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# ADOPTION OF E-SERVICES IN LIBRARIES: DANISH EXPERIENCES AND CHALLENGES

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## Abstract

*This paper reports the findings of a case study of Roskilde University Library (RUB), a research library supporting learning activities at Roskilde University. The investigation has focused on the main issues related to innovation that RUB had to deal with due to the advent of Internet and e-services as well as the future challenges that e-services provide for RUB. In addition the consequences of e-services adoption for Roskilde University library organization, its business model as well as relationships with customers, publishers (providers of knowledge) and other research libraries in Denmark have been investigated. The main results can be summarized as follows: 1) Adoption of e-services has forced RUB to innovate at a very fast pace. Innovation is driven, among other factors, by ICT development (technology push), but innovation is also pervasive throughout the organization and user-driven. 2) E-services have changed the organizational structure and the division of labour within the library by moving more and more towards IT-based jobs and competences. 3) E-services have changed the relationships with users and publishers. 4) E-services have changed the business model of the library. 5) RUB is becoming a combination of a virtual and physical library, moving more and more towards a virtual library, but still keeping the traditional function of a “knowledge space”.*

# 1 E-SERVICES AND THEIR CHARACTERISTICS

The networked ICT technologies (such as the Internet) are having a dramatic effect on how services and especially knowledge services are innovated, designed, produced and distributed. In addition ICT-networks such as the Internet have created the basis for the development of new types of services. These networks may also change the way customers or users experience service functions. For example in the case of hospital services "relational times" (person-to-person relations) are increasingly replaced by "technical times" where people are moved from a technical system to another. ICT-networks seem to be a catalyst to a renewed use of services here called e-services.

One feature characteristic of services is that customers are per se more involved in service delivery. Concerning this customer interaction, there are different types of services ranging from customer interaction with less standardized service components to customer interaction with highly standardized service components (self-service). To guarantee that customers' demands are best served by the provided services, the level of customer interaction has to be reflected in the entrepreneurship or innovation management process of the company. This development could lead to a self-service society. As a result both service firms and manufacturing firms have to face new challenges and may introduce new business models. Changes may come in customer relations (service encounters and quality), in organisational forms, (e.g. introduction of virtual organisations), improved management of intangible resources, and customer driven innovation.

Business-to-business e-services and business-to-consumer e-services can be conceptualized as a subset of business-to-business (B-to-B) e-commerce and business-to-consumer (B-to-C) e-commerce. E-services are therefore defined here as services that are produced, provided and/or consumed through the use of ICT-networks such as for example Internet-based systems and mobile solutions. E-services can be used by both consumers and businesses, and can be accessed via a wide range of information appliances (Hoffman, 2003, p.53). E-services include also selling of physical goods on the Internet as for example an airline ticket that is purchased online, but delivered by surface mail to the buyers or government services offered on the Internet or e-government. There are three main characteristics of e-services:

- The service is accessible across the Internet or other electronic networks
- The service is consumed by a person across the Internet or other electronic networks
- There might be a fee that the consumer pays the provider for using the e-service, but that might not always be the case as for example in some e-services offered by the government.

Normally the production, provision or consumption of a service requires the interaction between the service provider and the user of the service. Traditionally this has been based on personal interactions, most often face-to-face interactions. In e-services, the production, consumption and/or provision of services takes place through the intermediation of an ICT-network such as Internet-based systems or mobile solutions. Examples of e-services are e-banking, e-library services, e-publishing, airline tickets, e-government, information and location services. However e-services also include for example the online selling of real estate property or the purchasing of physical goods that are then delivered by other means. The advent of e-commerce and e-services has raised a number of challenges for knowledge intensive service organizations such as consulting companies, libraries and publishers as well as for companies selling physical goods. For example companies have to innovate, have to develop strategies and new business models for the production and provision of e-services, and acquire or develop new competences.

