

The recombinant library: portals and people

Lorcan Dempsey
Vice President, Research, OCLC
E-mail: DempseyL@oclc.org

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published article. A suggested citation appears at the bottom of this page.

Last change to this version: 2 September 2003.

Copyright 2003 OCLC Online Computer Library Center, Inc.
6565 Frantz Road, Dublin, Ohio 43017-3395 USA
<http://www.oclc.org/>

Reproduction of substantial portions of this publication must contain the OCLC copyright notice.

Suggested citation:

Dempsey, Lorcan. 2003. "The Recombinant Library: Portals and People." Co-published simultaneously in *Journal of Library Administration*, 39,4:103-136; and in *Improved Access to Information: Portals, Content Selection, and Digital Information*, ed. Sul H. Lee, 103-136. Binghamton, NY: Haworth. Available online at: http://www.oclc.org/research/staff/dempsey/recombinant_library/

*A distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience.
Kevin Lynch (quoted by Joseph Rykwert¹)*

The words of things entangle and confuse, said the poet Wallace Stevens, and ‘portal’ is certainly one such word. This is in large part because we do not have a shared sense of the ‘thing’ of which it is the word. Indeed, ‘portal’ is one of the least helpful words we have developed in recent years as we come to terms with the changing information environment in which we research, learn and work.

Of course, this confusion is symptomatic of the early stage of our thinking, and of the natural tendency to reach for answers before we really understand what some of the questions are. What I hope to do here is to discuss some of the current ways in which we are using the word, but I really plan to examine the contexts in which it has been invoked and to say some thing about them, moving beyond the current portal discussion to think about the general network information environment.

I will proceed in this way: A first section will explore some general issues invoked by the portal discussion. A second section will examine some current library approaches to portal construction, with some focus on architectural concerns. A third section will return to the broader view, considering briefly some aspects of the information environment in which libraries are working, and saying something about how the library manifests its services in a network space, a network space within which, increasingly, resource and service components need to be flexibly combined to support research and learning experiences. The second section is largely focused on a particular strand of current portal development; the third section looks a little more to the future.

The style of this article reflects its origin in a presentation to the *Improved access to library collections conference*, organized by the University of Oklahoma Libraries, in Oklahoma City, February 2003. In the main, I have followed the structure of the presentation.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

1. Introduction – the portal question

Consider two loose characterizations:

An information hub. An entry point to information resources. A density of resources and services on the network. A 'portfolio' of resources, potentially customized to specific role or individual interests. An aggregation or collection of resources organized to assist particular categories of users.

How the library mediates the engagement of users and resources in a network environment

The first is broadly reminiscent of various portal definitions. The “portal” is an entry point to a world of resources, designed to save the user time, to unite him or her with relevant resources, and to encourage maximum use of acquired resources. It may be customized to personal or role interests. Such portals are now much discussed and aspired to.

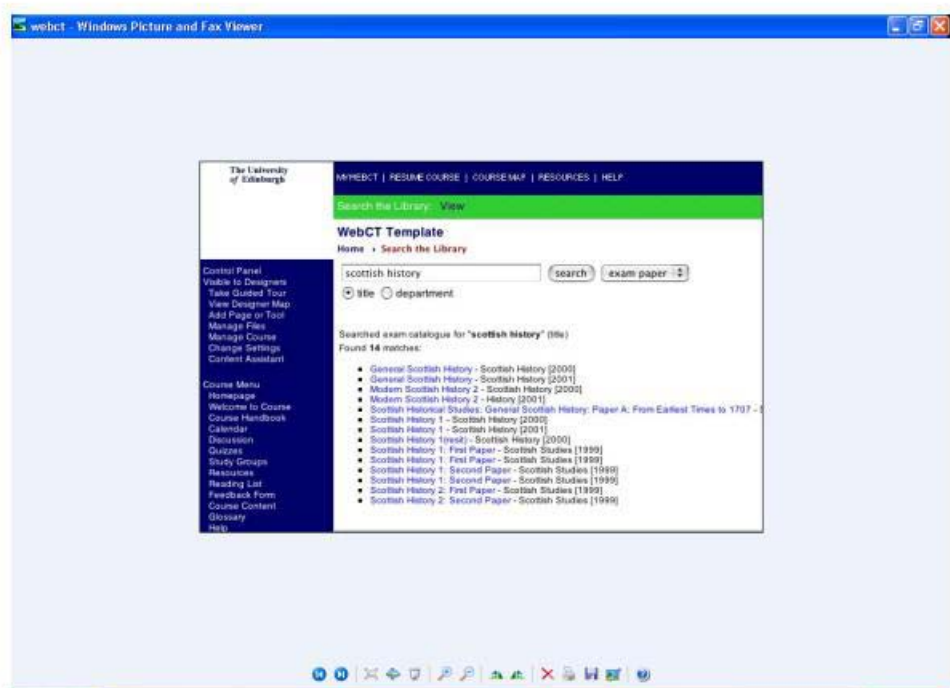
The second characterization talks about an environment. It is arguable that the major service issue facing libraries at the moment is how to develop a network presence, how to make services available to users at the point in their research or learning activity that makes sense. The current network presence is in early stages; think for a moment of the limited utility of the flat alphabetic lists of electronic resources we present to our users.

Here, I argue that a major reason that the portal discussion is often unsatisfying is that we imagine that the portal is a sufficient response to the issues raised by the second characterization above. It is often imagined that the ‘portal’ answers the question of how the library fruitfully engages the variety of resources and the variety of user needs. At best, however, I argue, the portal is only a partial answer; at worst, it obscures the real question. This is for several reasons. One important one is that the user typically will be served by a variety of network services, by a learning management system and a campus portal, for example. There will in fact be several ‘hubs’ around which he or she articulates network behavior. How does the library portal relate to these other hubs of use? They cannot all, despite their aspirations, be ‘one-stop shops’². In short, a portal – however defined -- is not a substitute for a strategy for effective use and management of resources in a network environment; it is a part of it.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

I return to these issues more fully in section three. For the moment, here are a couple of examples to think about. First, a screen-shot from a project, Devil, at the University of Edinburgh (Figure 1)³. What this shows is a search box for library resources embedded in a learning management system. The rationale here is that the learning management system is an important ‘hub’ of undergraduate use, and that such a service, bringing the library to the student, better supports learning activity and effective use of library resources. The broad aim of the project is to identify resources of interest to tutors in creating courses, and then provide them with tools to permit dynamic data integration between information resources and courses mediated by Learning Management Systems (WebCT in this case). In fact, behind the scenes there is the cross-searching functionality that is central to many library portal initiatives. In the terminology presented below, the learning management system is a presentation environment for library resources. And the library resources are potentially integrated by a cross-searching ‘broker’ which talks to several databases using the Z39.50 protocol behind the scenes. The broker allows a simple search box to be presented, and then invisibly spreads out the search and consolidates the results.

Figure 1

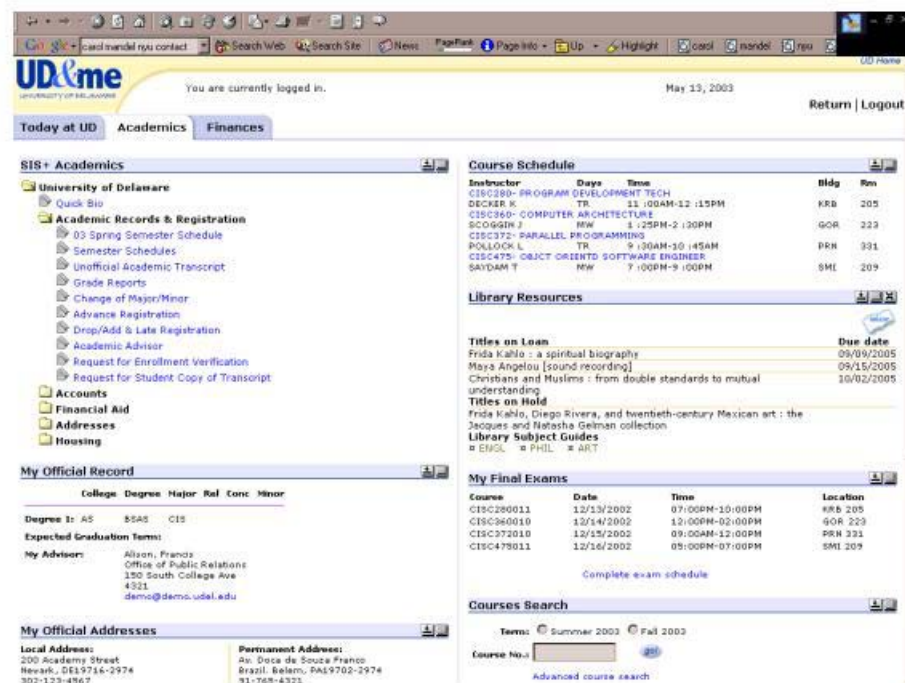


Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Second, a screen-shot from the University of Delaware (Figure 2). In common with many others, the University has a campus portal. Again, this is potentially a ‘hub’ in the students’ network behavior, a place which brings together a range of administrative and university environment information for convenient access. It is described in this way⁴:

Welcome to UD&me, your own "pocket-sized" version of the campus Web. UD&me allows you to view personalized information, from a variety of sources, in one convenient place.

