Scholarly communication and national union catalogues: a strategic role for SUNCAT in the UK Information Environment.

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ABSTRACT

The paper sets out to re-assess the role for SUNCAT, as national union serials catalogue, considering how it might move beyond its original remit as a simple route to discover and locate serials, to be a component in a system that also supports request and access to serial content. This is set within the context of the needs of scholarly communication and the particular role played by journals. The serials' community is faced with a paradigm shift that challenges existing publishing practices. Union catalogues have traditionally played a role in resource sharing, often in association with schemes of inter-library loan. With online access to content, and telematic opportunity, there are new possibilities that could also build on collaborative action. Opportunity is taken to review other union catalogues of serials, centralised and virtual, that are defined by theme or geographical location, both regional and national.

1. INTRODUCTION

SUNCAT, the national serials union catalogue for the UK, was launched in August 2006 - see suncat.ac.uk; it had been active as a pilot service since the start of 2005. Envisaged by others (Kidd (1) it is the product of a four-year (2 Phase) project, now populated with over two million item records from the Online Public Access Catalogues (OPACs) from over 50 of the largest university and research libraries in the UK. These are matched for display at 'title-level' to support search and locate by researchers, both from the UK and world-wide; it is clear that the library profession will also wish to use SUNCAT, for a variety of purposes.

SUNCAT has graduated to a service at a JISC-designated national data centre, EDINA (2), promoted and supported as a tool for researchers and for librarians. The serials' world, however, remains in flux, so it is timely, when planning further development for what is termed Phase 3 of SUNCAT (due to start in late 2007), to re-assess the qualities to be sought in a modern serials union catalogue. Just how should it serve scholarship and UK research policy within the context of a network-based information environment? This paper is intended to assist that debate, providing the basis for comment, with review of national union catalogues in other countries.

What is the role of a 'title-level' facility for serials in the UK digital library in the operation of a network-level 'reading and reference room' for the

UK? To what extent should functionality go beyond the bounds of the traditional role for a union catalogue of serials?

The term serials is a technical bibliographic term, which includes the journals and other periodicals that have a long-established role in research and scholarly communication; it is easy, therefore, to make the assertion that systems for discovering and locating where the contents of such serials can be accessed are an essential part of the information infrastructure to support researchers. Just as the OPAC within a given research library cannot function in splendid isolation, so too must union catalogues of serials, which act as directories to material held elsewhere, establish their appropriate role across the network.

Our reflections must be set within considerations about a national digital library infrastructure that will support and deliver additional value to researchers, within which a researcher can locate serials holdings beyond the confines of a given host institution. This is particularly important at a time when, faced with increases in the number and price of published serials, research libraries may be forced to reduce the number of subscriptions taken.

Within the UK that national infrastructure is represented in large part, for universities at least, by what is termed the JISC Information Environment, as a catch-all for what is required to support the delivery of content, services and facilities for UK research and education. Early thinking for this took place in a series of seminars called MODELS (MOving to

Distributed Environments for Library Services) Information Architecture (3). In describing the background to MODELS, Dempsey et al (4) refer to a paper by Heseltine (5), published in 1995, in which he refers to the need to create models where services fit together to facilitate the work of the end user. Among other outcomes of MODELS were four simple verbs corresponding to aspects of the digital library: Discover, Locate, Request and Deliver.

These demand-side verbs were subsequently re-worked by service organisations, such as EDINA, to represent the key tasks facing their users: Discover, Locate, Request and Access. In short, a given researcher wishes to discover some reference to an information object of potential interest (a journal article, say); then, with that found reference locates one or more services offered on that object (online, say); makes a request (by privilege of membership of an organisation holding a licence, or by simple payment of money) in order then to gain access (by some mode or another).

Over the past ten years, online access has become commonplace. Researchers and students are now accustomed, in their everyday lives, to Internet-based services that successfully go from discovery to access, anytime, anywhere. This works most evidently when the request is made with payment of money.

Researchers and students are also turning to Open Access to scholarly work. To earn respect and to survive, union catalogue services must not

only deliver the functionality traditionally expected of a union catalogue, but also have the promise of delivering content, or at least be seen to ease passage to, services that hold that object of desire, the full text, and more, in the article issued in journals and the like.