The purpose of this study is to investigate the challenges that e-services are posing and will pose for research or academic libraries. The research library is chosen here because it is a particular type of knowledge intensive service organization: it has the role of acquiring and providing research and learning related knowledge as well as store and preserving such knowledge. More specifically, the

study shows how the advent of Internet and the World Wide Web and consequently the advent of e-services has revolutionized the whole concept of library and forced libraries to innovate at an extremely fast rate. In fact libraries have been using Information and Communication Technologies (ICTs) for more than 20 years, but while the first wave of ICTs and technological change had resulted in automation with consequent rationalization and decreased costs, the advent of e-services is moving the library from automation to digitalization, causing a shift of paradigm in libraries. The study has focused on the consequences of e-services adoption for Roskilde University Library organization, its business model as well as relationships with customers, publishers (providers of information) and other research libraries in Denmark.

The case is based on a number of interviews with RUB management, secondary material provided by Roskilde University library and information retrieved from on the web page.

## **2 THE ROLE AND CONCEPT OF ACADEMIC LIBRARIES**

In order to understand how digitalization and e-services are changing the library and its innovative activities it is important to understand what a library is, and what are its major roles in learning. Libraries have been historically having a central role in learning, since the first library was created 2,000 years ago in Alexandria. Libraries can be defined as “an organized set of resources, which includes human services as well as the entire spectrum of media (e.g. text, video, hypermedia). Libraries have physical components, such as space, equipment, and storage media; intellectual components such as collection policies that determine what materials will be included and organizational schemes that determine how the collection is accessed; and people, who manage the physical and intellectual components and interact with users to solve information problems” (Marchionini and Maurer, 1995, p.68). Marchionini and Maurer (1995) distinguish three major roles that academic and research libraries serve in learning.

The first role is sharing expensive resources. These resources are physical resources such as books, periodicals, media, and human resources such as the librarians that provide a number of responsive and proactive services. Responsive services include maintaining reserve materials, answering reference questions, providing bibliographic instructions, developing media packages, teaching users how to use the material. Proactive services include selectively disseminating information to the faculty and students, collaborating with instructors to plan teaching.

The second role that libraries serve is a cultural role in preserving and organizing artefacts and ideas. Libraries have historically had the role of preserving material to make it accessible to future learners in addition to ensuring access to materials through indexes, catalogs and other aids that allow users to find what they need.

The third role of the library is that of serving as a physical knowledge space, where people meet to study and read and often to exchange ideas.

## **3 DANISH LIBRARIES LANDSCAPE**

### **3.1 The Danish Library Concept**

The Danish library system is based on the concept of the citizen's fundamental right to knowledge and information. Basically the library service is free of charge, but in certain cases libraries can demand payment for special services. (Danish National Library Authority, [www.bs.dk/publikationer/english/statistics/](http://www.bs.dk/publikationer/english/statistics/)). The Danish library system is characterised by extensive and well-functioning co-operation, both within the individual library sector and between the different library types. In Denmark there is an agency that is responsible for all matters that are related to libraries: The Danish National Library Authority. The Danish National Library Authority is an agency under the Ministry of Culture. The Authority is responsible to advise the government on the organisation, co-ordination and strategy for the Danish library service and gives professional advice to ministers and public authorities, as well as local authorities, libraries and information services. In

addition the Authority has an active role in international collaboration within the field of libraries, documentation and information. The major duties of the Authority consist of the administration of the Act regarding library services and a number of statutory government grants for library purposes. The Authority is also responsible for collecting and providing statistical information about Danish libraries. The Authority furthermore acts as the administrative base (secretariat) for Denmark's Electronic Research Library. This is a major initiative for the development of library e-services in Denmark and the libraries digitalization process.

There are two types of libraries in Denmark: public libraries and research libraries. Public libraries have the purpose to promote information, education and cultural activity by placing books and other media at the disposal of the public. Libraries therefore offer books, serials, talking books, recorded music and electronic information resources (including Internet), to the citizens. All the public libraries are connected to the Internet. In 2004 there were 224 main public libraries, 428 branch libraries and 44 mobile libraries.