Figure 2



This is built using the widely used open-source ‘portal framework’, U-portal, which takes an ensemble approach to service construction, allowing several ‘channels’ to be assembled in a customizable way. What this screenshot shows is an example page from a guest account at UD&me. You will see a library ‘channel’ where some information about library resources is embedded. This includes a note of books checked out, books on hold, and subject resources relevant to the individual’s course. So, the library channel is specific to an individual user. Again, a library service is brought to the user, surfaced in an important ‘hub’ alongside other, non-library, resources.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Before moving on, I need to make one very important point about these examples. These are not necessarily substitutes for a library 'hub', they do not replace services provided elsewhere. We are talking 'and' not 'or': these services may potentially be available in several places, depending on individual or library preference. The important point is that the user – the reader, the learner, the faculty member – has access to a service where it makes most sense. What these examples signal is an 'unbundling' of library services so that they can be more readily recombined with other environments to meet service goals.

There is also a third emphasis which is not so readily recognized in the portal discussion, but which is in important one. The library is faced with major issues relating to the management of digital resources; it is not yet a routine issue. Consider for a moment the management of materials in the print library. Librarians have evolved well-understood internal practices and procedures for management, and predictable ways of presenting services for their users. In this, they have been assisted by the evolving technologies of print and publishing, as well as by internal library technologies. Books and journals come in accepted formats, which support some consistency of treatment and arrangement, which allow the advance construction of shelves and processing equipment, the assignment of space, and so on. They only exceptionally require special treatment. These particular technologies have become unobtrusive, experience of them submerged in routine processes. This introduces economies, economies of processing and economies of use. However, digital resources do not always come in this readily processible and presentable form. They often require individual attention, may have different license conditions attached to them, and have different user interfaces. In short they may require custom, and accordingly expensive, treatment. An important strand of the portal discussion is the evolution of an environment which provides a more predictable management context for digital materials, the 'shelves' as it were on which we can routinely line up database offerings. At the moment, the digital environment is one that lacks consistency; it is as if each book coming into the library was a different shape and had to be read in a different way. The benefits of a more consistent environment are clear: library time and resource should be freed to think about selection and use of the collection, not consumed by the messy mechanics of acquisition and processing; and the user experience should be shaped by learning and research needs not by the arbitrary constraints of interface and format. We need to achieve the economies of consistent treatment as well as the benefits of consistent access. The focus in this article is on access, but it is useful to remember that this is part of a larger management issue.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

So, let me summarize briefly before moving on to a slightly more detailed discussion of existing portal approaches.

The library wants to provide a web environment which: enriches learning and research by providing timely, convenient access to relevant and appropriate resources; surfaces potentially valuable resources which otherwise might be overlooked; and enables users and the library to focus on fruitful use of collections rather than on the messy mechanics of interaction. Such environments increasingly need to interact with other environments such as the learning management system, institutional portal frameworks, and the other ‘hubs’ of network presence. I suggest that this means that the current portal discussion marks a transitional phase. The question we need to address is not the integration of library resources with each other; it is the integration of library services with the learning and research behaviors of users. The former may sometimes be a means to achieve the latter, however it should not be confused with it.

2. A schematic review of current library portal approaches ⁵

In this section, I will provide a framework for thinking about the ‘portal’ response in libraries. There have been two main strands in this response. The first of these is to provide cross-searching or metasearch services, services which basically allow one to treat a ‘portfolio’ of resources as if they were one by providing a ‘meta’ service which hides their difference and which searches across them and combines the results. These have been the focus of considerable research and development activity, and are now supported in a variety of products and services. (In recent work by the Association of Research Libraries a ‘portal’ is defined as an application providing a metasearch service and one other supporting service.⁶) The second is to provide ‘views’ of sets of resources based on individual or role preferences. In each case, the main focus has been on access to bibliographic resources, catalogs, abstracting and indexing services, e-journals, and locally developed databases, as well as on access to openly available Internet resources. Of course, some applications provide both of these service components.

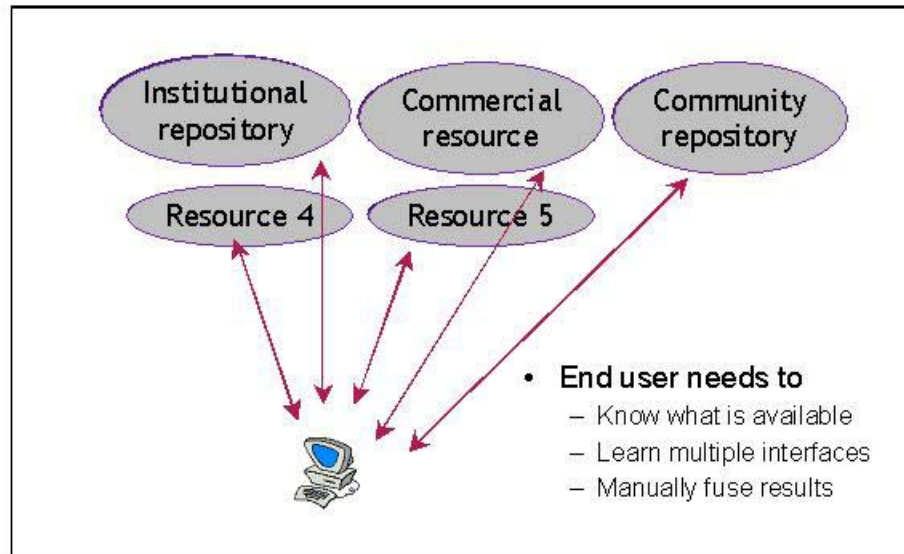
On the perceived need and historical development of library portals

Figure 3 represents the network information environment as it has historically developed. A user typically interacts with a range of information resources. The introduction of the web may have provided a consistently navigable overlay on this environment, but the following issues remained.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Figure 3

Portal issue



The user had to:

- *Know what is available.* To use a resource, the library user typically has to know in advance of its existence. Of course libraries get around this by developing lists of resources, but these are not always the most effective way of guiding users to resources of potential interest. *This issue has driven an interest in personalization and customization, as a way of fruitfully matching users and resources.*
- *Learn multiple interfaces.* Typically, a user has to ‘learn’ each resource. They may have different features, different interaction metaphors, different combinations of functionality. This variety is a disincentive to use. The motivation to use information resources has to overcome the barrier caused by this variety. *This has driven an interest in cross-searching activity, where a user interacts with a range of resources through a higher level interface which hides difference.* (Interestingly, I think that one of the impacts of Google

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

and Amazon has been to move towards much more streamlined interfaces with some commonality.)

- *Manually fuse results or move data between applications.* Typically, resources are available at user interfaces not at machine interfaces, and resources are not linked to each other. What this means is that a user will have to fuse results themselves, for example aggregating various result sets into a bibliography, or will often have to take data from one system, a catalog for example, and re-enter it in another, an Interlibrary Loan system for example. Of course there may be integration within particular system environments, an integrated library system, say, but moving data out of that environment is not always easy. Accordingly, ‘integration’ tends to happen at the user level: the user manually manipulates results and requests. Furthermore, it means that the data is often less useful than it should be, because its structure is thrown away when it is delivered at a user interface, it cannot be reused intelligently. Again, these issues have been an impediment to most effective use. *This has driven an interest in consistency of metadata and development of agreed machine interfaces.*
- *Meet repeated authentication challenges.* To carry out a simple procedure – to search in several databases for example -- a user may have to remember and enter several sets of credentials. *This has driven an interest in distributed approaches to authentication and authorization.*

At the same time, resources tended to be developed as if each were the sole focus of a user’s attention, rather than as a part of fabric of service provision. This has led to some particular resource characteristics:

- *A provider view.* They are organized by supplier interests, rather than by scholarly or pedagogical value or user preference. Resources are often grouped by publisher or aggregator, which rarely maps onto user interest.
- *Autonomous.* They are autonomously managed; they have developed independently, responsive to different service and business goals. This means that within any information process, it may be necessary to interact with several services which do not coordinate their activities. So, for example there are network services which accept document requests, there are packages which can format requests for dispatch to such services, there are

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

services which allow people discover the documents of use to them. These may not be linked in such a way that an end-to-end process can be automated. Data may not cross boundaries, or may have to be re-keyed or transcribed by user or by staff. This issue has recently been highlighted and is driving an interest in identifiers and linking, which help to automate discovery to delivery chains.

- *Individually controlled.* Information providers wish to protect the value of resources they make available. They will almost definitely make resources available under different terms and conditions. There may be a need to confirm the identity of users or the integrity of resources. At present identity, access, and rights management services are provided on a service-by-service basis, creating significant impediments to use.
- *Different functional aggregation.* For example, a journal aggregator may allow people to discover, request and have delivered a particular selection of journal articles from a particular selection of publishers. An abstracting and indexing service allows users to discover the existence of documents. Some services may be offered as 'one stop shops'. Although some organizations now offer services which include discover, locate, request and deliver facilities, they are still just components within this potentially distributed document supply service since no server will meet all coverage or quality of service criteria.
- *Limited disclosure of content.* They say little about themselves to a potential user. Services require the user to have significant advance knowledge of what is available, and some persistence if they wish to use several resources.