There is attempt here to use the terminology of FRBR (Functional Representation of Bibliographic Resources) which offers useful control of vocabulary when considering the object to be described in a catalogue, union catalogue or service directory. FRBR defines the form of hierarchical relation between 'the work', the 'expression' (of that work), the 'manifestation' and 'the item'. It may be interpreted that, for serials, the scholarly record of a given learned society (or individuals) is the work; its journal is the expression; the format-specific product available to be purchased is the manifestation; the copy on the shelf, or accessible online, is the item. (The terminology of FRBR can also refer to the article within a given journal.) Typically, libraries hold items; library OPACs contain descriptions at the level of manifestation; SUNCAT (as a union catalogue) aggregates data from OPACs to the level of expression - at what is sometimes referred to as title-level description.

2. CONTEXT: SCHOLARLY COMMUNICATION

Scholarship is an umbrella term for the creation, development and maintenance of the intellectual infrastructure of subjects and disciplines. Boyers (6) proposed a framework in which four aspects of scholarship are defined:

- o Scholarship of Discovery
- o Scholarship of Integration
    - ▪ primarily interdisciplinary or interpretive
- o Scholarship of Application
    - ▪ applying knowledge to the affairs of society
- o Scholarship of Teaching
    - ▪ related to pedagogical practices.

Underlying and enabling each is scholarly communication, between peers and for client groups. Peer communication of the matters arising from the research process is an essential part of scholarly activity, at a bare minimum, within disciplines and across universities, but also across boundaries of discipline and beyond the universities, thus enabling change.

Two different perspectives on scholarly communication are taken in Burnhill and Tubby-Hille (7) and Halliday (8). The former examines the flow of publications that arise from research activity (represented by funded research projects) in the social sciences; the latter has its focus on the status of emerging formats. Each has discussion about purposes of scholarly communication, in order to set context in which formal publication takes place, written, respectively, during the beginning and middle of the shift from print to digital.

In considering scholarly communication, Graham (9) defines three basic aspects:

- Informal communication

- Initial public dissemination

- Formal publication

With the emergence of the digital medium and pervasive telecommunication, informal communication between scholars (by written and even spoken word) can readily become a more public form of scholarly record. Similarly, initial public dissemination, through conference presentations and working papers, also readily become public, and can become important as public reference. This begs questions about the formal publication through the issue of articles in journals and other published serials.

Formal publication was taken to refer to the creation of material in a form which makes it publicly available and with a degree of permanence. Since the invention of the printing press, publication has been in printed form and the main vehicles for the scholarly record have been monographs or serials, these terms being technical bibliographic terms to denote, respectively, a single or continuing publication.

Role of journals and other serials

Use of the term 'serial' is broad, including periodicals, newspapers, annual reports, journals, proceedings of societies and numbered monographic series. It is now used to describe

" *a continuing resource issued in a succession of discrete parts, usually bearing numbering, that has no predetermined conclusion." (10)*

The journal is the form of serial most closely associated with scholarly communications. Although not all scholarly publication is through journals, they are a very important means of scholarly communication and have been so since the 17th century (11).

The significance of scholarly work published in journals has not diminished, as can be indicated by, and perhaps perpetuated by, the Research Assessment Exercise (RAE) in the United Kingdom. The RAE takes place every 4-6 years in order to inform funding allocation in universities: the next is scheduled for 2008. Analysis of RAE submissions made in 1996 and 2001, summarised in Table 1 below, confirms the significance of journal articles, but also illustrates the limitations of generalising across all disciplines (12). Journal articles are not the only fruit of scholarly endeavour, especially in the humanities, arts and also the social sciences, where book-length work is used as evidence of worth.