Danish research libraries are government institutions and serve mainly higher education and research, but most of them are also open to the public at large. In Denmark there are 20 major research libraries connected to universities and other institutions of higher-level education. There are also a large number of smaller research libraries that are connected to educational institutions. (<http://www.bs.dk/publikationer/english/statistics/2004/index.htm>)

### **3.2 The Important Role of DEFF in the Digitalization of the Danish Research Library System**

In the 1990s, the Danish government had made a policy plan focusing on the "IT society" or "IT for all". This vision of IT for all included the digitalization of the libraries to provide all the citizens with access to electronic resources. This idea laid the foundation for the establishment of "Denmark's Electronic Research Library", via a network of cooperating electronic research libraries (<http://www.bs.dk>). In 2003 "Denmark's Electronic Research Library" (DEF) became a permanent activity with the objective of improving the use of IT in supporting research and education. This is done through six programme areas:

- E-learning
- E-publishing
- Licenses
- Portals
- System architecture
- User facilities

Today Denmark's Electronic Research Library (DEFF) purpose is to advance the development of a network of electronic research libraries that make available their electronic and other information resources in a coherent and simple way. This is obtained partly through government funding and partly by joint purchase of licenses ([www.deff.dk](http://www.deff.dk)). According to Deff's web page, the strategy of DEFF is "to improve the end user's access to information through cooperation between the Danish special- and research libraries. The cooperation includes joint development in cases where cooperation will result in a greater advantage than the sum of local initiatives, including a better and total utilization of the libraries' resources; further development of the joint network of information resources; collective dissemination of the research libraries' information resources to the public"([www.deff.dk](http://www.deff.dk)).

## **4 ORGANIZATION BACKGROUND: ROSKILDE UNIVERSITY LIBRARY**

Roskilde University Library (RUB) is a research library serving the students and staff at Roskilde University. Roskilde University is a university located in Roskilde, a city about 35 km. from Copenhagen, the capital City of Denmark. The university counts circa 10,000 students. According to Roskilde University Statute ([www.ruc.dk/library](http://www.ruc.dk/library)), Roskilde University Library has the following purpose:

- To give teachers and students at Roskilde University access to information and materials containing information, that are necessary for research and teaching, as well as ensure information on and access to the university's teachers and students' research.
- As a public research library to make available its collection to external users, among which regional research and teaching institutions, business and citizens.
- Participate to the national and international library collaboration.
- To conduct research and development within the library subjects and functions, but also the surrounding community and businesses as well as anybody who would like to use the library being this a public library.

Today the library counts circa 45 employees, and the number of employees has decreased since the library started the digitalization process and adopted e-services. The library holds today a number of paper books, paper journals, the entire spectrum of media as for example videos, and a number of e-journals and e-books. The library acquires still 8,000-9,000 books in paper format per year. The cataloguing of these books and paper journals is still done by people employed at the library. However they expect this number to go down, while the number of e-books to go up especially as the quality of e-books improves. In addition RUB counts today circa 18,000 e-journals, while the number of paper journals has gone down from circa 5,000 to 2,000. The purchase of e-journals is based on the gateway model (Scupola, 2002). This model implies that the library buys the license to the e-journals that are stored in a central repository located at the publishing house.

Information and Communication Technologies (ICTs) have made their way into library systems for more then 20 years and today, in Denmark, libraries are the heaviest users of ICTs among the public sector institutions. At the beginning of the library digitalization process, ICTs contributed to a transformation from a card catalogue to an electronic catalogue. The advent of the Internet and the World Wide Web circa 10 years ago has completely revolutionized the way RUB operates and has made possible a number of e-services and self services. The adoption and implementation of e-services and self services has resulted into a number of organizational changes, changes in the organizational structure, the competencies of the librarians and relationships between the library and the publishers and the library and the users. In addition also the business model is changing as RUB is trying to sell the services to the private businesses. RUB is moving towards a combination of physical and virtual library, as many services are getting transformed into e-services and self services. The advent of e-commerce has raised the question of disintermediation of some actors of the value chain (e.g. Scupola, 2002, Sarkar et al., 1995). Accordingly some speculations have been made about the disintermediation of the research library. However according to RUB's management the library will still keep existing due to the value that it adds to the electronic resources provided by the publishers, the need to collect and store the knowledge produced on campus by teachers and students, but also as a knowledge space where students meet with friends and go to study. Therefore Internet and e-services might change many aspects of the library and its relationships with users and publishers. However, RUB might preserve its historical role of knowledge space, even though after the implementation of library's online communities, such knowledge space can become also a virtual knowledge space.