Together these issues reduce the motivation to use the resources provided by libraries; this is not to say that they are not valuable, rather that they are difficult to use.

Contrast this situation with Amazon and Google. Each of these is immediately accessible on the web (no need to remember a password), gives the appearance of being comprehensive within their areas (no apparent need to prospect multiple different resources), and offers instant gratification (click through to a web-site or a purchase).

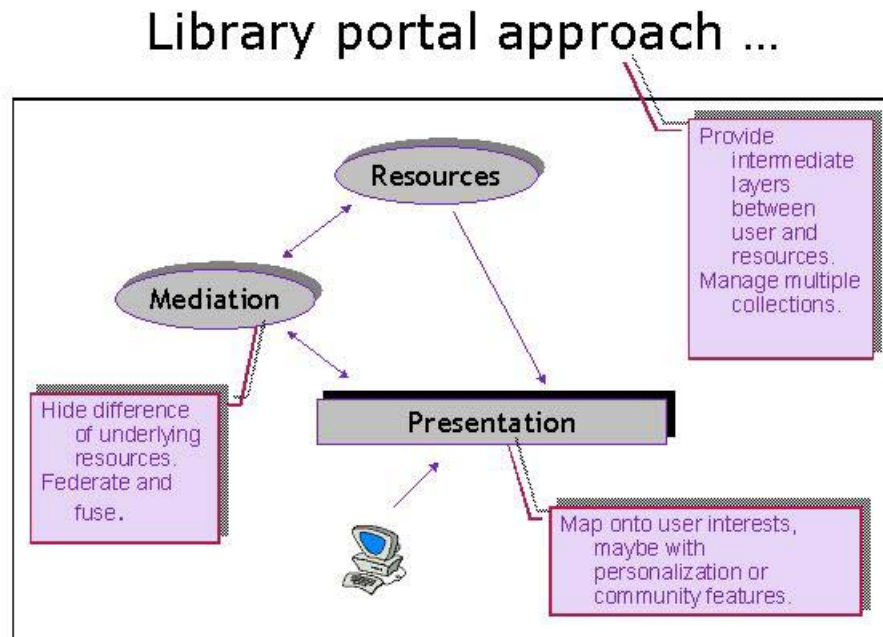
The library portal response to these issues is to provide some intermediate layers between users and resources. These aim to overcome the fragmentation

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

of the resources, and to provide a unified interface which reflects a user interest rather than the arbitrary characteristics of format, interaction or delivery channel.

Figure 4 shows this in a schematic way.

Figure 4



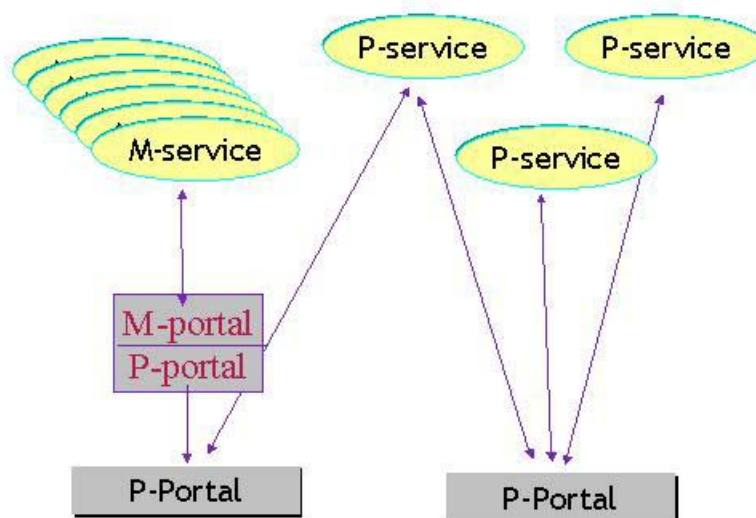
On some important portal distinctions

In considering the nature of this 'intermediation' it is crucial to grasp some important distinctions. Again, our current lexicon does not give us much help, always a sign of early development.

Let us define a *service* simply as a functional component available on the network. There is then a major qualitative distinction between two types of service, which is crucial in characterizing portal approaches. This is one between resources provided at user interfaces and those provided at machine interfaces.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Figure 5



In the first case, a resource is made available at, say, a web page. The intended consumer is a human, so it is oriented towards reading and navigation. Integration of resource content needs to be provided by the user. Think of the user who successively looks at several catalogs: typically, he or she will have to manually integrate, sift, manipulate or merge. Most of our information services are now made available in this way. Think of the library 'portal' which provides organized lists of internet resources. The user may be guided to resources of interest, but once they commit to looking at a particular resource, they leave the 'portal' environment and are delivered to the door of the remote resource. Think of lists of e-journals, or of abstracting and indexing databases: again, the user may be guided, may have a personalized list of resources presented to them, but is then delivered to the front door of the desired resource. Once they go through the door of the desired resource, the user is in that remote resource environment, and needs to behave appropriately. The desired resource sits on the network behind its own user interface. Integration is shallow. For convenience, I refer to services which appear at a user interface as p-services, where 'p' stands for 'presentation' and

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

‘people’: ‘p’ services are oriented towards presentation and are aimed at people.

A p-portal provides an entry-point to p-services. So, we could describe the access lists mentioned above as p-portals. A database of resource descriptions could also be considered as supporting a p-portal, as would a personalisable environment like MyLibrary. The key thing is that a p-portal does not itself shield the user from the differences of the target resources, or link them together.

In the second case, a resource is made available at a machine interface, and the expected consumer is not a human but a program, a machine. So for example, a service may disclose resource metadata for harvesting by an OAI-PMH-compliant harvester, or for search by a Z39.50 client. In each case, the service must support a protocol (OAI-PMH or Z39.50, respectively) and a machine interface which can interact with the consuming application.

We could name a service available at a machine interface an m-service. And an m-portal provides access over m-services. ‘m’ here stands for ‘machine’ and ‘mediation’, the latter because the m-portal does not just deliver a user to the door of a service, it reaches into the remote resource on the user’s behalf. In this case, the key issue is that the user does not leave the m-portal environment: an m-portal application goes out and interacts with services on the user’s behalf. A better word than m-portal might be ‘broker’, or portal application. A broker provides a deeper level of integration. Here are examples of what broker applications do:

- hide difference and the mechanics of interaction from users, so as to save time and simplify procedures. An example here would be a cross-searching application which creates a federated resource from several others. Of course, such applications raise various complications in implementation.
- facilitate flow of data between applications so as to automate processes. This includes inter-application integration. An example here would be a resource sharing application which mediates searching, ILL, resolution, and document delivery transactions, perhaps interfacing with billing or other applications.
- Aggregate resources for further use. An example here would be an OAI-PMH-based harvester which takes data from several sources and makes it available at a machine or a user interface. The Open Archives Initiative Protocol for Metadata Harvesting is a technique for sharing metadata between services. One service – a data

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

provider in OAI terms -- makes metadata available in an agreed way; another service comes and 'harvests' it. The latter service -- a service provider in OAI terms -- may harvest from multiple 'data providers' and in turn may provide access to the metadata it collects in this way.

The crucial thing, then, about mediation, in this conversation, is that it involves the orchestration of machine to machine interactions which allow a higher level of abstraction to be introduced between the user and the resources. This in turn has an important further consequence: it means that resources have to be made available at machine interfaces. (The focus here has been on bibliographic resources, typically metadata resources. Increasingly, as I discuss in part 3, libraries will provide access to a richer range of resources.)

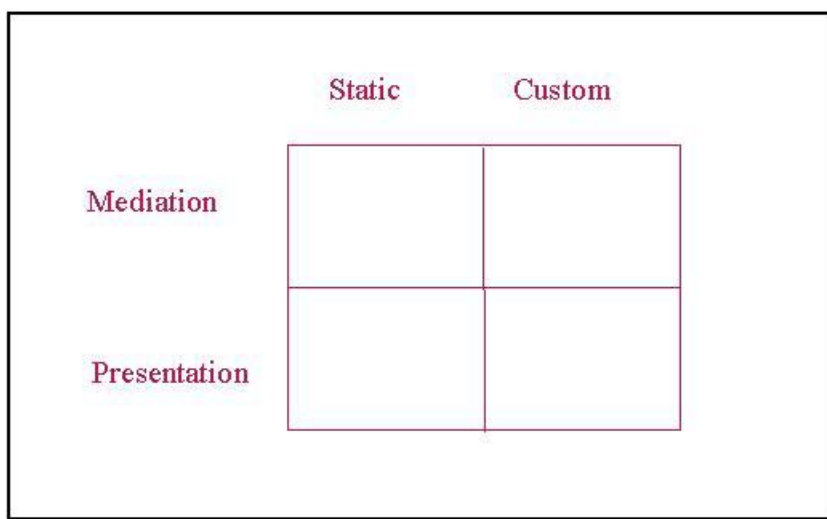
Of course, the distinction between m-services and p-services is becoming blurred. Nevertheless, in the current environment there is an important distinction to be made, particularly when it comes to complexity and cost of implementation. We have limited broker or mediation services in current library environments, and the reasons include their cost of implementation, the burden placed on resource operators to support additional protocols or processing, and some concern about effectiveness in the current network environment. Of course, mediation and presentation services are not exclusive. Typically mediation services support presentation: services will be delivered at some stage to a user interface.