Table 1. Form of publication by disciplinary area, as row percentage

Row %		Journal articles	Book chapters	Books	Other
Science	**RAE 1996**	89.8	3.1	5.8	1.3
	RAE 2001	95.8	0.9	2.5	0.8
Engineering	**RAE 1996**	57.3	30.8	8.1	3.8
	RAE 2001	78.1	14.9	5.4	1.5
Social Sciences	**RAE 1996**	42.4	6.2	32.3	19.0
	RAE 2001	54.1	2.5	28.2	15.2
Humanities, Languages & Arts	**RAE 1996**	33.4	4.4	51.4	10.8
	RAE 2001	36.5	2.5	52.4	8.6

Paradigm shifts for serials

Some of the changes indicated above have been seismic in their impact on those working with the serials. How, then, do these changes effect national union catalogues for serials? Five of those changes may be considered. The first is the issue of articles in electronic format, both for formal publishing (through a publishing house) and for informal and initial public dissemination. The second is the issue of articles outwith, or in parallel to, those issued by the publishing house, that is, by commercial publishing where the author signs over copyright and the issued article is only available to reader or to library under restricted licence and payment of money. The third is the number of serials, specifically of journals, reflecting an increase in the volume of research funding, of researchers and of research articles. The fourth is the cost, both as price and as total cost to the library, with focus of attention on consortia purchases (with

complexity for authorisation of access) and on licences that allow access to changing bundles of journals. This gives rise to the fifth change, of major significance for a national union catalogue: the shift from a focus on what participating libraries have on-shelf, towards a focus on what they also have licence to access on-line.

There is an idealised picture of the scholarly journal, in which the role of the editor, and of the publishing house, is guardian of quality. The editor, appointed by learned society or by publisher, is normally a recognised specialist in a given subject area, often having support for selection from an editorial board that comprises experts in the journal's subject field, and access to other experts, if required, for what is usually described as 'peer review'. These processes, most often managed by contract from learned society or (by means of property ownership) by a publishing house, are combined with factoring that addresses licensing and distribution and the underlying economics. This is said to ensure the issuing of articles of quality into the annals of a recognised journal. Beyond the limitations of the print era, the economics of that factoring are being challenged, and material is made public by other means, with different strategies being adopted for the assessment of quality – see the discussion of Open Access below.

For union catalogues of serials, the debates about quality and peer review are interesting but they do not help define boundaries of scope. Instead, they highlight that there are new arenas for the publication, or issuing of articles, that are coming into being beyond the convenience of publishing

houses; this poses questions about whether and how they should be included in the scope of a union catalogue of serials.

The extent of the move from entirely print-based journal publishing to providing online access to the full text is incomplete and varies between disciplines, being particularly prevalent in the sciences. However, it is now possible to read that:

"In the sciences nowadays there are probably no journals of any repute that are not published electronically." (13)

In making that move to digital products and services, publishers devised various business models that would generate revenue to re-coup the costs of their investment - the purchase of hardware, software and skills. Ironically, the universities already possessed much of that infrastructure for distribution. Those revenue models involved various systems of product definition and licensing with a resultant complexity that is not readily captured in the bibliographic systems used by librarians to manage such resources on behalf of their client communities. Union catalogues for serials most often take such bibliographic systems as the source of their data.

These changes in technology, as much as the financial changes discussed below, have spawned alternatives to traditional commercial-based publishing. The Open Access movement challenges traditional publishers by providing access to material at no cost, and with minimum licence

restriction, to end users or intermediaries. Suber (14) provides an introduction to the Open Access movement and to its importance for libraries, with the case for the expansion of Open Access material through deposit in institutional repositories put forward by Harnad and Brody (15).

The 'serials crisis', as described to the JISC in a report by the Library and Statistics Unit, Loughborough University (16), relates to the increase in the number and cost of serials, especially in science, technology and medicine, and the limitations in the budgets available to libraries. A later study carried out by the Unit (17) showed that in a specific subject area (biomedicine) price increases during the period 2000 to 2004 ranged from 27% to 94%. Coping strategies have included reducing the number of subscriptions, signing up to new electronic delivery packages via different deals and co-operating with other institutions on resource and collection management.

3. NATIONAL UNION CATALOGUES OF SERIALS

For researcher, student, and librarian, union catalogues have been a vital finding aid to what is held where. They can also be used as a resource discovery tool, of what serials exist and on what subject. The two traditional purposes, of discovery and location, remain important. Before considering extending functionality, to cover online access to journal content, it may be useful to review other implementations of union catalogues. SUNCAT may be the first online national union catalogue of

serials in the UK, but others have existed elsewhere, and there have been many other union catalogues at a lower than UK level.

