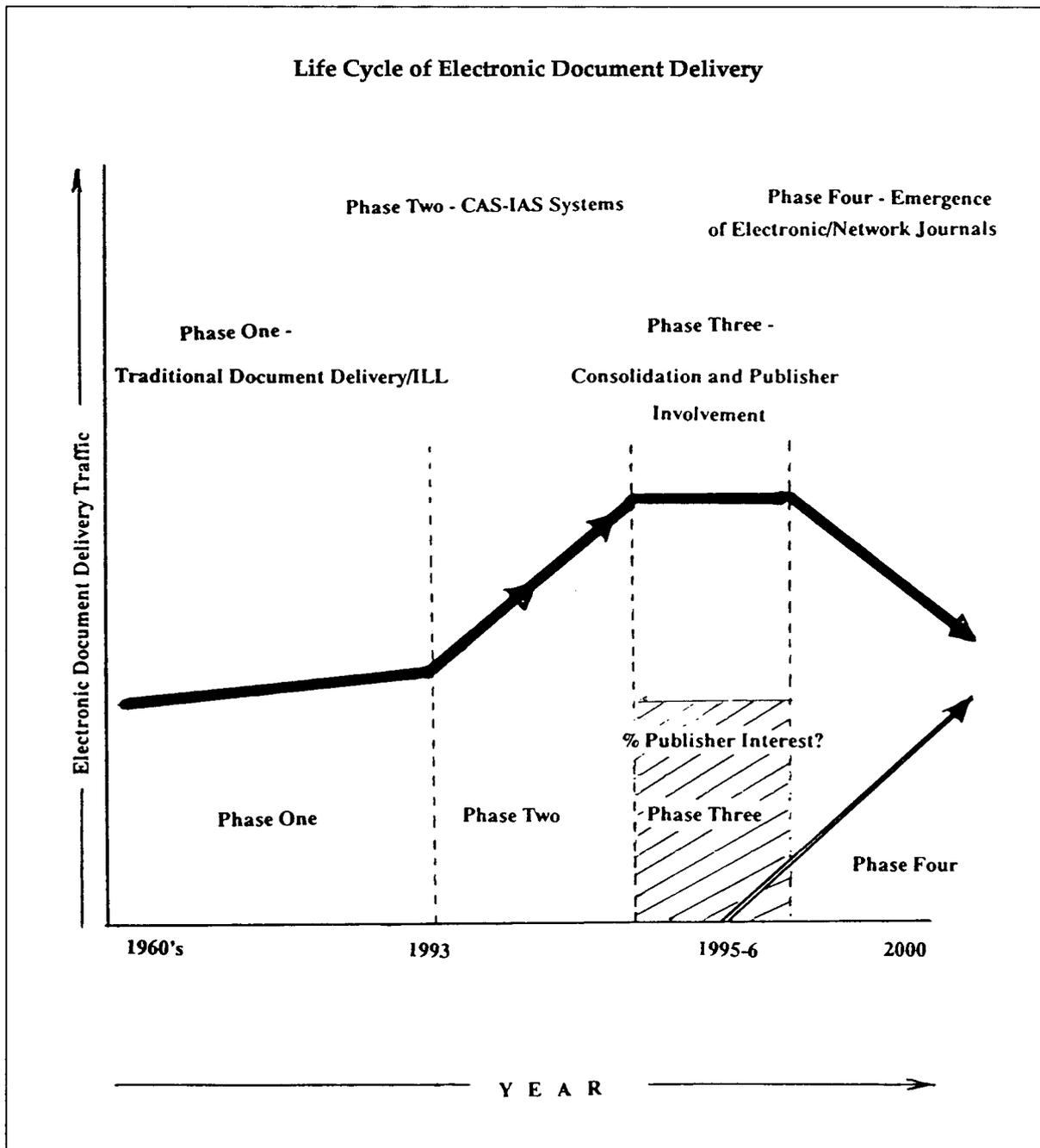
**Provides global statistical tracking**

This is also a new system which ultimately will allow publishers to see which articles are

demanding and to modify editorial acquisition practices to cope. Some of the risk may be taken out of the publication of future titles with these data on hand.

