

SUBJECT PORTALS: A NEW INFORMATION DELIVERY MODEL TO ENHANCE TEACHING AND LEARNING

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ABSTRACT

This paper describes a UK project which is developing subject portals to support digital communities of scholars in four disciplines: humanities, life sciences, social sciences, and engineering. These portals address the need for simpler and more uniform access to two key sources of networked information resources: quality assured information freely available on the Web, and subscription-based services such as abstracting and indexing tools, e-journals, and digitised collections.

INTRODUCTION

A portal is a Web interface that offers integrated access to information and related services, tailored to the needs of users. For example, australia.gov.au¹ is a world leading portal for the delivery of government information and services online. australia.gov.au has been created to help all Australians find government information in an intuitive and easy way, without needing to know which specific provider website to go to. This paper describes a UK project which is developing a series of four subject portals for the higher education community. The Subject Portals Development Project (SPDP)² addresses the need for simpler and more uniform access to two key sources of networked information resources: quality assured information freely available on the Web, and subscription-based services such as abstracting and indexing tools, e-journals, and digitised collections.

Portals can make information delivery more 'people-centred', by offering a combination of access to networked information resources with tailor-made services and tools to enable interaction and participation. The 'joined-up' view of a subject-specific academic information landscape provided by the subject portal will simplify the process of discovery, access, searching, and delivery of networked materials of various kinds.

In the future, the subject portals under development in the SPDP may become a networked learning space capable of sustaining a digital community of scholars in a given discipline. These new virtual spaces will deliver relevant information, provide search tools that cross a variety of remote systems and resource

discovery tools, and facilitate participation and interaction. Research in the business environment suggests that there are many benefits for organizations that encourage the development of informal online communities. Lesser & Prusak (2000) suggest the self-organized interactions and relationships that characterise what they call "communities of practice" can play a critical role making people's work more productive. They refer to the resources that are drawn on by the community as "social capital". If the subject portals can assist discipline-based communities to develop social capital, this will enhance the capability of the community through improved access to the most relevant scholarship. I will describe how the subject portals currently under development will contribute to the structural, relational, and cognitive dimensions of social capital, thereby stimulating further research and scholarship and nurturing the growth and vitality of scholarly communities.

SUBJECT PORTALS DEVELOPMENT PROJECT

My focus on the community-building potential of portal technologies is informed by twelve months' work with the Joint Information Systems Committee (JISC) in the UK³. In 2000 I spent three months at Nottingham University working with the BIOME team. BIOME⁴ is a bio-medical subject gateway, and my attachment was partly supported by a James Cook University General Staff Development Grant. This attachment led to taking up a ten month secondment with King's College London to manage Phase One of the two-phase project called the Subject Portals Development Project (SPDP). The JISC-funded project aims to

¹ <http://www.australia.gov.au/>

² <http://www.portal.ac.uk/spp/>

³ <http://www.jisc.ac.uk>

⁴ <http://biome.ac.uk>

develop a series of portals in different discipline-based subject areas. The BIOME team is one of the participants in the SPDP. BIOME is building a portal for the health and life sciences community.

The SPDP is run by the Resource Discovery Network (RDN)⁵. The RDN is a co-operative network of subject-based services, each of which follows the BIOME model. Collectively the RDN provides free services for effective access to high quality Internet resources for the learning, teaching, and research community. The service is primarily aimed at users in UK higher education institutions. The RDN builds upon the foundations of the subject gateway activity carried out under an earlier JISC program.

GATEWAYS, HUBS AND PORTALS

The terms gateway, hub, and portal are confusing because they can be used in many ways. The RDN has developed a list of terms used in their publications and the definitions provided in this list are applied here (Powell, 2000). The term 'hub' is used to describe an RDN organization offering various services within the RDN framework. Thus BIOME is an example of a hub. The services offered by a hub are based around one or more Internet resource catalogues and seek to enrich learning, research and cultural engagement by providing access to high-quality Internet resources (Powell, 2000). These catalogues are generally known to their users as subject gateways. The RDN gateways were set up by the JISC in the mid-1990s and have now become a familiar feature of the UK information landscape, valued by students, academics, and researchers as reliable and free points of access to relevant Internet resources.