#### **4.1 E-services Adoption at RUB**

Over the last few years RUB has adopted a number of e-services and self services that are changing many aspects of the way the library operates. Many of the services provided by RUB have been transformed into e-services after the advent of the Internet and the World Wide Web. Nowadays RUB offers a number of e-services and web based self-services. The main e-services offered at RUB are as follows:

- access to electronic journals
- access to electronic books
- Digital repository of all the students projects
- Chat with a librarian

Examples of self-services include:

- Rucforsk: a self-service system for the online registration of research and other activities of the teachers.
- Online reference search, online reservation of material not available in the library, etc.
- Digital repository of the compendia used in the courses

The library is also working on developing a digital repository of the compendia used in the courses. These e-services and self-services are developed on the base of open source software, although the IT department at RUB modifies it to make the software fit to their needs.

## **5 ISSUES AND CHALLENGES IN ADOPTION OF E-SERVICES**

This session presents the main issues that RUB has encountered in e-services' adoption, the organizational transformations RUB had to go through as a consequence and the challenges that RUB is presently facing and expecting to face in the future.

### **5.1 Back Office**

Back office processes have been completely automated as a result of e-service adoption and they have changed from manual to electronic. All library work is today done with the use of ICT in RUB. Even when they get the physical magazine, they insert it into an integrated library system. Everyone working in the library is using ICTs to do their job.

### **5.2 Innovation**

Innovation is very important at RUB. The whole e-services and self services business model is based on one key word: innovation and especially IT-driven innovation. E-services related innovations at RUB are both user-driven and employees-driven.

The sources of innovation are very different. A lot of projects are based on ideas coming from people employed at RUB such as librarians, management, the director and the IT department. Also they provide courses to new enrolled students and faculty about how to use the e-services, and a lot of ideas come from these teaching sessions. In addition they have a complaint box and library users may send e-mails to the library. These e-mails get screened and RUB may use such suggestions for incremental innovations. DEFF (see above) is also an important source of innovation especially regarding the technology aspect of e-services implementation. Through DEFF RUB can get ideas from and share experiences with other libraries. For example each library might be in charge of testing an IT solution, then they share experiences and finally they decide to choose and adopt a system. DEFF is also important in financing new ideas or innovation projects, as RUB might lack the financial resources to start all the projects they believe are worth pursuing.

The main driving forces of e-services adoption have been the government vision and policy for an "IT society for all", the technological development of Internet, World Wide Web and related IT solutions mainly in a technology push fashion, the pressure from cutting costs in the public sector coming either from the government or local university authorities, an IT innovation culture that has always existed in the Danish libraries, (as the director of reader services says "you want to be a little bit better than your neighbour library" ), competition among the different libraries' top management and, even though to a less extent, the customer wishes.

### **5.3 Organizational Change**

The digitalization process has changed the structure of the organization in several ways. First of all a new organizational level, a management level has been introduced that can make the organization look more hierarchical than before, but it cannot really be compared with a classical hierarchical structure. In addition such a management level is mainly dealing with library development and with political situations. Most importantly the division of labour has changed. Especially the number of IT-related jobs has grown a lot. For example 13 years ago RUB had one employee dealing with IT, while today

they employ 6-7 people in the IT department. The IT department is expected to grow in the future in special fields. In addition almost everybody in the library has to be an IT literate and librarians have to grow together with IT as the trend goes fast. Each employee is participating into several projects, mostly dealing with e-services and e-services development. When Roskilde University started, RUB employed circa 70 people and was servicing circa 1/3 of the number of students and faculties that has today. Nowadays RUB employees 45 people and serve a number of students and faculties which is 3 times as large as the one that was servicing when the university was founded. In addition the number of RUB's employees could further decrease in the next years. This is because the adoption of e-services and self-services has decreased the need for competences such as the classical librarian, as more and more services that earlier were done by RUB employees are now done by the users of the library. There is a shift from the librarians to the users in the production-consumption of (e-) services. The use of e-services and self-services is increasing a lot. Circa 80-85 percent of the users of the library are using e-services and self-services. As a result while earlier they needed 2-3 librarians at the reference desk, now one is enough. As in all the organizational changes this is causing resistance and to some extent dissatisfaction among the employees and users of e-services. As a matter of fact even though most of RUB users (about 80-85%) are very satisfied with the digitalization trend and the introduction of e-services, there is still a small group that is missing the old library and is unsatisfied with e-services.