**Life cycle model of document delivery**

The following is a very rough summary of the developments which categorise the various stages of document delivery.



### 1960s to 1993

This is the traditional phase, with something like 41 million requests fulfilled, 18 million of which are docdel, 20 million being ILL and 3 million are other). The business has been growing steadily over the years.

The BLDSC is a key player with a request rate of 3.4 million, followed by similar centres in Europe (INIST, TIB Hannover, ZBM Köln) each with request rates in the 0.5 to 1 million pa. In Canada, CISTI performs a similar function.

The ILL business is focused in the US, particularly through the OCLC network. This processes some 7 million book and journal requests per annum covering the broad spectrum of subject interests. The National Library of Medicine, meanwhile, co-ordinates some 2 million requests of mainly biomedical interest.

It is a passive operation, with the requester having to use online searching, contacts or other published references to determine what article he or she wants. It then takes several days, in the case of ILL in the US several weeks in some cases, to fulfil.

### The emergence of CAS-IAS services

Appendix I shows the large number of organisations now offering some form of electronic document delivery service. They can be structured into subscription agents, library utilities, libraries, secondary publishers, primary publishers and network operators.

What this shows is that electronic document delivery is now a well-established industry, with some large and significant players taking an active part in its development.

### Maturity in document delivery

This third stage is when some further manoeuvring for position will occur, both by publishers who need to reconcile electronic document delivery with their journal publishing operations, and by possible additional new entrants.

Document delivery feeds off the existence of journals. If the 'access' policy of librarians shifts too far, the decline in journal subscriptions will prevent articles being published in their current form.

**Publishers** need to address this. In some rough financial modelling undertaken a few years ago it was shown that for a typical specialist research journal with 800 to 1,000 subscriptions, falling at 3-5% per annum, and receiving minimal current docdel revenues, the publisher would need royalties of \$15 to \$20 per article for that journal to retain a stable revenue base.

This royalty level would fly in the face of current levels of consumer price expectations, set at a time when national delivery systems were serving national academic needs and the amount of photocopying was not a severe danger to subscriptions. This low price expectation is one of the serious barriers which publishers have to surmount if financially realistic price levels for documents are to be adopted.

Meanwhile there are about 41 million formal, traditional document delivery requests. If a notional \$12 per article is achieved for each of these documents this gives an existing business of \$500 million. This is almost 20% of the estimated annual turnover of printed subscriptions for STM and related journals (between \$2,000 and \$2,500 mill).

In a recent article, published in *Learned Publishing*, Karen Hunter points to the fact that Elsevier currently receives 0.2% of its total revenues from article royalties. The gap between the 20% and 0.2% is a gap which publishers need to address during the mature stage of document delivery.

There are still other organisations which have not dealt their hand in the document delivery business. **Library automation supply** services have so far remained on the sidelines, taking a largely introspective and short term perspective of the services they provide for their 'captive' library customers. The possibility of SLS, Geac/CLSI and similar organisations also becoming active is not unthinkable during the next few years.

**Network suppliers** such as SURFNet, which is already experimenting with a document delivery server on their network, and pursuing this independently from the PICA services, may also be future players.

**Decentralised library groups** may also see that their combined holdings of specialist material give them a particular future in docdel and that they will be able to earn an additional source of income from their traditional collections and current

specialist acquisitions. For example, the University of Hawaii is already feeding its Pacific-related information into the UnCover system.

### The decline in document delivery

Finally, the role of document delivery will be challenged by the growth of electronic publishing, publishing on the networks, multimedia publishing, etc. These offer an alternative mechanism of article-like delivery, one which is not dependent on the commercial viability of a printed journal for its existence.

There are many experimental schemes which are testing user acceptance of an electronic journal:

- TULIP offers images and searchable text to nine US research campuses as a way of testing alternative delivery and pricing models for 43 materials science journals;
- RED SAGE offers a strategic alliance between Springer-Verlag (publisher), AT&T (network host and software supplier) and UCSF (user) to test high quality images and halftone delivery in molecular biology and radiology journals;
- SPIRS offers ten UK publishers the ability to experiment on a common testbed with delivering colour images in journals to libraries through SuperJANET;
- CORE is a joint venture between OCLC, American Chemical Society, CAS and Bellcore to design front-end delivery systems for chemists, etc.

