

A Researchers Paradise

High Quality Services on the Internet for Research and Life-long Learning

Jørgen Burchardt

Tidsskrift for arbejdsliv / Nyt om arbejdsliv

jbur@post1.tele.dk

ABSTRACT

Services for research are still in the early days of development and adoption by scholars. Over the next years many new methods will emerge. These new scholarly resources may be very different in form and function than their current manifestations.

Focus will be on research as such. The first part of the paper will outline its relations to learning, e-learning and knowledge management. A theoretical framework will be presented within which the new possibilities for the development of the research can be understood.

This paper is then a preliminary attempt to map out some of the key contexts within which the scholarly resources will exist. I will examine the emerging role and fit of the different services in scholarly scientific practice - including examples of the 'best practice' within the field- the range of dimensions that shape their usage and provide value for scholars, and the larger impact on scholarly practice.

In the final section, I present insights on the adoption and implications for the future.

Keywords

Science portal, electronic publishing, virtual university, research community, e-learning, knowledge management, learning on demand, learning communities, learning portal, peer-to-peer learning, scholarly resources

THEORETICAL BACKGROUND

Research and knowledge

Two big words with many meanings. I will not define the first term any closer, but base my understanding on the general assumption that research consists of factors such as investigation aimed at the discovery and interpretation of facts, revision of accepted theories in the light of new facts, and practical application of such new theories.

I will, however, look into knowledge, since this term during the last decade has been debated from the point of view of several sciences. Particularly the technical possibilities within IT have forced the development of theories on knowledge (management) as

well as the related term *e-learning* to a certain extent.



The ancient Greeks were the first to learn that knowledge had more than one aspect. Aristotle divided knowledge into three terms, namely *episteme* (theoretically scientific knowledge), *techne* (the form of knowledge of the artisan), and *fronesis* (practical-ethical wisdom).

Recent research has developed the term even further, and the perception that knowledge is primarily associated with a person (Clarke and Rollo 2001) is increasingly agreed upon. Knowledge is a social construction and therefore not available by IT-people with computers and databases.

Knowledge may be connected with data, which is an unsystematic collection of objective facts. When data is put into a systematic order, it is transformed into information, but not until people with insight and values have treated the information

does it qualify as what we call knowledge.

An important insight is that knowledge is not merely a mechanical memorising of know-what, but also a know-how. Thus knowledge may be divided/separated into a conscious part (explicit knowledge), and a part that is more difficult or impossible to articulate (tacit knowledge). If you like one or more layers may be added, such as wisdom that is said to be a selection of the ideal knowledge.

If you were to arrange these terms in a pyramid, you would in the lower part have elements such as data and information that may easily be treated by IT. On the other hand, wisdom and tacit knowledge constitute knowledge as emergent properties of complex systems. It is seen as a social construction in an ongoing process embedded in the communication between people.



Research and learning

Research is not necessary learning. If research takes place in a process, where no new land is conquered regarding the personal competence - developing increased capacities to do things - surely it would not be called learning. On the other hand, a person may acquire new methods and competencies without this necessarily happening during a research process. These terms overlap each other to a large extent, though, and they have many of the same problems.

However, it should be taken into consideration that the ordinary learning theories do not consider learning at the academic level (Laurillard 1993). The academic learning is often about how people learn about the world through the descriptions of the world made by others.

Skill and competence are two important words in the process to obtain knowledge. Here learning is fundamentally social and integrated in the life of communities. This part of learning has during the last decade had renewed attention (Lave and Wenger 1991, Wenger 1998). According to these theories, 'principles of learning' are fundamentally social and integrated into the life of communities. It is thus an act of participation. Participation takes place in 'communities of practice', where 'practice' makes a difference from 'communities of interest', where the daily commitment is far less radical. Thus, professional art intermediaries will belong to the first category, whereas regular art lovers will belong to the last one.

At the level on which researchers move, learning is an active, individual, cumulative, and self-regulated process. The traditional teaching method with traditional, inflexible teacher-student roles is ruled out for several reasons. The researcher is a specialist, who seeks concentration. In principal, her quest is to be the best in her field, where the leading field often consists of very few people. An e-learning programme, on the other hand, is not possible, as a traditional distance-learning programme requires 100 - 200 participants per year to pay (Darby 1999).

Instead, learning takes place as peer-to-peer learning. In some part fields one researcher is ahead in the leading field and may teach the rest; in another area someone else is ahead and may share his knowledge.