#### **5.4 RUB Business Model**

RUB's business model is changing as a result of e-services and self-service implementation and adoption and is going into different directions. Within Roskilde University RUB is getting more involved with Campus IT. Campus IT is the part of Roskilde University web system that offers e-services such as "Find a Person", the online help desk, e-mail lists. Campus IT is presently developed by the IT department at Roskilde University. This department deals with all the IT matters concerning the campus. RUB and the IT department at Roskilde University are already sharing the network and the servers, but collaboration is sometimes difficult due to different priorities. RUB believe that they will play a central role in future e-learning projects at Roskilde University. In addition they are trying to collaborate with the teachers and instructors on how to best use the library for teaching and research, including a number of courses on how to use the e-services and self services that the library offers.

Outside Roskilde University, RUB is looking at offering consulting in the field of e-services for other libraries, including business libraries. They are also trying to open their market not only to the campus' students and faculties, but also to companies, especially small and medium enterprises. Participation to the DEFF project can influence the future RUB's business model as well. For example they presently provide an e-service called chat with a librarian, which they are running not only for RUB, but for all the other research libraries in Denmark as well.

#### **5.5 Relationships with Customers/Users**

Since the introduction of e-services and self services the relationships with the users of the libraries have changed a lot. The number of users coming to the physical reference desk is decreasing quickly, while the number of inquiries at the virtual desk is increasing. The total number of inquiries is decreasing. In addition the user behaviour is changing. For example while paper books are still important for the readers, the total number of library loans is decreasing and the number of downloads of e-books is increasing. This trend is also observed for the journals. While RUB still has a substantial number of paper journals, more and more downloads of e-journals articles are taking place. They expect that in 5 years most of the material will be provided in electronic form. The users that have a login to the library can access the e-services 24/hours per day, 7 days a week no matter where they are. So they will have everything they need on the computer. Some things are printed, others are not. The relationships with the users are expecting to change even more in the future as a result of implementation of library blogs. In fact RUB is looking at blogs and how to use them or integrate them with e-services such as electronic journals or e-books. Blogs would have the objective of creating online communities around specific topics, specific books or journal articles. In addition RUB



is looking at making an agreement with Google to have all its collection retrievable through Google search engines. Therefore e-services are leading to a digitalization of knowledge that was already codified in printed form. E-services are making it easier and quicker for users to find, store and analyze such knowledge. Finally, e-services are making it easier for more users to get access to the same piece of knowledge or information. In fact if only one user at a time could get access to a specific journal in print form, in electronic form many users can get access to the same journal, article or book chapter simultaneously. In addition e-services are pushing customer relationships towards a virtual form. This is the case both regarding the relationship user-librarian and the relationship among the library's users which, after the implementation of blogs, is expected both to become more virtualized and to increase the number of (virtual) relationships due to the formation of online communities.

## **5.6 Relationships with Publishers (or Providers)**

This relationship has also changed as a result of e-services. Many of the traditional transactions such as ordering, cataloguing etc. have disappeared. In that respect the total number of transactions with the publishers has decreased. The e-journals are kept at the publishers' repository and RUB only buys the access or license to them. Initially the publishers offered a huge amount of e-journals at a smaller extra cost. As a result RUB cut the number of paper journals from circa 5,000 to circa 2,000 and instead has acquired access to circa 18,000 e-journals. However the publishers are now increasing prices on e-journals, therefore the total costs might increase as a result in the future. The risk with this strategy is that if the library decides that they do not want to pay the prices that the publishers are asking for, than they lose memory of the past issues, as they do not keep an electronic copy of the journals on their repository. This kind of license agreement has contributed to the formation of a Danish library consortium, whose purpose is to get better prices to electronic journals and e-books from the publishers.