A subject gateway is a website that gives organized access to Internet resources. Subject gateways have tended to focus on a specifically defined subject area, but as the technology matures, multi-disciplinary gateways have appeared. The Argus Clearinghouse provides a central access point for a number of gateways, which it calls "value-added topical guides"⁶. In general terms each of the RDN hubs represents an aggregation of subject gateways. For example, BIOME's five gateways provide access to quality networked resources: medicine, veterinary science, bioresearch, natural resources, and agriculture and forestry. The

BIOME hub aims to be the national focal point for online access to information across these subject areas.

Subject gateways direct users to useful Internet resources. In order to explore those resources, the user leaves the gateway environment. In other words, the gateway presents a range of websites available for human inspection. Brophy (2001) describes the user as "a temporary visitor to the gateway", following signposts to other sites, possibly returning to the gateway to find more useful resources and moving on again. A portal, by way of contrast to a gateway, is a 'sticky' website. The user does not have to leave the portal website, because the portal can call on broker technologies that will 'inspect' remote websites on the user's behalf.

The hypothesis presented in this paper is that in future, subject portals will enrich communities of practice within a given discipline. To understand how it is that subject portals might fulfil this role, further explanation of both the organizational structure of the RDN and its technical architecture is necessary.

The organization that runs each of the hubs is a consortia of prominent library, academic, research and professional organizations. Because the hubs create databases and services for the RDN this means that key activities, such as evaluation and organization of resources, are carried out locally by people with the necessary expertise and subject knowledge. The Internet resource catalogue that is at the core of a gateway service is a database of meta data describing high-quality Internet resources. Websites or pages are evaluated for their quality and relevance to the target audience, and reviewed resources are catalogued and indexed using the relevant specialised taxonomies and classification structures. This creates a structured repository of meta data that can support sophisticated search access. Links are checked daily in an automated process and all entries are updated regularly. Through these processes, a gateway can provide the search and browse functionality and the reliability that we have come to expect of library catalogues. Subject gateways are set apart from conventional search engines by virtue of this intellectual input, which in the case of the RDN, comes from a distributed network of subject specialists who represent a very wide range of organizations.

⁵ <http://www.rdn.ac.uk/>

⁶ <http://www.clearinghouse.net/>

The RDN gateways are effective tools for information retrieval, and assist researchers and learners in providing guided access to the Web. But gateways are only one tool among many. The number of useful information tools is increasing rapidly, and each tool does a slightly different job. Students and staff in universities now have access to a bewilderingly vast range of networked databases in addition to the print collections held in their institutional libraries. The proliferation of retrieval interfaces has become itself a barrier to access to scholarly information. Portals will not replace the variety of information retrieval tools, but will provide integrated access and a joined-up approach to discovery, browsing, searching, and delivery of networked information resources. This will help to demystify the confusing landscape and also will enhance users' awareness of the range of services and collections already available.

The SPDP seeks to build portal services that will interact with a number of remote services using machine-to-machine protocols (e.g., Z39.50, LDAP, WHOIS++, XML) which return structured data for reuse by the portal service. An example of such reuse might be a search that retrieves records from various types of sources – a subject gateway, a bibliographic database, a library catalogue, and an image bank – and presents them in folders categorized according to the user's personal interests.

The RDN portals will offer a unique information-finding service because of the RDN's ability to offer unbiased channels of information, independent of the commercial interests of particular publishers or providers. Portals will provide generic access and utilisation tools. The technologies are complemented by the nature of the hub organization, which means that each portal user interface, each portal cross-search broker and user profiling service, will be responsive to the discipline-specific needs of the particular academic community. The result will be that rather than publisher-led approaches to information, the portals will present a user-focused view, shaped by the communities they serve.