And the distinction may become even more blurred as the web becomes more application rich. Syndication using RSS (Really Simple Syndication) is a good example here. The emergence of 'web services' is also very important. 'Web services' is the phrase introduced by the World Wide Web Consortium to denote a suite of protocols that define how requests and responses between software applications should be encoded and transferred over the web. I discuss this approach further below.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Figure 6

A portal grid



This distinction allows us to further discriminate between current library portal developments, as in Figure 6. This shows four quadrants characterized by whether they provide mediation in addition to presentation and by whether they are customizable to individual or role interests, or are static. Here are some observations on candidates for each quadrant:

1. mediation/static. An example would be one of the commercial library metasearch products which does not profile by user.
2. mediation/customizable. An example would be one of the commercial library metasearch products which includes the ability to profile by user.
3. presentation/static. This might be a list of links on a University gateway. There are many such resources. An elaboration might be a database of descriptions of such resources. A subject gateway provides an example here.⁷
4. presentation/customizable. An example here is MyLibrary, “a user-driven, customizable interface to collections of Internet resources -- a portal”. An

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

application, “primarily designed for libraries, **the system's purpose is to reduce information overload** by allowing patrons to select as little or as much information as they so desire for their personal pages”⁸.

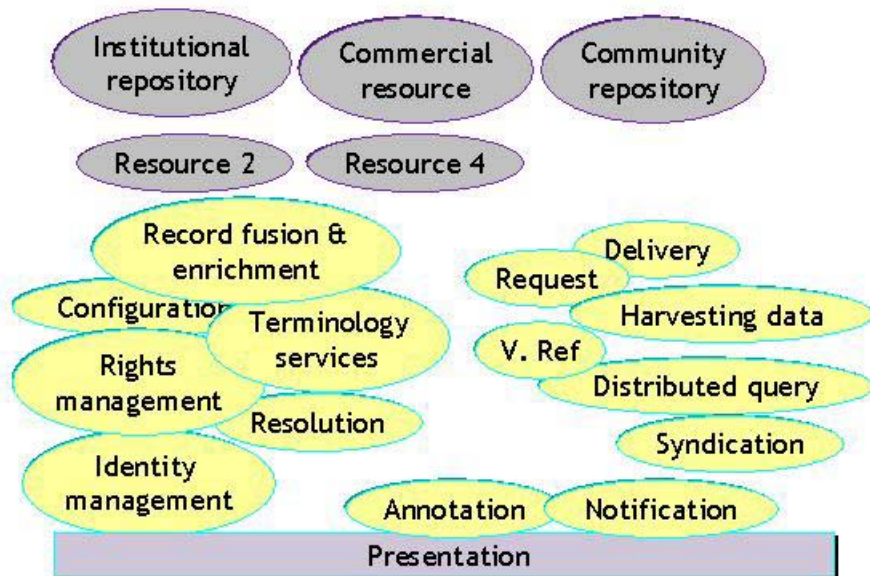
I include this characterization because of what seems to me to be a confusion in discussion between these groupings, which in turn rests on a confusion between portals which aggregate what I have called p-services and those which aggregate m-services.

On portal services – an architectural perspective

I now want to turn to the question of what types of services are being provided through portals, and some scalability and architectural issues that are beginning to emerge based on experiences to date.

Figure 7 shows a range of candidate services for a portal. Some of these will be available in some portals. Some portals will provide services that are not listed here.

Figure 7



Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

- *Distributed query or 'metasearch'*. This is a central component of library portal offerings. Typically, a broker will search across several target databases. There are a variety of approaches: Z39.50, custom query techniques, and various inelegant screen-scraping techniques. Z39.50 is now well established and its strengths and weaknesses well understood. There are many issues surrounding indexing practice, different controlled vocabularies and so on. More recently, there has been an interest in new approaches which preserve some of the semantics of Z39.50 but implement them as 'web services'. These go by the names of SRW and SRU⁹. Distributed query approaches are supported in several scenarios where a library wants to offer a search across several databases. This may be to group disciplinary abstracting and indexing services; it may be to search across a group of library catalogs; it may be to bring together different resource types to give a unified experience.
- *Harvesting*. A more recent approach looks at bringing metadata together by harvesting – a program, a broker, collects metadata from several sites. This metadata can then be made available for searching. The Open Archives Initiative Protocol for Metadata Harvesting provides a mechanism for managing relationship between the harvested and harvesting sites. To date, we have seen little production use of OAI-PMH, but its wider deployment is much anticipated.
- *Syndication*. I use this term to refer to the increasingly common use of RSS. RSS (a contested acronym, here expanded as Really Simple Syndication) is an XML-based format for sharing content between web applications; it is typically used to embed or aggregate feeds of structured data, news for instance. RSS is being used by many people to share alerts, updates or other structured lists of current information.¹⁰
- *Request*. A portal application may allow a document or other resource to be requested, through circulation, ILL or other application.
- *Deliver*. It may allow receipt of a document or other resource.
- *Configuration*. I am using configuration as a summary label for an especially interesting set of issues. For a portal effectively to mediate between user interests and available resources it will need to 'understand' quite a bit about the environment, both about users and resources. First of all, it will need to be able to talk to a variety of machine interfaces. Even if it only talks Z39.50 it will have to know something about the configuration of each target database: what port it is at, what record formats or services are supported, and so on. If it talks to a variety of

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

target databases with custom machine interfaces, or if special programs have to be written to interact with them, then other data may need to be held. We can call this data ‘service description’. It is also common to store some data which says something about the databases or collections available, which can be used to pop up some descriptive text on a user interface, or which can be searched by a user looking for relevant resources. This type of data is sometimes known as ‘collection description’, although of course that term has a wider sense to include structured description of library and other collections.¹¹ To support customization, a portal may need to know something about a user, something about their privileges, maybe something about their preferences or their past behavior. In each of these cases, it may not be unusual to configure the portal application itself with this data. However, it also makes sense to interact with external directories, and in some cases, it may make sense to share this data across applications or institutions. Certainly, in a campus environment, for example, one would want to avoid duplicating user data. Library portals are currently redundantly creating service and collection descriptions. Anecdotal evidence suggests that this is a significant burden for the portal manager, or system supplier where it takes on this role: it is an interesting question as to whether third party services which removed the burden of individual data creation would be feasible.

- *Personalization.*¹² Many services have personalization components, typically local to the system itself. They may be based on historic use or stated preferences, as suggested above. A simple personalization approach would be to match user profiles against collection descriptions, or to allow a user to select from a checklist.
- *Reference.* There is considerable recent interest in virtual reference – the mortal in the portal – where access is provided to a local or distributed human reference resource.¹³
- *Annotation.* This is a user-oriented application, where users or groups of users might be able to add sharable or local annotations to a resource.
- *Notification.* Again, this is a user-oriented service which provides alerts about some matter of interest, about, for example, new or changed resources. Syndication would be one means of providing this service.
- *Terminology service.* Such services are not widely deployed but we may expect them to become more common, whether offered directly to a user, or provided in the background interacting with a programmatic user

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

carrying out search. Examples of services which might be useful: map between controlled vocabularies, enrich query terms with associated terms, associate personal or corporate names with names matched from an authority file, expand acronyms, associate synonyms, broaden or narrow search by moving within a thesaural hierarchy and so on. Again, these types of services, where they are available, have been integral with a particular search service; they could also be externally provided.

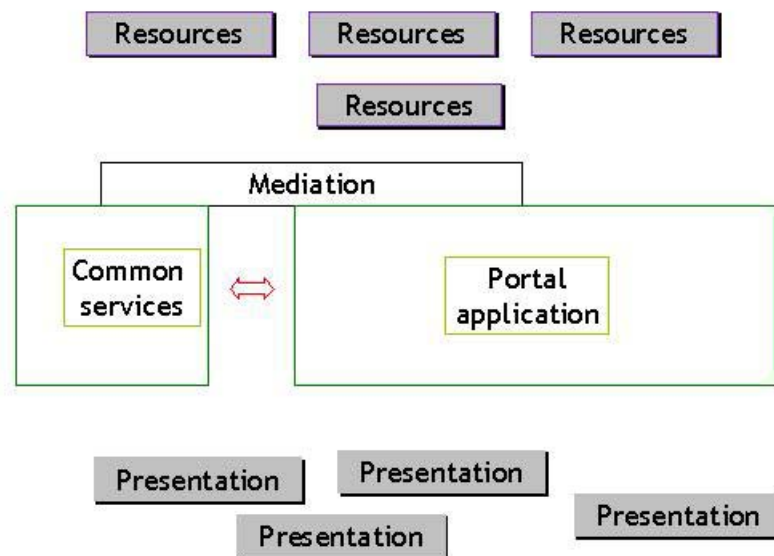
- *Resolution.* A resolution service will typically take an identifier and return data about the resource identified. In the last couple of years a particular type of resolution service, based on the OpenURL, has become very important in library portal applications. An OpenURL provides a way of encoding citation data and exchanging it between services. Reference linking applications have emerged which are configured so as to resolve an OpenURL in a way that is configurable to the particular context of the user. So, in a typical scenario, given a journal article a user might be directed to the local collection, to a particular aggregator, and so on. This is a way of linking metadata for a resource with the 'appropriate' copy of that resource, as determined by the library.
- *Result enrichment and fusion.* A cross searching application will often merge results from different sources, sometimes deduplicating them. However, it may also be possible to enrich data from a third party. So, for example, a search service may consolidate catalog records from several sources, and it may enrich those records with table of contents data pulled from a third party on the fly.
- *Rights management.* Particular terms and conditions will be associated with resources. Increasingly, libraries are having to manage multiple licenses.
- *Identity management.* This is another complex area. A major application area for portals is to provide single sign-on, so that a user is not repeatedly challenged as they move between services. In this context, a user needs to be authenticated (to establish that they are who they purport to be), and then authorized to use particular services.