This way of learning is an ancient tradition in the academic world, and even such an obvious phenomenon has been analysed by Davenport and Prusak, 1998, who stress that people want to share their precious knowledge if there is a certain reciprocity, where they get something in return. The tradition may also be based on people behaving as experts in order to obtain expert reputation or it may be an expression of altruism regarding a fascination subject.

The various ways of learning may also be drawn up in a table (extended table according to Prinds 1999):

	Teaching room	Practice room	Study room	Research room
Activity	Mediation of knowledge	Practising of material	Project	Research
Teacher's role	Intermediator	Trainer	Consultant	Colleague
Student's role	Recipient	Apprentice	Student	Colleague
Organisation	Class	Individually/by the group	Individual/group	Individually
IKT	Presentation tools, note making	Simulation database	Internet communication	Internet communication

At a conference such as this on e-learning, it seems obvious to show the research related peer-to-peer learning (in the top right-hand corner) in relation to the remaining ways of learning. A research process, however, often includes the entire room of knowledge (Table according to SRI Consulting).

SERVICES FOR RESEARCHERS

The researchers personal information

The dramatic impact of the new technologies on the distribution of information is being particularly felt in research. The new developments provide enormous potential benefits for the scientific information chain and hence for the progress of science.

The amount of information today is overwhelming. In the early years the amount of information could be easily overlooked - in 1472 the library at Queens' College in Cambridge, England, had precisely 199 books. At that time people could claim with some plausibility to have read every important book ever written.

Today there are in libraries approximately 60-80 million books. The amount of information on the Internet is estimated to be around 3-10 billion pages. All of these areas are constantly growing/developing.

A saying is therefore, *the right information just in time*. In order to meet this goal, a personal selection of the information available is therefore imperative.

A wide range of alert-services is already available, which can be confirmed by this author, as his mailbox similar to what is true for many other information-craving individuals is gradually being filled with newsletters he has signed up for (Europemedia - in the following an example of 'best practice' is stated in parenthesis and with URL stated in the bibliography).

The principal of this is true, it is also certain, however, that the future will bring more specifically developed services with very fine-meshed bibliographical subject headings - and people to assess the resources.

The same principal must of course be true for all sites on the Internet. The pieces of information contributing to 'information overload' should be made invisible here; the reader must receive selected, precise information instead. The method has been developed through Customer Relationship Management and used in commerce. The behaviour of consumers is analysed through data processing in order to observe their expected desires and preferences. It is this method, which ensures that regular customers with Amazon.com are recommended books with similar subjects and in the areas where they have bought books before. This is almost certainly a facility the academic world will adapt in the future.

The needle in the haystack

The most efficient search-engine at present is Google. It is quite impressive, what its more than 10.000 computers together can accomplish. It is understandable that the company shows the time for searching - it is something of a miracle that more than 2 billion pages can be seeped through in 0,08 seconds.

A search-engine is an amazing tool - especially if users teach themselves to search the net for information in an efficient and precise manner, the needle in the haystack may be found.

In the future, search-engines will be improved. What is even more important, though, is that the suppliers of information on the Internet improve their meta-data. There are for instance great opportunities in a future semantic web and in the use of xml (New Journal of Chemistry).

We have already benefited from part of the digital interest in the libraries, whose catalogues are often on-line. But also here the overwhelming amount of information is a problem. Unfortunately, librarians do not have a tradition for adding qualified opinions on bibliographical information. Once a book is in the library, it is equal to all other books. A human surplus value should be added here.

This surplus value is found in selective bibliographies, where experts in the field through their choices prioritise the bibliographical information (Scholarly Electronic Publishing Bibliography).

Collections of links have since the beginning of World Wide Web been important in order to find resources on the Internet. Concurrently with the increase in the amount of information, this tool must also be developed. Again, a value must be added. For instance every link should be assessed from both the extent of its interest, it must have a brief and adequate description, as well as which sort of resources you may benefit from instantly (Teknik @ Kultur).

News now

Researchers are required to keep up within their field. Everyone, however, have trouble finding the time for all of their activities. The search of daily news will therefore be an area that can truly be made efficient. If half an hour is saved every day, 23 days are saved in a year.

News services of the kind where experts select news from daily newspapers and other relevant media and present them in a shortened form are important. Most academic disciplines have a matching practical trade that they must keep up with. Theologians have churches, historians have museums, biologists have nature etc.