Traditionally, the role of the union catalogue has been to promote resource sharing among libraries, essentially to create a 'community collection' of resources which may be housed and shared across many institutions, Gatenby (18). This sense of 'community' has given rise to many union catalogues that have a regional character, or that have their focus on a particular discipline or specialism.

A union catalogue is defined as a *"catalogue of the combined holdings of several libraries"* (19), although it might be preferable now to regard it as a directory on what is held by others, where each institution makes details of the resources it has available via the library OPAC. Union catalogues have taken the form of a physical union catalogue, where records for a number of contributing libraries are stored in one place, or the form of a distributed, or virtual, union catalogue, achieved through federated searches across OPACs. Each has their particular challenges, as are discussed by Gatenby (20) and by Cousins (21).

Whilst the majority of union catalogues are now provided online, not all are. Some important union catalogues are only available in their traditional printed format: e.g. the British Union Catalogue of Music Periodicals. Most paper-based catalogues were migrated to CD-ROM or web-based resources in the 1990's. This coincided, for serials, with the prospect of access to the full text of an article in a journal – that is, for

electronic as well as print material. SALSER (22), launched in 1994 as the union catalogue for serials in Scotland, was one of the first web-based union catalogues. CD-ROM union catalogues do remain in use – particularly in discipline-focused union catalogues where the serials in that discipline remain paper-based. Community-generated, open access union catalogues are most common, but some union catalogues are commercial or by subscription only.

All union catalogues share concerns about coverage, currency and usability, including the extent of apparent duplication. Centralized online catalogues remain the norm but there has been repeated investigation into use of virtual union catalogues –via federated searches powered by Z39.50 (23), SRU/SRW (24) and similar technologies. Such virtual union catalogues can be inexpensive to set up and, by their nature, can be as up-to-date as the constituent libraries, but there is often little prospect of de-duplication of data. Federated searches risk low usability as they can be slow and/or unreliable due to the nature of searching multiple targets at once and because of potential disparities between data. The plain fact is that serials data vary widely from one OPAC to another.

The biggest problem for both researchers (of all types and levels) and practitioners using any type of union catalogue is establishing whether a resource is current, updated and actively maintained. A major problem, for both virtual and centralized union catalogues, is that the enthusiasm, volunteer effort and funding associated with the initial set up and development can wane, with the long-term maintenance and the addition

of new libraries difficult to sustain. There are plenty of examples of union catalogues that start up as funded projects, but even if their product remains available online it decays over time as data lacks currency. Often, however, the products of these projects are now totally inaccessible having never been fully implemented or developed after initial launch. One example would be the Welsh union catalogue SEREN (25); there are many others. The complex challenges and the knowledge of past projects is perhaps the reason for the popularity of federated searching technologies in the UK and the existence of partial distributed union catalogues using Z39.50 technology.

Subject specific requirements and a relative lack of interdisciplinary scholarly bodies along with locally controlled public library funding explains the fact that many UK union catalogues are themed by subject, sector, or location. Several excellent services focused on highly specific user requirements or accessibility issues do cover a broader range of collections restricted not by discipline but by the availability of material in an appropriate form for these users.

One example of a subject-based union catalogue is arlis.net (26), a union catalogue of art and architecture periodicals; another area-based one is InforM25 (27) the union catalogue for libraries in the London area. A further example, RevealWeb (28), see Chapman (29), is designed, structured and populated for the specific needs and access requirements of specific groups, in this case blind and partially sighted library users.

There are other UK-wide union catalogues for a broader range of materials (full catalogue holdings of monographs, serials, maps etc.) but with very specific coverage: COPAC (30), the CURL database (31), Talis Source (32) (successor to UnityWeb) and the UnityUK (33) come to mind.

Beyond the UK, in the rest of the world, there is comparable variety of catalogues – particularly the division of academic and public library catalogues and the phenomenon of subject-specific union catalogues. Many countries have opted to develop publicly-funded national union catalogues, either using the physical or virtual union catalogue model or, like Singapore's SILAS (34), a hybrid of both.