Few portals incorporate this range; some portals may have other services. In the current model, services tend to be specific to the portal. However, a moment's reflection shows that many of these services are potentially common to several applications within an organization, or across organizations.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

So, for example, many services on a campus will want to authenticate users. If we think of portal applications across several similar institutions, it is likely that there is some overlap in the collection or service description that they create: there is redundant and costly local configuration effort. Some other examples were mentioned above. Thinking along these lines prompts us to think again about separating the described services into categories. Figure 8 provides a distinction between services which are potentially common to many applications and the applications which provide the portal functionality.

Figure 8



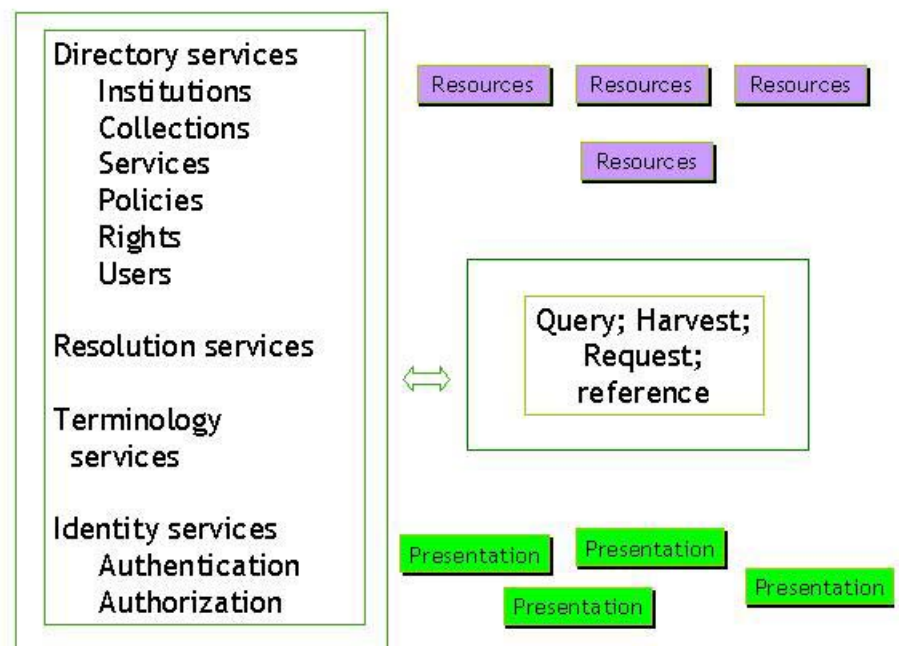
This is further elaborated and slightly abstracted in Figure 9. The portal may need access to data about institutions, collections, services, rights, and policies (think about a portal that provides resource sharing services – one may want access to information about library ILL policies). Potentially, the portal may want access to intelligence about all the objects of interest to it in directory-type services. The portal may require access to resolution services which are potentially shared with other applications. Similarly for terminology services, and crucially for identity management services.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

What we see emerging is a situation where, potentially, the portal not only interacts with a range of information resources to support the user, but also interacts with a range of common services which allow it to do its job more effectively or cheaply. It will be interesting to see if the incentives to work in this way are strong enough to see the emergence of such shared services.

Finally, a note on metasearch applications. Although, there is now a lot of experience in using such applications, we don't appear to have a settled consensus on their role and usefulness. It is likely that research libraries, and potentially others, will use them to provide sensible aggregations (by subject, level or course, for example). However, they may also want to provide access to the target resources themselves for those with more particular interests. For a brief but judicious appraisal see the recent article by Roy Tennant¹⁴.

Figure 9



Some summary remarks on part 2

Part 2 has discussed the library portal, focusing on current capability and the bibliographic environment. Here are some summary observations based on this discussion:

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

- The library portal as conceived in recent years provides intermediation between a fragmented resource base and a view of an ‘information landscape’ adapted to user interest.
- The level of intermediation may vary. A crucial distinction can be made between portals which provide integration at the presentation level only, and those which provide richer mediation at machine interface level. The former involve bringing together a set of resources, maybe with single sign-on, personalization or other user services, but not taking the user beyond the front door of the target resources. They remain individual opportunities. The user may be guided, but still has to drive the use of target information resources. The latter involve the use of mediating applications or brokers to weave target resources into a higher level application which shields the user from their underlying difference. Here the user drives an application, and it is the application which drives a set of other services. Various products exist to assist in portal construction in each case.
- The range of services offered by portals is wide, and growing. Some of these services are common, in that they are potentially used by other services whether within the same institution (authentication, for example) or across institutions (service description directories, for example). It would seem to make sense not to build these services redundantly portal by portal, and it will be interesting to see whether incentives are strong enough to lead to a market of third party or shared services to meet these needs.
- The recognition that there may be common services across portals, the desire to provide services in various presentation environments, and the growing interest in ‘web services’ to provide modular building blocks, move one to an architectural perspective in which one can identify services and their relationship at a more fine-grained level. This is an important topic in Part 3 below.

My opening discussion focused on ‘information resources’, reflecting the initial primary interest on providing access to digital resources. The natural tendency now is to begin to talk about ‘services’ as the environment becomes richer. Some services make resources available; some facilitate the environment of information use.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

3. Mediating the engagement between resources and users

Locations, collections and services

The library might be seen as an articulation of three components: a location, a collection of resources, and a set of services (using services in a broad sense here). Historically, these three components coincided in the physical space of the library and the library as functional entity involved collocation of library users, library collections and library staff. This co-incidence continues to create value for library users. However, we are also seeing the separation of these three components in a network environment, and their co-development in a new constellation of mutual interaction. In this final part, I want to use a discussion of these three components as a way of thinking about access in a network environment.

Thinking about locations and hubs

In considering the impact of the network on place, William Mitchell¹⁵ observes:

We will, I believe, plot our actions and allocate our resources within the framework of a new economy of presence. In conducting our daily transactions we will find ourselves constantly consulting the benefits of the different grades of presence that are now available to us, and weighing these against the costs.

So, interestingly, as collections and services move to the network, we see a renewed emphasis on the library place as ‘agora’, as a social assembly space. Developments include major new building work which focuses on this social aspect and on the symbolic aspect of the library, a growing interest in the exhibition and display of special collections and rare materials, on redeveloping space for social learning and interaction, on the library as a neutral ‘third place’, and on information and research commons activities.

At the same time, in the emerging library economy of presence, users look for library services in other locations. In one view of it, the ‘library portal’ is an aspiration to create *the* library service location on the web; just as library users may once have found their way to the physical library building, now, the thinking goes, they will find their way to the library portal.

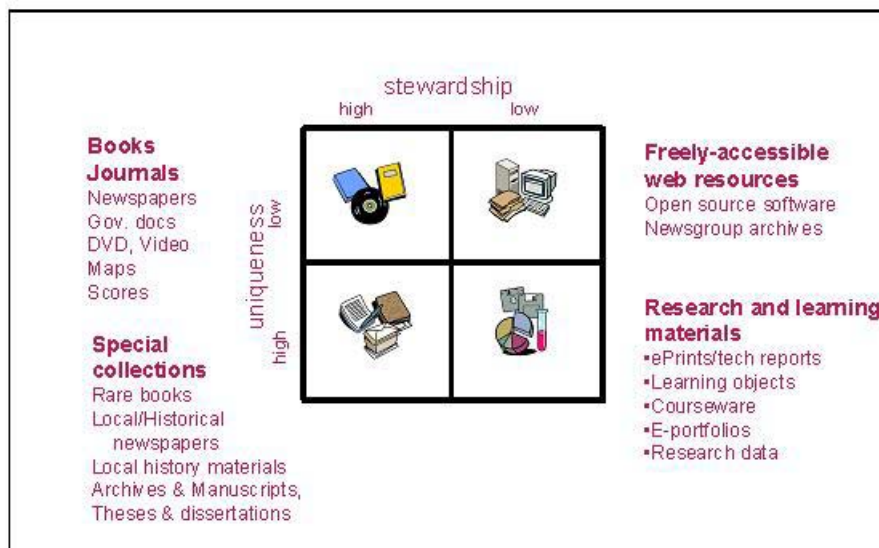
However, consider for a moment what is happening, for example, in a university context¹⁶. There is likely to be a university-wide portal initiative,

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

which aims to bring together a range of administrative and university data, perhaps with single sign-on and some personalization. Typically, in the terms presented above, this is a p-portal over data from various university agencies. There also may be – in a more or less coordinated fashion – an investment in a learning management system. In each case, the service provides a ‘hub’, potentially another portal. And there may be other internal hubs, emerging digital lab-book environments for instance, or departmental sites. And certainly, there will be external hubs of use: Google, disciplinary resources, ResearchIndex, and so on. Against this background, the aspiration to create the ‘one-stop-shop’ for information needs seems a forlorn hope. The user will potentially interact with a variety of hubs.