News services are being established in many fields, but many of them are still dominated by automatic harvesting of news. When the presentation is based on journalistic principles, it can be effective and useful (Elearningpost).

This filtering of the news-flow can of course also take place internally in the scientific world, where the eternal flow of books and periodicals require precise and determined news services in the same way. Many fields have established review e-journals with monthly bulletins (Current Cites) whereas others regularly send their comments and reviews.

A small but particularly important area is the presentation of conferences and events. The amount of 'call for papers' and invitations to meetings and seminars is enormous here as well. It therefore true again that offers must be tailored so that the right offers meet the right recipient. This area must be highly prioritised, as these gatherings and events are great opportunities for scientists to meet. It is here that the above-mentioned transfer of explicit knowledge takes place to a large extent.

Living electronic publications

The publishing of books and articles is the utmost important form of mediation within science. Today we are in the same period of promoterism ("gründer period") as we were when cars were new - the first cars were built, so that they looked like horse carriages.

However, the image of a new media is emerging, especially when publishing articles.

The production process of a traditionally book printed periodical is slow and heavy. It may take a year from the reception of an article at the editors until the postman has delivered the printed periodical.

With the Internet all this has changed. Articles that have been handed in may be published immediately in a rough form (Open Archives Initiative), a further finishing, however, is often desired. For instance accepted articles can be presented for an open peer-review, where all readers may contribute with their suggestions and comments for improvement, as opposed to only the few official peer-reviewers (Journal of Interactive Media in Education). This will create a direct communication between readers and authors. The entire process may subsequently be part of the electronic publishing, so that the pre-publication history of manuscript can be viewed (British Medical Journal). Naturally, corrections from the authors can come in after the publishing (British Medical Journal), and many periodicals now publish both comments and debate from the readers along with the article (Internet Journal of Chemistry).

Most publishers of periodicals prepare index and other forms of preparation to search services. One of the more recent initiatives is an index of the quoted works - with direct links to an on-line edition; this way interested parties can report for notice of when a certain article is quoted by others (iop).

The Internet is an inexpensive media that makes it possible to release publications with important scientific results, before they are sufficiently and thoroughly prepared for an actual publishing. Many conference proceedings are now available on-line (Networked Learning 2000), so that if you do not have the time to examine papers, you could perhaps be satisfied with reading reports of the conferences - perhaps even as they are being carried out (BioMedNet).

The limitless possibilities of science

The technical possibilities seem endless. At least extensive work in developing technical platforms and filling them with relevant contents is being carried out these years. In this context, I will only mention a few of the ones that will carry great importance for both the form and contents of research.

The world consists of a long series of linguistically divided cultural circles. From our part of the world the English language may appear to be world standard, but they might not agree in China or South America. This problem will however no longer be of importance when efficient translation services are introduced over the next few years (Cultivate). For the very first time, all of the researchers in the world will be able to cooperate across languages.

Individual languages within the various fields of science may be developed dynamically thanks to the Internet. For instance registers of accepted basic terms may be revised gradually through suggestions from researchers (Expert Reviews in Molecular Medicine).

Incidentally, on occasion this publisher prints animations as a supplement to the traditional two-dimensional illustrations.

In many ways, the basic material of research is made available on the Internet, so that all scientists in the world may take advantage of it. It is a time consuming work but the collection of data of many archives, museums and institutions will be made available over a sequence of years (United States Patent and Trademark Office).

Learning communities and portals

The researchers have taken in the new technology. It has become so widespread in our part of the world that communication by e-mail is a rule rather than an exception. Equally, most people employ discussion lists and news lists.

New services on the Internet are being developed. An impressive one is Community of Science, which among other things include a register of more than 480,000 researchers, who have submitted their résumés themselves. The world of researchers may find colleagues to learn from here.

However, the Internet-sites with the most perspective for the future are the so-called portals that hold entire subjects and offer a series of the above-mentioned simple services. They will give learning on demand by bringing researchers at universities, researchers at other institutions and work together.

This model of "learning communities" is an attempt to rebuild society's educational system on a new cultural foundation that is democratic and has a person-focus rather than a mechanical one. It is the idea of the lifelong learning as a start for social and cultural renewal.

Through electronic publishing, science portals and virtual universities, the scientific community will soon be well established in the

WWW. For instance has the amount of information potentially available for the researcher grown exponentially in recent years. Most of this information is available on-line, but efficient and exhaustive use of it is rendered problematic by the way in which it is organised. The researcher is often confused by the quantity of information and by the lack of quality control of that information.