Besides the above specific projects there is an undercurrent of activity which could become the electronic journals of tomorrow. Some 5,000 bulletin boards are estimated to exist on the many networks which are used to carry e-mail, file transfers etc. from researcher to researcher. These bulletin boards are unstructured - something like the informal letters of the 17th and 18th centuries which became the formal printed journals we know today. The electronic equivalents lack some key ingredients:

- **Editorial quality control** This can be addressed through the introduction of 'moderated' bulletin boards, whereby one of the members of the group takes on the role of evaluating, refereeing and circulating the selected information to the rest of the group.

- **Visual quality control** The inability to display images, halftones and illustrations is something which will change with the more powerful networks which are being introduced (SuperJANET, NREN). Experiments are underway in the UK, as part of the SPIRS initiative, to provide colour articles delivered through SuperJANET.
- **Navigation** Getting lost in an electronic jungle is a legitimate fear and such navigational issues between items and within an item are also being developed (Archie, Gophers, WAIS, WWW, etc.).

Some 200 or so electronic journals are now being listed in an ARL directory of such items. With an underlying 15% per month growth in the usage of Internet the scope for more to be added in the near future is high. PACS-L, one of these embryo electronic journals, has over 10,000 users.

Once the technical constraints are overcome and social barriers to using the screen as a method of information collection are reduced, the need for electronic document delivery will not continue its projected upward growth. The 'window of opportunity' for CAS-IAS services is of undefined length, but one assumes it will continue through to the next century. It is an interim technology. Nevertheless, like the printed journal it will be around for many more decades to come.

### Structure of the supply industry

If there is a need for the commercial base of electronic document delivery to remain sound in the short to medium timeframe, is it not possible for publishers to take a greater slice of the business? It appears, however, that the research publishing industry is not well-equipped to take an active part.

### Fragmentation of publishing

Scientific journal publishing is a notoriously fragmented business. There are too many small players to allow the development of a critical mass of quality information suitable as a basis for document delivery. I am indebted to both B H Blackwell and Swets for confirming the extent of this fragmentation. B H Blackwell has kindly allowed use of the following chart to demonstrate this fragmentation.

**Distribution of Serial Titles among Publishers**  
(Source: B H Blackwell, personal correspondence March 1993)

	Number of publishers	Number of titles
<b>Worldwide (excluding the UK)</b>		
Publishers with a turnover in excess of £50,000	51	2,854
Publishers with a turnover of less than £50,000 but more than £5,000	781	2,996
Publishers with a turnover of less than £5,000	11,232	16,057
Total	<b>12,064</b>	<b>21,907</b>
<b>United Kingdom</b>		
Publishers with a turnover in excess of £50,000	66	4,323
Publishers with a turnover of less than £50,000 but more than £5,000	206	1,051
Publishers with a turnover of less than £5,000	5,195	7,643
Total	<b>5,467</b>	<b>12,926</b>

For the rest of the world 12,000 publishers are responsible for 22,000 titles (fewer than 2 titles per publisher). In the UK 5,500 publishers create 13,000 titles (slightly more than two titles per publisher). This same high fragmentation - and dominance by the many small publishing / printing units - can be seen in UK production census statistics.

The economies of scale in scientific journal publishing are small. There are few benefits conferred through size.

This makes it difficult for one publisher - even Reed/Elsevier with over 1,000 titles - to effect dominance in the document delivery area. The minimum acceptable level of titles within CAS-IAS services is about 10,000 but moving up all the time.

#### **Co-operation among publishers**

There is a tradition whereby publishers seem unable to co-operate effectively on strategically-important issues. ADONIS is an exception, but it has taken fifteen years of hard work by the small and energetic management team to reach its current level of co-operation on 450 titles in the biomedical area. Other experiments such as Knowledge Warehouse have failed.

#### **Individual publisher commitment to R&D**

Given the volatility of the information business it might seem prudent for publishers to invest some

of their present (journal and book) revenues into designing electronic information products for the future.