Portals are often described as offering seamless access to global resources. In fact a portal simply provides a single view of different information sources, rendering that information into a format designed for a particular user. Access is seamless only to the extent that the user does not need to know which domain or application has been sourced. 'Seamlessness' as

a quality in part relates to the consistency of representation of data at the portal interface. It is preferable to describe the subject portals as providing access that is well-seamed. In other words, because of the nature of the resources that the subject portals will deliver, we expect that users will frequently want to go to an external website to make use of the full native functionality associated with a resource. The interface design should encourage this by making it easy to do so. In part, the degree to which a portal can provide apparent seamlessness in access to resources relates to interface design, in part to the navigational steps required to complete the process of accessing something at the item level. For example, it should be possible to order a book having found its description in a library catalogue or on a commercial website.

To become fully operational, the RDN subject portals will require access to certain 'middleware' services that are also under development. A directory containing high-level collection descriptions and service descriptions could be one example of shared middleware. Each of the four portal servers needs meta information about potential collections and information providers from which it can decide whether to query that source to satisfy a particular information need. Directories containing meta information may be maintained centrally or even by another agency which could handle queries from multiple portals. Other middleware possibilities are authentication services, a user profile system, and e-commerce facilities. Descriptions of these services and an architecture to support them are outlined in *The DNER technical architecture* (Powell & Lyon, 2001).

SERVING COMMUNITIES THROUGH PORTALS

In the business sector, portal sites typically address knowledge management requirements of the commercial environment. Typical features of enterprise portals include a directory of websites, search tools, e-commerce, community forums, and shared workspaces. These can be customised by the administrator to provide the functions most relevant to a particular workgroup. An individual may also be able to personalise her or his desktop portal to include channels such as news, weather information, stock quotations, directory and map information, etc.

Like enterprise portals, the RDN portals will include tools to deliver (push) validated information based on individual or group requirements. Although the SPDP focuses on cross-searching functionality, many of these other features common to enterprise portals are also being developed under a separate initiative that is proceeding in parallel. A set of tools is being developed that will allow for services to support end-user-created resource descriptions, allow lecturers to create interactive reading lists or pathways for a particular learning objective, and deliver alerting services and news feeds. These flexible shared services are intended to underpin the development of the central RDN Web service (Powell, 2002). There are strong synergies between these services currently under development to support the development of a personalised 'MyRDN' service and the tools being developed in the SPDP. The SPDP will offer a federated entry point for searching information from commercial sources such as academic publishers and databases, as well as current news and research. The value of a consistent interface that extends across different classes and formats lies in the ability to be able to easily move between multimedia materials, directories, databases, commercially published sources, and freely-available Web pages. The unifying framework is the discipline-based approach. Because the subject portals are being developed within this wider RDN architecture, there will be increasing opportunities for users to make choices about the way services are presented and used and to contribute to the performance of this networked learning space.

An example that illustrates how both strands of research and development come together is the ability to present the RDN cross-search functionality from some other system. The RDN already offers a service to other institutions that allows them to insert an RDN search box into their own websites. Online learning materials could in future include a button that would provide a customised version of the functionality of the relevant subject portal. The lecturer could set an activity in the learning path which would trigger information-seeking activity using RDN search facilities and discover high-quality Web resources while remaining within the familiar look-and-feel of the local site.

This feature is available at the Routledge *philosophy Arena* website⁷, where it is used to complement access to print-based and commercial publications. From the Routledge page users can enter their search term via an RDN button. The search operates against a subset of over 350 hand-picked, good quality philosophy resources described in the RDN Internet resource catalogue (Routledge, 2002). This example is interesting for a further feature currently under trial. Working on the assumption that good quality resources link to other good quality resources, the RDN have created a 'harvested' database of machine picked resources. The database is generated by seeding indexing software with the URLs of the hand-picked resources. Using these URLs as a springboard, the software retrieves the resources and follows links within them to other documents. It finally indexes every word it finds.