## **5.7 Relationships with Other Research Libraries**

The trend towards adoption of e-services by the Danish libraries has changed the relationship between RUB and other research libraries in Denmark by increasing collaboration and partnerships among them. Two key examples of this collaboration and partnerships which RUB is part of are Denmark Licensing Consortium and the DEFF initiative. Denmark Licensing Consortium is a consortium of libraries getting common licenses to publishers' e-journals and e-books. The major purpose is to put pressure on the publishers and decrease costs for the single library. Therefore the adoption of e-services is causing a convergence and standardization of the (e-) services offered by the different Danish libraries. Libraries were differentiating from each other much more before the adoption of e-services. Now all the research libraries members of the license consortium offer the same types of e-journals and e-books, and more or less the same type of e-services. Those few that are ahead get caught up within a 6 months period. By participating to DEFF the libraries can achieve economies of scope and scale in the development of e-services.

## **5.8 Future Challenges**

There are many challenges laying ahead for RUB. RUB will continue to exist and keep the role of library as an information centre, but the way the information and knowledge is provided will change. RUB will still face several organizational and technological challenges in the future.

From a technology point of view, the ICTs platforms used in delivering e-services become obsolete quite periodically and new e-services solutions have to be found. For example with the introduction of WEB 2.0 they will have to make new types of systems. Integration of RUB e-services into one single web page is also an important technical future challenge. Presently the e-services located on the web page are connected to 6-7 different systems and a future challenge is to integrate all these different systems so that it looks like it is just one system and one web site. Standardization is another technological challenge. Customers want fast response and RUB is working on this by looking at standardization issues and they have to continue doing so also in the future. Standards are very

important for library's e-services. Finally, ensuring to get the best and same results for the same search is also a future technical challenge.

Copyrights and licenses are another important obstacle and challenge for the development of RUB's e-services. For example they are running a project to convert the library's videos into files to be kept on the local servers in order to be able to keep the video for many years. The problem is though that whenever a student wants to see a video, instead of seeing the file on the computer screen, they have to save the file on the tape, since the material that they loan out has to be still in analogue form due to copyrights restrictions. So copyrights of what can be digitized are a big barrier to further e-services development and especially use by the customers. Licenses on the other hand limit the use of the e-services for remote users that are not connected to the university and therefore do not have a log in to the library system. This implies that these users still have to walk into the library to be able to use the e-services, thus limiting to some extent their functionality.

Another future challenge comes from the library users. The users are becoming much more advanced and sophisticated in their online searches, young people have a lot of ideas about how to do things better. Here the challenge is to understand their needs and implement user-driven innovations in e-services. Budget problems are another challenge for RUB. In the last few years the budgets allocated to research libraries have been decreasing. This trend has been worsened by decentralizing the budgets concerning the research libraries from the government to the university the libraries are connected to. This creates the possibility for management at Roskilde University to cut the library's budget in favour of other activities.

Organizational challenges are also lying ahead. As the number of physical loans will decrease and the number of electronic downloads keeps on increasing, there is going to be less need for the reference desk. The way of working in the library is changing, therefore the type of competences needed might change moving more towards IT specialists and going away from the classical librarians skills. Disagreement on e-services future development between the different groups in the library is also a major organizational and human resource challenge, even though most RUB's employees like e-services. This requires RUB to explore new functions and new directions to change their business model.

## **6 CONCLUSIONS**

This paper has contributed to understand the implication of e-services adoption for Roskilde University library (RUB) as well as the future challenges that e-services provide for RUB. Specifically, the study has investigated the consequences of e-services for Roskilde University library organization, its business model and relationships with customers, publishers (providers of information) and other research libraries.

The picture that emerges is one of fast innovation, big transformations and change for the organization, business model, as well as relationships with customers, publishers and other research libraries. In addition there are a number of challenges that RUB has to face in the future in response to e-services. Some are IT-related; others have to deal with copyrights, licenses, standardization and user-driven innovation. The general trend is that RUB is becoming a combination of a virtual and physical library, moving more and more towards a virtual library by providing resources and knowledge mainly in digital form and by offering blogs and possibilities of online communities to discuss books and articles. On the other hand RUB is still keeping the traditional library function of a physical knowledge space. How will RUB look like 10 years down the road? The only certain answer according to RUB management is that it will still be there.

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