Figure 10

Collections grid



Thinking about collections

The grid¹⁷ presented in Figure 10 is a schematic way of considering collection development attention. There are two axes: ‘stewardship’ and ‘uniqueness’. The binary divide is a stylization, used for its mnemonic qualities only – each axis is a spectrum. The grid also provides a snapshot in time, and, in fact, one of its uses – not explored here – is to consider how

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

materials might move in line with developing trends. It was developed to show how different forms of material call forward different forms of attention, and here it is used to prompt a brief discussion of changing patterns of access.

By 'stewardship' we wish to suggest the degree of curatorial attention that materials receive by libraries. Highly stewarded materials are collected, organized, preserved. Thus, 'left of the line', materials tend to be in library collections, and subject to traditional practices of organization and access. By 'uniqueness' we wish to suggest the degree to which materials exist in more than one collection. Thus, 'below the line', objects or collections are unique or rare, are currently relatively inaccessible, and tend to be institutional assets rather than more widely published materials.

Consider briefly some issues arising from each quadrant:

1. *Upper left. Formally published materials (books, journals, DVDs, videos, etc).* These materials tend to exist in many collections; to be supported by a well-developed apparatus of catalogs and union catalogs, and abstracting and indexing services; to be published in multiple copies and possibly available in multiple versions. Materials are either licensed (typically digital materials – journals and indexes) or bought (books, videos, etc). Much of the library portal activity has focused in this area, and some of the particular issues that have emerged (reference linking and the appropriate copy problem, for example, or resource sharing applications) flow from the specific publication characteristics of these materials and the apparatus of their provision. There is an articulation of catalogs for discovery and location of materials (union catalogs at national, state or regional levels; distributed resource sharing arrangements) and an interlibrary loan apparatus in place to request items. Much portal activity focuses on cross-searching the abstracting and indexing resource, the electronic journal resource, and articulating these and the book resource. Much of the focus here is internal to the institution (interacting with its licensed materials), or, where external, flows through well understood, if evolving, organizational arrangements (for resource sharing/ILL).
2. *Lower left. Unique and rare materials in library collections. Special collections, archives and manuscripts.* There is growing appreciation among libraries that unique or rare materials are valuable research and learning resources, that they have been underutilized, that digitization offers opportunities for releasing their value in new ways. There is a growing interest in digitizing cultural heritage materials, as a way of disclosing the memory and identity of communities. Many research libraries have archives departments and are creating finding aids. This has

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

led to increased interest in how to make their resources available on the network, and some interest in approaches based on harvesting of metadata. Some of this material is available in library catalogs, much not. It presents issues of description (sometimes hierarchical approaches using EAD or other techniques, sometimes Dublin Core based item level description, sometimes unitary collection level description). In terms of access, there is interest in using OAI-PMH to aggregate metadata for this material, and some of it is represented in existing catalogs and union catalogs. However, there remain large aggregation and discovery issues. An interesting and unresolved issue relates to the articulation of collections and items in discovery scenarios. In libraries we are used to providing access at the item level. We don't yet have widely agreed ways of characterizing collections. We have little experience of thinking about providing access at different levels of granularity and aggregation in digital environments. How do you move interestingly between descriptions of collections and items?

3. *Lower right. Research and learning materials.* Research and learning behaviors are increasingly network mediated. There is growing investment in learning management systems to mediate and manage the learning experience. Learning materials are being produced in various digital forms, and learning technology is being introduced in different ways in different environments. The library may be more or less involved, depending on local circumstances. There are at least two broad areas of engagement: involvement in the life cycle management of learning materials (creation, description, management, discovery, use and reuse), and interaction between systems environments. The latter is increasingly important for the academic library: library resources and services need to be accessible within the learning management environment

Research activity is similarly diffuse. Faculty may use computational, information or communication resources on the network. Increasingly, research results are available, in 'raw' form or as a part of broader resource such as an exhibition or learning materials. There are curated data sets across disciplinary areas. There is a movement to make e-prints available as part of the open access movement.¹⁸ In these and other cases, the library is emerging as a potential partner, as a source of expertise, as a persistent institutional venue which provides continuity of management and economies of scale. Recently, the term 'institutional repository'¹⁹ has emerged as a general summary label for a range of supporting services the library might offer in this environment, working with faculty to provide curatorial attention to a dispersed, complex resource. An important aspect

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

of this activity is organized disclosure of institutional informational assets using the Open Archives Initiative Protocol for Metadata Harvesting.

4. *Upper right: Wide open web*²⁰. Libraries have taken several approaches to selecting and organizing materials on the web for their users, from simple pages of links to reasonably full description. This effort has been massively redundant across libraries. The ‘subject gateway’ is one interesting response.²¹ Of course, most users discover resources here using Google or other search engines, and this again raises an interesting question about the focus of library activity. Should library resources be disclosed in a way that they are indexed by Google and thereby rendered potentially discoverable by Google? In the coming years how much of the materials in the other quadrants will be indexed by Google and with what implication for other forms of access? Of course, discovery is but one service that a library provides, and I argue below that the library service experience on the network needs to be much enriched.

What can we say about access and portals in the light of this stylizing analysis? As libraries look forward, a major issue becomes providing access to whole range of material, but a variety of issues will need to be worked through:

- *Above and below the line*: Library portal activity initially has been focused ‘above the line’, on providing access to catalog and journal data, and to some extent on providing access to Internet resources. The focus is bringing together materials for a local population. As already noted, the library community has established and developing processes for discovery to delivery options over their book collections. They are working with others on a rapidly developing apparatus to provide access to the journal literature. However, the situation ‘below the line’ is much less mature. Some material surfaces in catalogs. But there is a growing resource whose fragmentation across organizations makes discovery difficult. There are many ‘puddles’ of data which are not brought together in any critical mass. Currently there is a focus on harvesting data, but sustainable production models have not developed. This makes it potentially difficult for any individual library to provide access to the wide range of special collections materials across other institutions.
- *To the left and right of the line*: Materials on the left are generally ‘library’ materials, they are procured and managed by the library. This is not the case to the right of the line. There, there may be

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

various levels of library involvement. For example, within universities, Wendy Lougee has spoken about a model of “collection federation” where the library may not have control over individual collections but may provide a larger federating service which provides unified access to collections which continue to be autonomously and externally managed.²² She cites the example of the University of Michigan’s Image Service in this context, and notes that such directions involve complex balancing of roles between the library and the collection manager. As we look at developments in learning management and at nascent institutional repository discussions²³ it is clear again that libraries in some cases are beginning to put in place models for such activity, but that no single pattern is emerging. This is within institutions. Again, when one looks across institutions the aggregation of such materials is in very early stages.

- *A unified pattern?* What this means is that there is not a unified pattern of activity across the quadrants. There are well developed, though changing, activities in the upper left quadrant. New approaches are being developed in the others. This complicates provision, within and between institutions. It is interesting to consider a technical example here. What acronyms does one associate with the upper left quadrant? Perhaps MARC21, Onix (used in the book industry), OpenURL (increasingly important for tying together services), DOI (used by publishers), Z39.50. What about below the line? Here the picture is much more diffuse. Perhaps Dublin Core, EAD, OAI, IEEE/LOM, and then a host of community and discipline specific approaches. The different forms of attention that the quadrants receive complicates the provision of integrated access. There are different metadata schema, many ways of organizing subjects, and so on.

This analysis suggests that the range of library attention will grow, to embrace the development of a variable set of services across materials with quite different characteristics.

Thinking about services

It is sometimes suggested that content is king, that the major imperative of digital initiatives is to make collections available. But this is to ignore the relationship advanced at the beginning of Part 3 between location, collections and services. Appropriate services make collections come alive. Our emerging network information environments are still limited: we have limited instruments to do interesting things with collections, to make associations, to

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

manipulate and analyze content or metadata, to repackage, to navigate. Current portal environments tend to allow us to discover, locate, request and deliver resources. These are broad, general services, which only bring the user some way along the path of effective information use.

In this section, I briefly look at two examples of how services might better work to support user behavior. These are taken from research work on humanities scholars, and from current discussion about libraries and learning management systems. Then I look at some implications of a 'service ensemble' model.

Developing services: the example of humanities scholars

Here I want to point to the work of Carole Palmer and colleagues in exploring the behaviors of interdisciplinary humanities scholars.²⁴ She identifies a variety of patterns. These include a desire to prospect a contextual mass of literature (not just the top scholarly journals or the canon), iterative reading of a personal collection of texts, wide reading and chaining (collections created by citation links and bibliographies), collection communities, rich finding aids that cross institutions and fields of studies.

A moment's thought shows how current digital environments could do much more to support some of these behaviors. For example, the current dominant discovery experience in portal environments is searching or browsing databases or lists of references. It would be useful to allow people to enter an information space through annual reviews of the literature or review articles, or by following citation chains, or to traverse richly associated resources.²⁵ (The popularity of ResearchIndex is interesting.) We provide limited support for the creation of personal collections.