The SPDP project is primarily concerned with technologies that broker subject-oriented access to resources. Prototype portals have been built that enable a user to search across a number of systems simultaneously and view results from a range of other, heterogeneous, network services. The BIOME prototype searches a union catalogue, a table-of-contents service, a directory of museum collections, a journal index, and an image database. The cross-search prototypes are now being further developed to take account of additional resource discovery services such as described in the previous paragraphs.

RESOURCE DISCOVERY

Subject portals have a major role to play in resource discovery, that is, in assisting users to identify and locate relevant information. In the shared space of the subject portal, users will have unprecedented ability to discover relevant opportunities, resources, and linkages. The strength of the portals will be in joining different domains of information. In particular, the portals will increase the availability of free digital resources by integrating access to these and presenting them alongside access to subscription-based bibliographic resources.

Searching is just one of the functions associated with resource discovery. The others are description and location. For effective searching

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<http://www.philosophyarena.com/philosophyarena/homepage.htm>

the user needs quick access to some details about the resource. This includes the information that describes, analyses and evaluates information resources and establishes provenance and cost (if any). Then the resource discovery system needs to be able to locate (and possibly deliver) an appropriate copy or a version of the item. The underlying portal architecture will make it possible to fulfil both the description and location functions using locally maintained directories. A major advantage of this is that institutional preferences or requirements relating to resource use can be addressed. It is also possible that narrative contextual information describing resources could be specially tailored to the needs of particular groups of learners.

PUBLISHER AND PROVIDER PERSPECTIVES

The major new content sources to be invoked by the RDN portals are provided by a mix of electronic scholarly publishers (both for-profit and not-for-profit), trade publishers, information aggregators, and other vendors and disseminators. By ensuring selection criteria are drawn up in consultation with the academic community, the integration of resources and services at each portal will reflect research strategies and paths of inquiry specific to a discipline.

For the commercial scholarly publishers, the subject portal represents an entirely new marketplace. Making their product available to a portal is a novel idea. Firstly, the publishers are to some extent relinquishing control over how their content is presented, because this will be governed by the portal interface. At the user's screen, the data retrieved from an image database may be combined with data from a mapping service and added to demographic data drawn from another source. Secondly, there are new technological demands in providing access to support resource discovery and this will require that publishers and providers meet minimum standards for interoperability. Some providers of bibliographical services may choose to allow users to view a limited meta data surrogate of an item via the portal, even though the user is not affiliated with an institution that has licensed access to the full service. Thirdly, subject portals will support provider disclosure of relevant offerings in a highly dynamic context, and new marketing strategies will need to be developed to suit the more collaborative environment of the portal. For example, a commercial publisher may

provide selective table-of-contents information as part of the portal's altering service, and this may require a new set of business rules to govern which users will receive the alert and in what context. Finally, pricing structures have evolved to suit the current higher-education environment and will need to be reviewed. Current packaging has been developed to suit the institutional marketplace, and there will be advantages in reconfiguring the product mix to suit delivery to a particular subject community.

The SPDP assumes people will be able to create and submit resources to the RDN and that the portals will provide collaborative working spaces, where annotations and resource evaluations can be shared. This will further contribute to the uncertainty facing the scholarly community about what defines a 'publication'. New combinations of users, service providers, and information resources will be enabled in this networked space. Patterns of scholarly communication are changing and the distinction between for-profit and community-based information providers is less important than it used to be. The RDN is already working with a number of UK universities towards the goal of providing central exposure of locally-maintained collections. As more institutions set up e-print repositories, this will add a valuable new dimension to the services of the RDN portals. In future, similar tools could even be developed for the portals to assist in the development and federation of scholars' personal collections. Certainly the subject portals will offer the ability to unite items from dispersed collections, combined with functionality that will allow several formats to interact. Search results could be manipulated as an aggregated set of items, mimicking a coherent collection. In effect, portal technologies offer the potential for users to be able to create new meta collections.