The services, therefore, play a strategic role in the orientation of the researcher's choices – they will become a researcher's paradise.

In order to meet the users' needs, a portal service may be able to supply indications and suggestions to those searching for information on the Internet, in a systematic if not exhaustive manner,

Much of this use has brought on the interest of theorists and inspired them to develop theories for co-operation in spite of the lack of physical presence (Lave and Wenger 1991, Wenger 1998, Wenger 2002). The theories are becoming increasingly well known especially since there is a digital divide here in using automated services.

As someone who practices in this field, I should like to add two perspectives. One is the value of physical contact within defined professional circles (Burchardt 1992). Some attitudes and values can only be acquired in the personal meeting - consider what you yourselves have gained from a gathering in the small hours after a pint of beer at a conference such as this. Therefore, in the end the ideology behind such a learning portal should be a desire to bring people together physically, not merely virtually. It is therefore natural that portals have arisen from and function in connection with actual meetings and possibly a scientific periodical for the relevant field of work (Nyt om arbejdsliv).

The other perspective is the practical principal behind the development of portals. It does not suffice to choose the correct software or to have an editorial office working as a passive moderator. The very best results are achieved through active control with journalistic and educational flair coupled with an insight of the potential and history of development of the relevant work field

THE FUTURE OF RESEARCH AND LEARNING

The international research community

The future infrastructure on the Internet is being created now. Although many of the well-established institutions apparently remain strong and unchangeable, the next decades will prove great changes.

The editing business is already undergoing remarkable changes; especially within the technical and scientific branches there are large, upcoming corporations such as Springer and Elsevier. They sell their products to the libraries in large packages. The libraries receive these periodicals including registers, and they can no longer save money on the budget by saving the cost of a single periodical; they are bound by the either/or of the extensive royalty arrangements.

Part of the world of researchers, however, are dissatisfied with the fact that private companies have taken over their products for free, and treat these as common commodities. There are therefore contrary initiatives with regard to making science easily accessible on the Internet. For instance an initiative such as Public Library of Science and lately Budapest Open Access Initiative have worked hard to make the articles of scientists accessible and free on the Internet - at least after a shorter period of time.

The libraries are squeezed in this development. On one hand their position is weak with the large corporations who they try to counteract through the creation of syndicates with other libraries. On the other hand, the Internet is pushing them via 'library bypass'.

The Universities are equally large and heavy institutions with many interests to attend to. Cooperations with other universities are particularly disliked; they compete for the same limited research funds and students.

These days, MIT and other universities are busy making all of their coursework freely available on the Internet. Along with the new resources for scientists, this will change the universities. Conglomerates co-operating internationally will emerge much in the same way that industry grew international with a vengeance during the 1970'ies. It was appropriate before to have universities as physical institutions at a certain geographical distance of each other where they were able to provide a comprehensive selection of tutoring and lectures and where the university libraries could provide a wide selection of matching literature. Today, researchers do not necessarily have to cooperate with the other researchers living in the same geographical area.

New forms of universities may emerge within very few years, once the electronic possibilities have reached a break-even. Even large universities will have difficulty competing with the extensive, high-quality, globally accessible intellectual resources of the virtual universities. This will lift research to a higher level. So far the growth of research has happened to a large extent by recruiting new candidates. This growth will end for demographic reasons. In return, a considerable change to make it more efficient can be expected through better mediation and co-ordination of research at the international level. The traditional universities will have a different

role. The official hierarchies will lose their power.

The researcher will be free. Research partners may soon be chosen freely since institutions no longer bind researchers.

The future of personalised learning



The future of e-learning is learner-centric. Learning is no longer a one-time event but an ongoing, lifelong process. Therefore it must be available whenever and wherever we need it. The future learning technologies and methodologies will take into account our need to be continuous learners. It is no longer a 5-year **education at a university and then no more. It is now 40 years or more in a continuous learning culture that encourages creativity and innovation.**

The paper has focused on structured sharing of knowledge.

In each scientific field communities as a strategic initiative and public service can be built online through designing learning portals and virtual campuses. It will function in an integration of research and education for this lifelong learning. It is therefore necessary to rethink the basic skills in adult education. At the same time it will re-shape the culture of research by making new forms of organising. It will develop a community of practice in the design of efficient corporate communities where a high degree of democracy is built in. It will change society as well as each single organisation when students can have the same information as the teachers, and the common citizen the same as the researchers.

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