In Europe there are well-established country-wide union catalogues, some limited to higher education contributors such as France's ABES (35), and Spain's REBIUN (36). Others include a wide scope of contributors and features such as Italy's ACNP (37), which incorporates direct document delivery links alongside full holdings details, or Schweizer Zeitschriftenportal SZP - the Swiss Portal to Serials (38). The Nordic countries have a history of such collaboration at national and trans-national level: NOSP (39), LINDA (40), MANDA (41), SAMPER (42), LIBRIS (43), Gegnir (44), DanBib/bibliotek.dk (45). These union catalogues, being older, have been physical catalogues with active engagement by contributing libraries resulting in accurate and well presented union catalogues. Petersen (46) reports that hybrid models are under active consideration. AHEAD Text Access (47), in Ireland, caters specifically for print-disabled students, with coverage of all major Irish

third level institutions. KVK (48) is designed as a solution to the strong regional basis of German union catalogues, a model that may be applicable to other multi-authority states (49). The catalogue is a simple but robust application of federated search technology. Because of its origins, the KVK has particularly detailed cross-sectoral search facilities for German-speaking areas, but it has also been expanded to allow searching of a range of worldwide catalogues and book sellers.

As yet, there is no cross-sector union catalogue for all of Europe, virtual or otherwise. The European Library (50), however, is a virtual catalogue with coverage of the National Libraries in Europe, achieved via federated searching. There are also a number of Europe-wide union catalogues for specific subjects or contexts, such as the European Commission's ECLAS (51).

Several of the union catalogues in North America are well known, larger in number and varied, reflecting area or institutional groupings of libraries, having common funding sources or linked by the vagaries of geography. Those in the USA include Melvyl (52), JerseyCat (53), OhioLINK (54) etc. In Canada AMICUS (55), a national union catalogue, operates in parallel with local or regional union catalogues such as MULS (56). The most significant union catalogue in North America, and in the world, is WorldCat (57).

Further afield, Australasia and South East Asia have a number of well-regarded union catalogues, often cross-sectoral, such as Libraries

Australia (58), Te Puna (59) and SILAS (34); motivated perhaps by the geographic challenges (low population density, island communities etc.) for library provision in these regions. With telecommunication capability and federated search technology, established and relatively inexpensive to implement, catalogues such as India's DELNET (60) are gradually beginning to emerge in the developing world, as the advantages of participating in union catalogues gain policy priority.

There have been many commentators on the workings, potential and actual, of union catalogues. Union catalogues, particularly on an international scale, raise the possibility of highly rewarding and beneficial collaboration between libraries. Kohl and Sanville (61) and Laxman Rao (62) discuss the issues, potential benefits and highlight both proven ideas and potential opportunities for effective collaborative working and collection development in this type of environment. Hider (63) argues the case for the bibliographic value of a "physical" (centralised) union catalogue, and warns against the increase in duplication, error, omissions and inconsistency that can follow a move to a distributed model. Farelly and Reid (64), see also Reid (65), highlight the value of union catalogues for interlending and document supply and look to future improvements in national union catalogues for increased quality of information on interlending status of electronic materials.

As may be expected, the focus is now on the dominance of electronic journals as the primary form of scholarly research and communication, because of the speed and convenience of access (66) accompanying a

gradual decrease in loans and Inter-Library Loan requests (67) - although this may, in part, be accounted for by the licence restrictions over electronic materials which can leave libraries unsure of the terms of access for such an item.

4. SUNCAT

The origin, design considerations and updates on progress for SUNCAT are given elsewhere (68).   In summary, the user requirement for a national serials union catalogue was established in a research project, funded by JISC and the Research Support Libraries Programme (RSLP) in conjunction with the British Library, which canvassed views from researchers and librarians as part of an investigation into the case for an UK National Union Catalogue:

"When users were asked how often they would wish to use a UKNUC for various different purposes, the idea of locating all journals in a particular subject area achieved the highest score among most groups of researchers, with support ranging from 72% to 95%, the highest score reached in response to this question. This is a definite indication of the need and support for a Serials National Union Catalogue." (69)

Further work was commissioned to conduct a scoping study and specification for a serials union catalogue (70) and following competitive tender, the contract to create SUNCAT was let in February 2003, to a partnership of the University of Edinburgh and Ex Libris. EDINA has

provided the project management and much of the staff effort; Ex Libris has supplied and installed the Aleph 500 library management system on hardware at EDINA to act as the ingest, matching and source database for SUNCAT.