This is a small example of the limited instruments we have in digital environments to support use and users. It is important to remember this, and to remember that richer services are key to making users more 'at home' in the digital environment.

Developing services: the example of libraries and learning management systems

The DEVIL example above showed the how a search service could be embedded in the learning management system. However, it is clear that there are a range of other services that could be useful surfaced in this way. These include the ability to be able to consistently link to resources, to be able to search repositories, to be able to request items from services, to be able to interact with virtual reference systems, to be able to manipulate digital assets for incorporation in learning materials, and so on.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Building these types of links make sense, but also raise difficult and subtle issues. Consider briefly for example the question of reading lists. These are a place where library and learning management interests intersect. What requirements might one have of a reading list builder? To be able to take citations from different databases and add them to a single structured document? Exchange that document easily between applications (e.g. between a learning management system and a library portal application) and between authors while retaining its structure? So that a faculty member could create a list, and a librarian could add some general resources, maybe linking it to other library resources, and pass it back again? Include ‘canned searches’ against particular databases or combinations of databases? Have persistent links to remote licensed resources? Be able to include and share annotations? Resolve citations against an OpenURL resolver to ensure that the appropriate copy of a resource is obtained? Integrate with authentication and authorization services. These are all sensible things to do. However, what seems to be emerging is a view of the reading list as a sharable portal, with all the attendant issues we have discussed above.

Again, the structures to provide this level of integration are in early stages of development. But it is this articulation of fine-grained services which will allow the library create value for the learning process by supporting the user at point of need.

Articulating an ensemble of services – environments and architectures

Two broad directions are emerging: richer services which support and develop alongside research and learning behaviors, and more fine-grained services which can be woven into multiple environments flexibly.

What might all this mean? I think that these directions have major implications for how the library provides its services, which we are only beginning to investigate.

The first direction suggests a much more thorough exploration than hitherto of the range of service that it is appropriate to provide. This will proceed in a bottom-up way, based on local experiment, curiosity and imagination. At some stage though, this will develop into some consensus about what services a library provides and how. The second involves thinking about granularity, interoperability, design and related issues. Each involves a deep engagement with users and partners, a diffusion of interests, along the lines discussed by Wendy Lougee.²⁶ How will the library co-evolve with research, learning and general information use?

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Each direction also moves us towards an architectural perspective, a seemingly inevitable consequence of service unbundling and reconfiguration. An architecture is a mechanism for agreeing the components of an environment and the relationship between them. The advantage of architecture is that it focuses a discussion. It provides a common framework for design, discussion, or planning. It allows you to partition a problem. One of the confusions of the library portal discussion is that it proceeds without a shared architectural context which grounds it in a shared understanding.

Take two recent examples of service architectures. The JISC Information Environment looks at how a set of national UK services might be developed in concert.²⁷ Effectively, it describes an environment onto which a portal provides a view. Another service architecture has been developed by IMS, the organization which coordinates specification work within the learning management community. It has developed a Digital Repository Interoperability framework to frame discussion and development about how learning management systems and repositories communicate to create higher level services.²⁸ Effectively, this again provides a view of how a portal (in this case provided by the learning management system) fits into a wider environment of services. At a high level these architectural initiatives are quite similar, they discuss similar services and seek to facilitate similar types of design and discussion.²⁹

A second major factor in the ‘service’ discussion is the emergence of ‘web services’. Web services are defined by the World Wide Web Consortium as:

*The World Wide Web is more and more used for application to application communication. The programmatic interfaces made available are referred to as **Web services**.*³⁰

Web services are modular applications available on the web. They may be recombined to provide other services. Effectively, they seek to create a framework for easily combining distributed applications. Google and Amazon make interfaces available as web services so that others can more easily build them into their applications. I mentioned SRW above; this is a recasting of Z39.50 as a web service. This is not the place to discuss web services in any detail; however it is important to note that they provide a framework for developing and deploying ‘m-services’ more easily.

Finally, in this section, I want to mention ‘portal frameworks’. I have already mentioned u-portal. U-portal is an example of a portal framework, an application that allows you to tie together various services in a presentation-

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

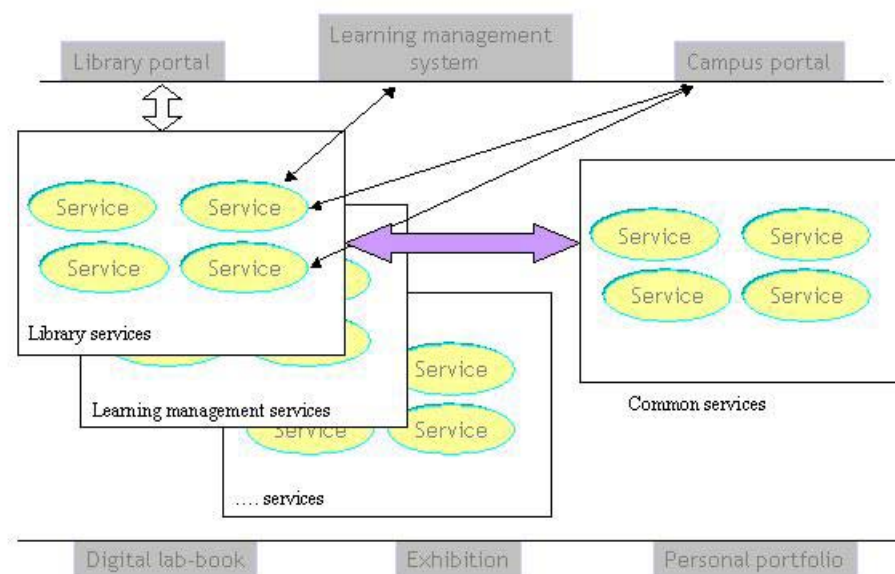
oriented 'portal' service. Effectively, services become 'channels' or 'portlets' in a user-configurable environment. There are several commercial and open-source portal framework applications available. It is interesting to see the library discussion intersect with a general industry concern to standardize here.³¹

So, to bring together some of this discussion: should the library create its own hub in network space, or is it better to appear elsewhere, to surface services in other hubs. Hitherto, in the short history of network information systems, the former has been the preferred option; gradually we will probably see the latter emerge more strongly as it supported by technology and driven by the need to be available in the research and learning workspace. Remember the examples given in the opening section: the surfacing of modular library services in the university portal and the library management system at the Universities of Delaware and Edinburgh respectively.

However, given the discussion in this section, maybe this divide is not so great as it first seems. Each direction moves to a similar architectural conclusion: the modularization of services so that they can be recombined as occasion demands, whether brought together in a library hub or portal, or embedded in other hubs. The technology discussed here may facilitate this trend, but is not essential to it. This recombination will increasingly be the hallmark of network information services. And clearly, to recapitulate the discussion in Part 2, each of these hubs may increasingly draw on common services. Figure 11 begins to show this. A range of hubs draw on common services, and also selectively on library services.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

Figure 11



Such an environment raises major issues for the way in which the library is visible to its users, it raises major issues about identity and perception of value. It brings us back to my opening remarks: the major development issue facing libraries today is how to create a network environment which is rich in services and which meshes with user behavior in useful and convenient ways.

Some summary remarks on Part 3

Early portal activity focused on a small set of services over a range of well-understood resources. The focus was on the discovery process. Metasearching and customized presentation of resources were, and are, popular services. However, a range of new issues emerge as location, collections and services are separated in a network environment, and co-evolve with user behavior, itself evolving:

- Locations: The library needs to integrate information resources with the research and learning lives of their users. The integration of library resources in a 'library hub' is one approach, however, increasingly libraries are interested in 'projecting' their services to other hubs also.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

This means that it is increasingly important to be able to provide a richer set of services in a fine-grained way. The physical library itself is being reconfigured to emphasize the social, the face-to-face, and the special.

- Collections. The collections landscape is becoming more complex. Libraries are providing support over a range of differently managed collections. These may be collections of metadata or collections of metadata and content, they may be curated within the library, or outside of the library, they may deploy different metadata and knowledge organization approaches, they are a mix of common and special. The library is interested in providing access to external resources. Many libraries are also increasingly interested in making more of their own resources, and the resources of their home institutions, available to external users. This in turn touches on major questions about future patterns of information use and scholarly communication.
- Services. To create viable digital information environments the library will need richer services, provided more flexibly, in ways that can be woven into user behavior more easily. This in turn prompts some unbundling of services, and a greater interest in architectural issues and emerging 'web services' approaches.

The issues raised here are complex, and will take time to work through. My purpose has been to show that the network information environment goes beyond our current portal thinking in interesting ways, ways which will require major work to address.

4. Conclusion

In this article I have discussed the emergence of 'library portals', network hubs which bring together users and resources of interest to them. I have noted how such portals have become richer, embracing a wider set of services. I have suggested that our current portals mark a transitional phase as we look towards the creation of network environments that mediate the engagement of users and information resources. Users may benefit from a library hub, but they will also benefit from integration of appropriate resources into their research, learning and information use behaviors in more fine-grained and particular ways. This means that we are beginning to see an unbundling of library services so that they can be better recombined with other environments, such as learning management systems or campus portals. Such an unbundling, in turn, means that architectural issues become more important, especially as we begin to explore what services are needed to

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

support effective network presence and the institutional and organizational frameworks through which they are provided.