In a study conducted on behalf of the BLR&DD three years ago it was shown that few publishers had established R&D, market research and new product development programmes. Pergamon is an exception, and several other UK publishers have recently set up new units under an 'electronic publisher' - Institute of Physics, Butterworth-Heinemann, etc.

It is still too soon for many of these recent initiatives to bear fruit. However, if the publishers are to provide more value-added services in future then the commitment to much more extensive investment in producing new services needs to be greater, and preferably on a co-operative and standardised basis.

#### **Summary**

Electronic document delivery is a potentially exciting business. It is one which is growing in times of world recession and library cut-backs. It answers a need by the market - the institutional libraries - to serve their patrons with the information they need when they want it.

However, it is a business which begs many commercial questions. One of these is how the existing journal publishing business can be maintained, given the claim that electronic document delivery does not provide the financial

returns which many publishers need to invest in the new information systems of the future.

Publishers will need to confront this particular issue during the next few years, and, depending on the form of their reaction, they will determine not only the rate of growth of electronic document delivery but also the willingness and needs of the research community to support the alternative

electronic journal publishing system which in itself marginalises some of the growth prospects for electronic document delivery.

Electronic document delivery offers many immediate answers to a budgetary crisis facing libraries, but it gives no answers to publishers seeking a comfortable and secure future financial existence.

### Appendix 1

## Overview of CAS-IAS Services

Organisation	No. of titles	When launched	CAS			IAS					Network
			Name	Content	Method	Name	Backup	Time	Method	Price	
<b>Subscription Agents</b>											
Faxon	9,000	Jan 1993	Faxon Finder	articles, news, letters, editorials	2x keyb offshore	Faxon Xpress	CISTI (Canada)	24/48 hrs	fax mail	\$12-15 \$20	Internet/X25 Datalinx
EBSCO	10,000	Late 1993	-	articles, conf. proceedings	BLDSC licence	-	BLDSC ADONIS	-	-	-	EBSCONET
Blackwell	13,000	March 1993	UnCover	articles	1x keyb inhouse	UnCover 2	Denver others	24 hrs	fax	\$6.50 + royalty	Internet CARL
Swets	6,000	Jan 1993	SwetScan	articles	scanning OCR	SwetDoc	BLDSC others	-	-	-	PICA DataSwets
Dawson	8,000	Sept 1993	-	articles, news, letters	OCLC	OCLC Dispatch	UMI, ISI Dynamic Info.	-	-	-	-
<b>Library Utilities</b>											
OCLC	7-8,000	Jan 1993	ArticleFirst ContentsFirst	articles, news letters	bought in	OCLC Dispatch	UMI, ISI Dynamic Info.	48-72 hrs	fax	-	OCLC FirstS EPIC
Research Libraries Group (RLG)	Bibli. database	April 1992	CitaDel	abstracts	A&I	CitaDel	UMI Ei	24-48 hrs	ARIEL fax	\$7.75 \$17.75	Internet RLIN
PICA	6,000	Jan 1993	RAPDOC	articles	Swets	RAPDOC	Dutch res libs	-	-	-	SURFNet
<b>Libraries</b>											
British Library	10,000	Jan 1993	Inside Information	articles	2x keyb offshore	Docdel	BLDSC (backup libs)	24 hrs 3-4 days	fax mail	- £3.80	ARTTel JANET
Bath Inform Data Services (BIDS)	7,000	April 1991	BIDS/ISI	articles citations	ISI licence	BODOS	October 1993	-	fax	-	JANET
<b>Secondary Publishers</b>											
ISI	7,000 jnls 4,000 conf	1960/70s	Current Contents Online	articles meetings editorials	scanning keyboarding	The Genuine Article (TGA)	1960/70s	-	fax mail	-	-
UMI	1,200 jnls 800 prof	1970/80s	UMI databases (ABI/INFORM)	abstracts	-	Article Clearing-house	1960/70s	-	fax mail	-	-
Engineering Information	4,000	1980s	Ei Page One	articles conferences	-	EiDDS Article Express	1993	-	ARIEL	-	Internet
Chemical Abstracts (CAS)	8,000	-	CAS databases	-	-	CAS DDS	-	-	mail	\$9-\$18	Internet