The initial priority was to create a critical mass of serials titles. To that end, in what was called Phase 1 (February 2003 – December 2004), about two million bibliographical records with associated holdings information from the OPACs of the 22 largest research libraries were received, re-formatted (to MARC21) and loaded. A further two million bibliographical records from the CONSER and the ISSN databases were also ingested. The process of matching records is described by Aburrow-Jones (71).

In Phase 2, from January 2005, the priority shifted to the development of key facilities, to preparations for the delivery of service, with launch of a trial service on 1st August 2006, and to the extension of coverage, with the addition of materials from thirty-six additional libraries by October 2006. The additional libraries include museums, learned societies, research institutes and the first large public library, as well as those from universities; Contributing Libraries are listed on the SUNCAT Web site (72).

The developments carried out in Phase 2 have included the implementation of a unique identifier (SUNCAT ID) to aid the matching of records, as a significant proportion do not have an assigned ISSN, and creation of a specific Librarians' Interface, with facilities for Contributing

Libraries to download records from SUNCAT to local OPACs and carry out computer-assisted record matching (73).

SUNCAT has had two aims: to be a discover and locate facility for researchers; to be a pool of high quality bibliographic records to allow Contributing Libraries to upgrade their OPACs. The variable and generally poor quality of records frustrates both the operation of the distributed digital library and also the operation of SUNCAT – at initial load, in matching and consequently in the existence of unwanted duplicates in display. Stubley, Bull and Kidd noted this as a major challenge for a serials' union catalogue in the UK:

"A particular problem when considering the bringing together of serials records from different UK library catalogues, either into a physical union catalogue, or by harvesting records from different systems to create a virtual catalogue, is the variable quality of many of these records." (74)

Holding statements are particularly challenging for union catalogues. There are three reasons for this. The first is variable quality, in terms of both use and content of field structures:

"Just as the bibliographic record for serials in many UK libraries has resisted standardisation, this is perhaps even more true for the holdings record i.e. the record of which volumes and issues are held at particular libraries (holdings information in its broader sense – which libraries, or which branches within a particular library system, hold a particular serial

or monograph – is also to be found in many different fields and formats)."

(75)

Some deficiencies can be overcome, such as holdings information held in different fields or in different formats. Inadequate or inaccurate data cannot realistically be remedied centrally.

The second reason that holdings statements are a challenge is because they are more prone to change than other parts of the record, as serials are cancelled or parts are lost, undermining the currency. That has prompted use of a link via OpenURL (76) through to the local OPAC in order to retrieve and display the most up-to-date information.

The third reason is that holdings statements are generally inadequate, or at best inconsistent, in giving good summary information about what is available on-line, as well as on-shelf. The approach under consideration is the possibility of obtaining such 'holdings information' about electronic journals from publishers, aggregators or Publication Access Management Systems (PAMS). This will be based on experience gained in a project, funded by the JISC, to test and evaluate the transmission of data from Serials Solutions (a PAMS) to SUNCAT using the ONIX for Serials (Serials Online Holdings) format (77).

5. EXTENDING FUNCTIONALITY

The principal task was to design, build and populate SUNCAT as a national union catalogue of serials for the UK that would offer researchers functionality that met two key user tasks: discovery (of what serials exist) and location (of a service for a given serial). This has been addressed successfully, offering a range of search keys across title level serial information and of summary holdings statements. Notwithstanding that there is more to do on the original remit, the matter for consideration in this section is whether and how to extend functionality and remit: that is, to create a serials facility that would meet the requirements of researchers to request (select and initiate a found service) and access (via download, personal visit or document delivery), not the serial but one or more articles in a serial. Rather than regard this as a matter only of extending the functional scope of SUNCAT, the stance taken is to identify issues that need to be solved in partnership with others.

SUNCAT is a serials facility, and what may be under discussion here are matters that relate to the planning of a 'serials services directory', as investigated and reported for an earlier Telematics for Libraries project, Bollini and Burnhill (78). More recent, non-technical work that reflects on resource sharing in the new environment is reported in Gatenby and Goldner (79).