The reconfiguration of presence and the mutual influence of physical place and network place has led to a heightened perception of the social aspect of library places, their role as a 'third place', as learning exchanges, as venues for collaboration and display.

At the same time, the library is looking at working with a collections environment in which it is mediating access to bought and licensed resources, to common and unique materials, to institutional resources which may or may not be in the libraries' curatorial care. It is looking to create new structures within which cultural heritage and research and learning materials are brought together across institutions for creative use. It is looking at how it manages this range in an integrated way, and what services will make these collections visible and valuable.

We are still in the early stages of thinking about what all of this means for the library and for the services it provides. The portal is part of a picture, but we need to look beyond it to build and sustain the services which enter the fabric of our users' research, learning and informational experiences.

5. References

¹ Rykwert, Joseph. *The seduction of place*. New York: Vintage Books, 2002.

² 'One stop shop' is another unhelpful phrase we use. A 'one stop shop' is in fact a 'one shop stop'.

³ Edinburgh University. DEVIL project [website].

<http://srv1.mvm.ed.ac.uk/devilweb/> (checked June 8, 2003) (Thanks to John MacColl for sharing the screenshot with me.)

⁴ University of Delaware. *UD&me* [website]. <http://uportal.udel.edu/student/> (checked June 8, 2003) (Thanks to Gregg Silvis for drawing this to my attention.)

⁵ This section draws on a variety of sources.

Lorcan Dempsey. The library, the catalogue, the broker. *New Review of Information Networking*, Volume 5, 1999. (Also available in: *Information landscapes and a learning society: networking and the future of libraries 3*. Sally Criddle, Lorcan Dempsey, Richard Heseltine, eds. London: Library Association Publishing, 1999.) (Also available at <http://www.ukoln.ac.uk/dlis/models/publications/landscape/> (checked 9 June 2003))

Lorcan Dempsey, Rosemary Russell and Robin Murray. A utopian place of criticism?: brokering access to network information. *Journal of Documentation*, 55(1), 1999, 33-70.

(also available at <http://www.ukoln.ac.uk/dlis/models/publications/utopia/> (checked 9 June 2003))

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

⁶ ARL: Access and Technology Program: Scholars Portal. *Portal functionality provided by ARL libraries: preliminary results of an ARL survey*. April 11, 2002. <http://arl.cni.org/access/scholarsportal/prelim.html> (checked 9 June 2003)

⁷ Dempsey, Lorcan. The subject gateway: experiences and issues based on the emergence of the Resource Discovery Network. *Online Information Review*, Vol. 24, No. 1, April 2000, pp. 8-23. (Also available at <http://www.rdn.ac.uk/publications/ior-2000-02-dempsey/> (checked 9 June 2003))

⁸ Morgan, Eric Lease. *MyLibrary* [website]. <http://dewey.library.nd.edu/mylibrary/>. (checked June 8, 2003)

⁹ Library of Congress. *ZING: Z9.50 international: next generation*. [website] <http://www.loc.gov/z3950/agency/zing/srw> (checked June 9, 2003)

¹⁰ Pilgrim, Mark. What is RSS? *O'Reilly XML.com* [website]. <http://www.xml.com/pub/a/2002/12/18/dive-into-xml.html> (checked June 9, 2003)

¹¹ Powell, Andy; Heaney, Michael; Dempsey, Lorcan. RSLP collection description. *D-Lib Magazine*. Vol. 6, No. 9, 2000. <http://www.dlib.org/dlib/september00/powell/09powell.html> (checked June 9, 2003)

¹² See for examples of current approaches and research directions: *Proceedings of the Second DELOS Network of Excellence Workshop on Personalisation and Recommender Systems in Digital Libraries: ERCIM Workshop Proceedings - No. 01/W03* [website]. Sponsored by the US National Science Foundation, Dublin City University, Ireland, 18 - 20 June 2001. <http://www.ercim.org/publication/ws-proceedings/DelNoe02/> (checked 9 June 2003). There is a succinct keynote by Clifford Lynch, Personalization and Recommender Systems in the Larger Context: New Directions and Research Questions, <http://www.ercim.org/publication/ws-proceedings/DelNoe02/CliffordLynchAbstract.pdf>.

¹³ See the special issue of *D-Lib Magazine* in February 2003 on digital reference for a good overview of this developing area.

<http://www.dlib.org/dlib/february03/02contents.html>

¹⁴ Tennant, Roy. The right solution: federated search tools. *Library Journal*, 6/15/2003.

<http://libraryjournal.reviewsnews.com/index.asp?layout=article&articleid=CA302427&display=Digital+LibrariesNews&industry=Digital+Libraries&industryid=%industryid%&verticalid=151> (checked 30 June 2003).

¹⁵ Mitchell, William J. *E-topia*. Cambridge, MA: MIT Press, 2000.

¹⁶ The range of interest is nicely captured in the program and accompanying presentations at: *Portals 2002: an institutional imperative*. A conference jointly hosted by the University of Nottingham and JISC, June 7 2002. <http://www.nottingham.ac.uk/portals2002/programme.htm> [website] (checked 9 June 2003). This includes presentations about US and UK enterprise portals, and general discussion of electronic information environments.

¹⁷ This grid was initially developed by Lorcan Dempsey and Eric Childress in the context of internal OCLC discussions. It is further explored in a series of presentations by Dempsey which can be found at www.oclc.org/research/staff/dempsey/presentations.shtm.

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

A recent ARL presentation gives a fuller treatment:
Dempsey, Lorcan. Place and space: Collections and access in light of changing patterns of research and learning: a schematic view. *A community commons: libraries in the new century*: ARL proceedings of the 142nd annual meeting, Lexington, Kentucky, May 14-17, 2003.

www.arl.org/arl/proceedings/142/dempsey.html

¹⁸ The focus here is on how the library creates access environments for its users. It should be noted in passing that these developments raise major questions for the library role and its support for changing patterns of scholarly communication and access which are not discussed here.

¹⁹ SPARC. Institutional repositories [website].

<http://www.arl.org/sparc/core/index.asp?page=m0> (checked 9 June 2003)

²⁰ This material is characterized as non-unique here as it is can potentially be added to many collection, it is routinely cached, and sometimes archived.

²¹ Dempsey, Lorcan. The subject gateway: experiences and issues based on the emergence of the Resource Discovery Network. *Online Information Review*, Vol. 24, No. 1, April 2000, pp. 8-23. (Also available at <http://www.rdn.ac.uk/publications/ior-2000-02-dempsey/> (checked 9 June 2003))

²² Lougee, Wendy Pradt. Diffuse libraries emergent roles for the research library in the digital age. Washington, DC: Council on Library and Information Resources, 2002. (Also available at <http://www.clir.org/pubs/reports/pub108/contents.html> (checked 9 June 2003))

²³ Lynch, Clifford A. Institutional repositories: essential infrastructure for scholarship in the digital age. *ARL Bimonthly Report*, February 2003.

<http://www.arl.org/newsltr/226/ir.html> (checked 12 June 2003)

²⁴ See the publication and presentation list at

<http://www.lis.uiuc.edu/~clpalmer/pubspres.html>. In particular see Palmer, Carole L. and Laura Neumann. The Information Work of Interdisciplinary Humanities Scholars: Exploration and Translation. *Library Quarterly* 72, 2002, p.85-117.

²⁵ See for example the experimental prototype FictionFinder from OCLC Research which allows you to traverse associations created between genres, characters, imaginary places, and real places. <http://fictionfinder.oclc.org/>

²⁶ Lougee. Op cit.

²⁷ UKOLN. JISC Information Environment. [website].

<http://www.ukoln.ac.uk/distributed-systems/jisc-ie/arch/> (checked June 9 2003)

²⁸ IMS. IMS Digital Repositories Interoperability - Core Functions Information Model

Version 1.0 Final Specification. (Revision 13 January 2003)

http://www.imsproject.org/digitalrepositories/driv1p0/imsdri_infov1p0.html

(checked June 30 2003)

²⁹ The approaches are compared by Andy Powell in a presentation given at the

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.

CETIS Metadata and Digital Repository Interoperability SIG, Milton Keynes, December 2002. *IMS Digital Repositories Interoperability* <http://www.ukoln.ac.uk/distributed-systems/jisc-ie/arch/presentations/cetis-mdrsig-2002-12/> (checked 9 June 2003)

³⁰ W3C. *Web services activity*. <http://www.w3.org/2002/ws/> (checked 9 June 2003)

³¹ OASIS. Web Services for Remote Portlets Specification Committee Specification 1.0, 4 May 2004. <http://www.oasis-open.org/committees/download.php/2750/wsrp-specification-1.0-cs-1.0-rev1.doc> (checked 5 July 2003) (OASIS is an industry standards group. This document specifies how a portal framework interacts with web services.)

Note: this is a pre-print of an article published by The Haworth Press. Please cite the published version. A suggested citation appears on the title page of this document, which is available online at http://www.oclc.org/research/staff/dempsey/recombinant_library/. Last change to this version: 2 September 2003.