COMMUNITIES OF PRACTICE

Although no specific evaluation has been carried out, there is anecdotal evidence that each RDN hub can be seen as a "network of practice", as described by Brown & Duguid (2000, p.143). Drawing from Brown and Duguid's framework, there is clearly strong potential for the additional services that will be provided through the SPDP to foster the development of subsections of the larger network, clustering around a particular interest. Portals will reinforce the three dimensions of social capital described in Lesser & Prusak (2000): structural, relational, and cognitive. In the structural dimension, the portal site will provide opportunities for users to

engage with other users and connect with people working in areas similar to their own. By being able to bring people together in the context of shared understandings of a disciplinary tradition, the portals will engender high levels of trust. Thus the portals address the relational dimension of social capital, building on the mechanisms for cooperative behaviour that already exist across research networks. Finally, the cognitive dimension will be reinforced through interface design that relies on the terminology and common practices of the discipline. However, the specialised vocabularies are applied in such a way that novices can access services and progressively engage with the community as they gain competence in the field.

In general, the use and usability of online scholarly information services is poorly understood, especially in the subject context (Dagar, 2001). When the subject gateways began operations in 1995, they were responding to a need to save the time of their users, connect them to resources which supported their teaching, learning, and research interests, and making sure that information about useful electronic resources was effectively disclosed. Dempsey (2000) said "they aimed to give shape and definition to an information space in a particular subject area". The evaluative work carried out demonstrated that their subject approach was welcomed. It is assumed that people's use of the subject portals will reflect behaviours related to their functional role and discipline and their interactions will lead to further differentiation in the services and information provided by each portal. Within the federated structure of the RDN, there is plenty of scope (and financial impetus) for each portal to build upon its own partnerships to deliver services that are specific to its own community interests. In this way, the RDN hubs with operational portal services will be able to make a fundamental contribution to education, fostering the constant renewal processes that scholarship demands.

Over time, there is potential for each portal to build up a unique 'networked learning space' in which users interact to shape not only their own ideas and learning, but the very nature of the information resource that is the portal. One way this may happen is through the provision of facilities for people to add notations and evaluative comments. In this way some responsibility for the accuracy, availability, and value of particular information resources is distributed across the discipline or community.

Many of the applications and standards that are critical to this project have yet to mature, but as the infrastructure develops, a richer and more sophisticated information environment will emerge. If the subject portals can create a participative environment, they will become centres of energy, supporting and generating communities of interest. A willingness to share, contribute, and build new partnerships is key.

Nichani (2001) outlines some of the theories about virtual communities of practice. The article draws from Brown and Duguid's work in noting that building and sustaining a community of practice requires more than just technological solutions. Nichani suggests that the social aspects are critical, and that underlying social structures and processes shape the flow of knowledge across networks. Yet the article concludes that "Technologies that support virtuality through online communities should thus be seen to complement, and extend existing communities." This is the effect described by Norris (2000) as the virtuous circle (as opposed to the vicious circle). Norris demonstrated the power of such a virtuous circle in her study of the impact of mass media on levels of civic engagement. Her research indicated that the ready availability of relevant content stimulates further engagement and participation. There is every reason to believe that the portals will create such a virtuous circle.

CONCLUSION

Of necessity, much of the research focus of the SPDP thus far has been on the technological infrastructure required to provide effective portals. This paper has served to highlight the community dimension by describing some of the ways in which subject portals can serve the real needs of learners and researchers. Brown & Duguid (2000) describe the power of communities in progressing individual learning. They also point towards ways that technology can provide opportunities for collectively constructing understanding. Subject portals offer a means to combine the power of technology and the social context of an academic discipline. The involvement of users will shape the technological development of the subject portals, and in turn, subject portal technologies will help to energise the flow of knowledge.

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