The following discussion is exploratory, reviewing access to:
a) Full Text of articles
   • both commercially-licensed and Open Access
b) Document delivery service

- for (hard copy of) the article

c) Inter-Library Lending systems

- for loan request of all or part of an issue or volume

d) Tables of Contents

- to browse information about article in journal issues

a) Access to Full Text services

A union catalogue, SUNCAT, contains bibliographic information about serials, not the (full) text of articles in those serials. In many instances, those journals (and other serials) are available only in printed format, and are on the shelves of contributing libraries. Users should understand that access to printed journals will require either a visit to the holding library or a request for an inter-library loan. In an increasing number of instances, the contents of all or part of those journals are online, available through licences taken out by libraries or under terms of Open Access. It is accepted that, for electronic journals, users will expect access to the full text will be readily available. Given that a union catalogue does not itself hold that full text – nor could any single aggregator - the challenge is to ease access to such content, locating the 'appropriate copy'.

Libraries contributing to SUNCAT vary widely in their treatment of electronic journals. Although the majority of Contributing Libraries do include information about electronic journals or electronic versions of journals in their local catalogue, at least for commercially-licensed journals, some have chosen to handle electronic journals in separate

systems and have not submitted this data to SUNCAT. The matching to 'title-level' within SUNCAT, however, may provide opportunity to assist researchers to locate the prospect of online access to content, not directly but by use of OpenURL linkage, via the national OpenURL Router, to institutional resolvers.

Not many libraries include comprehensive listings of Open Access journals in their local catalogues and hence the data submitted to SUNCAT is very limited. Perhaps the more relevant source of information is the *Directory of Open Access Journals:* this currently has 2340 journals in the directory with 674 journals searchable at article level. This is likely to grow, although Morris (80) reports that the listing overestimates the number of open access journals by 14% with 3.13% wholly or partly inaccessible, 1.15% not original journals, 0.82% are not full open access and a further 9.07% have published no articles since 2003. There are also other services such as *Social and Human Sciences Online Periodicals* (81) which provides access to articles from 700 periodicals in social and human sciences.

At the time of writing, development of institutional and subject-based repositories of post-prints of published articles is gathering momentum, with search facilities offering federated searching, and perhaps aggregation of article-level content. Creating appropriate links to these as well as existing commercial services would seem to be the way forward.

b) Access to document delivery services

Document delivery services straddle the world of per-article payment for use of online full text services, through bespoke delivery method by commercial services, to accounting schemes to support co-operation among libraries for inter-library loan (ILL). Given the spread of online access, retrospective digitisation and the continuing significance of print, this will continue to be an area of flux.

Whatever the label and the means of delivery, the purpose is to deliver a business model that meets need where there is no immediate access, on-shelf at the host library or on-line by privilege of membership of an institution with a licence - the Request and Deliver parts of the MODELS outlined earlier.

In some ways this can be regarded as an extension to the 'appropriate copy' problem, offering the option to place a request for one of a range of offers of service – that might vary in several respects, such as price and method of supply/ transmission: online, ARTEmail (82), ARTTEL (83), Ariel, secure electronic delivery, fax, e-mail as well as mail. A list of 73 suppliers is listed by Shipman (84). The premier supplier in the UK is the British Library Document Supply Centre with 260,000 international journal titles, covering every subject available. Clearly, there are issues to do with the initiation and authorisation of such requests, between library and their patrons.

c) Access to Inter-Library Lending services

Inter-library lending (ILL) is an older term, and remains a particular mode of document supply with collaborative overtones. Its history and that of the union catalogue could be thought to be intertwined, with the union catalogue used by ILL staff in libraries to see who (else) has what. There are interesting opportunities for national union catalogues of serials, individually and especially in combination. SUNCAT, it could be argued, even now contains information for near-to-all of the serials that are of interest to UK researchers. Even researchers at institutions with the most well-endowed libraries will not find every serial of relevance in their home institution, especially if it is in print format only. It is to be expected that requests for ILL will increase as SUNCAT becomes used as finding aid.

Having identified a title and a location (or locations) for a particular title, how might a researcher proceed? One option is for the researcher to note the relevant details and arrange to visit the holding institution. Alternatively the user might send a request for an Interlibrary Loan to the appropriate ILL department. Could the offer to provide this by ILL be one of the offers for document supply suggested above? How, though, might this be done? Once again the British Library Document Supply Centre plays the role of significant supplier.

d) Tables of Contents services

The table of contents (ToC) is the simplest means to go from serial-level to article-level, and this originates with the publisher, as ancillary data.

The challenge is to identify services that aggregate and present these for use. CrossRef comes to mind as having wide nominal coverage approaching the large number of serials in SUNCAT. Even the largest of the aggregation services (e.g. IngentaConnect and Zetoc) have only a relatively small proportion of the serials in the SUNCAT database: not all serials could be linked to an existing ToC service.

At the time of writing, IngentaConnect (85) provides access to over 28,000 journals and from 6,100 full-text online journals. Zetoc (86), the service from the British Library hosted by MIMAS (87), covers over 2000 journals. Some publishers offer ToC services themselves, either via an e-mail alerting service or on a web site. These include Blackwell Publishing (88), covering 600 titles via email and web site, and SpringerLink (89), including 700 titles by email, website and RSS feed. PubMed (90) offers an e-mail alerting service based on pre-selected journals in its database.

6. CONCLUDING REMARKS

The purpose of this paper has been to stimulate comment, as SUNCAT steps out into the light, seeking a place with other resource discovery and delivery tools in the 'online reading and reference room' of the UK digital library. Now that SUNCAT has been successfully launched as a working service for researchers, there is opportunity and obligation to re-assess the role of the UK national union catalogue for serials within the broader context of national and international provision on the network for scholarly

communication. Serials, more specifically journals, will continue to feature in scholarly communication, being the preferred publication method for most disciplines, but the means and terms of access to their content is undergoing seismic change, as is scholarly publication, especially with the issue of material under terms of Open Access.

SUNCAT arose out of stated requirements from researchers and scholars for a single facility through which to search and find journals. Although challenging, that has been achieved through the collective will, expertise and effort of UK research libraries. That has reduced duplication of effort for researchers and librarians, no longer having to check each OPAC. However, such an achievement is only a beginning. The challenges for those charged with the policy and operation of SUNCAT in its next phase are three-fold: to seek to increase the quality of service for existing functionality for researchers; to implement promised functionality for librarians in order to upgrade locally-held records; to investigate and develop extended functionality as an online serials facility – as a modern union serials catalogue or, more properly, an inter-operable component within the JISC Information Environment. Those challenges are all inextricably linked. Assisting libraries to improve locally-held records is co-incident with improved data quality for matching, and hence reducing duplication, which will therefore improve the quality of service to researchers. The implementation of OpenURL functionality, to link to OPACs for access to up-to-date holdings statements, can also be used to link from SUNCAT to the national OpenURL Router, and the OpenURL resolvers which will enable researchers to gain access to the 'appropriate

copy' of serial articles. OpenURL is but one of the planks required to bridge to extended functionality in order to meet the requirements of 'request' and 'access/deliver' for the modern information environment.

Recently there have been calls to learn from Internet commerce and to seek integration of catalogue data in the wider virtual world - see Nilges (91) and Dempsey (92), with the latter stating that:

> "*In a pre-network world, where information resources were relatively scarce and attention relatively abundant, users built their workflow around the library. In a networked world where information resources are relatively abundant, and attention is relatively scarce, we cannot expect this to happen. Indeed the library needs to think about ways of building its resources around the user workflow. We cannot expect the user to come to the library any more; in fact we cannot expect the user to come to the library Web site any more.*"

The task for UK research libraries and the serials community, in meeting the needs of those that they serve, is to decide what else should be taken to the network level, working with JISC policy makers and JISC service providers, to establish a framework for integration that gains leverage from existing JISC and institutional investment. The task for the JISC service providers is to work in closer relationship with one another and in partnership with national and international providers: SUNCAT needs to interact with services providing Table of Contents, ILL, document delivery

and other services. They also have the task of locating user workflows and discovering how best to engage attention: SUNCAT needs to place itself into the scholar/researchers workspace – a ready, web-services part of the workflow, not just a website waiting to be found. As the consumer sites such as Amazon develop what Dempsey refers to as 'a rich texture of suggestion' so it becomes incumbent for other information services to provide users with similar facilities. However, the business model for much Internet commerce is geared to revenue from advertising for retail goods. If access to the product of scholarly communication is to be free at the point of use, a long-standing policy objective, then the challenge is to devise and to support a business model that can fund services, such as union catalogues, in necessary infrastructure.

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