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Denmark's Electronic Research Library: A single Virtual Research Library for Denmark

by BO ÖHRSTRÖM

INTRODUCTION

The Danish Electronic Research Library (DEF in Danish) is the realisation of a vision of a single virtual research library focused on the need for easy access to scientific information for researchers and students in Denmark. DEF is a large government funded project, which over a 5 year period spends 200 million Danish Kroner (27 million Euro) in order to build a national virtual research library in Denmark. The project aims to help the transition from purely paper-based services to electronic services in the library sector and focuses on organisational changes as well.

This paper will describe the background and the present status of the project. The project is heavily based on co-operation on national and international level, and the strategy behind this is put forward.

DEF has 2 groups of users as targets for its services: Libraries and researchers/students. The services provided are similar but not identical. One common service from DEF is the main portal with a national authentication and authorisation system giving remote access to electronic journals and databases. In addition the portal allows cross-searching in library catalogues, access to Subject-based Information Gateways and integration of a distributed database system for Danish research results, projects and participants.

Further development of the portal could be based on XML and a 3-layer architecture.

The fulfilment of the vision from 1997 is evaluated as high, and the possibility for a permanent financing of the most valuable activities in DEF seems reasonably good.

Finally experiences from building the portal and controlling a national project are discussed.

BACKGROUND

Denmark's Electronic Research Library aims to move the Danish libraries from the state of automated, conventional, co-operating individual libraries to the state of one large, coherent, electronic library structure providing integrated information services.

The project was defined in a project description of September 1996 by the three ministries involved:

- Ministry of Culture
- Ministry of Research
- Ministry of Education.

A governmental agency, UNI-C, and the management consulting firm Ernst and Young then conducted a study, which resulted in the publishing of a report in early spring 1997. The report described a vision for the development of the research libraries in Denmark.

On the basis of this work the three ministries decided to develop the Danish research libraries over a five year period of time (1998-2002) in order to get them to function as one integrated research library: Denmark's Electronic Research Library. The ministries made a 200 million Danish Kroner (i.e. 27 million Euro) funding available for the project. The project was part of the government's initiative for research and IT in those years, and it is still part of the present political planning for the IT and knowledge society in Denmark.

A project organisation was devised for the implementation of DEF:

- liaison group consisting of members from the three ministries involved
- steering committee with eleven members appointed by the ministries and organisations
- secretariat integrated in The Danish National Library Authority.

The liaison group is headed by three director-level members from the three ministries, and the chairman of the steering committee represents the project.

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The steering committee represents various skills, for example, library management, research, IT and commercial work.

The role of the secretariat in the Danish National Library Authority is to execute the decisions of the steering committee in general.

After approximately one year's work the roles between the steering committee and the secretariat were changed from traditional steering committee and secretariat relations to relations similar to a board of directors and the managing director in a private company. This was the result of the chairman of the steering committee's demand for speed and low interference in the secretariat work between the committee meetings.

The goal for secretariat and steering committee is to realise the vision from the report taking into account that the world is changing and therefore also the conditions and opportunities for the project.

FROM VISION TO ACTION

Some key sentences from the report are:

- *network of electronic libraries.*
This shows that the goal is not to build one huge central library, but instead the Internet-based networking structure must be used. The physical libraries and information centres must connect to each other and establish several virtual libraries.
- *virtual access to all information resources in Denmark.*
This points out that access to the electronic library should be possible from any location either work, home or mobile. It also says that the goal is access to all Danish resources – but is not limiting the resources to pure Danish ones.
- *new standards and working relations.*
This means that new standards must be used in order to build an open structure with possible use of existing subsystems and easy interoperability to other systems. The new working relations is a very interesting and important area, since old borders have to be removed and new relations established mostly due to the new media and its possibilities.

DEF IS OPERATING IN FOUR ACTIVITY AREAS

The project is divided into four activity areas:

- national infrastructure
- library infrastructure
- digital resources
- user facilities.

National Infrastructure

The national infrastructure is the IT network and facilities enabling the libraries and the users to communicate efficiently.

The Danish Research Network has been chosen as the IT-network, and this high-speed network has the advantage, that a substantial part of the libraries and the users are already attached to it.

This national infrastructure is, however, more than technology. The overall infrastructure includes creating common guidelines for, in particular, exchange of information, use of international standards, unified user access etc. The regulations for user administration must also be uniform and according to consensus among all the libraries.

Library Infrastructure

To enable each library to become an active player in the virtual library, it should be modernised in a number of ways. Until now it has been acceptable for each library to use its own individual IT systems and organisational procedures. In the virtual research library the technology and a number of organisational issues must be standardised.

Increased co-operation between the research libraries will require overall common management and co-ordination. Co-operation across ministerial borders should be established, but the local participants must retain their independence in order to preserve the dynamics of the system.

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Digital Resources

National license agreements are negotiated and signed by the Danish National Library Authority on behalf of DEF. A better name for these licenses is common licenses or DEF-licenses, since most of them are not covering the whole nation but only the users of the essential institutions. As usual any library can co-operate with another library or institution, form a consortium and negotiate licenses. The consortium can apply for financial backing from DEF or just hand over the license to DEF thereby ensuring that more relevant institutions are invited to share the license. In this case the license will be transferred to the Danish National Library Authority as holder of the license.

Digitisation of some parts of various collections is in progress. For the digitised materials some of the challenges are:

- efficient management
- wide access
- protection against damage and misuse
- migration to future technological platforms.

National principles and a strategy for digitisation are developed by the steering committee. It concerns a framework for standards, methods, and competence centres - and a plan for selection of collections to be digitised.

Other digital resources are the Danish Research Database, which is under transformation to a new web based architecture, and a large amount of retro-converted card catalogues, where the conversion has been financed by DEF.

User Facilities

For the digital library user facilities will be a major issue, especially an economic issue. It will be crucial to provide the user with sufficient facilities and electronic services.

This activity area focuses on projects, for example, user services in subject searching (subject portals or Subject-based Information Guides, SBIGs), tools to web-based education and tools for annotation of web-based research and studying.

DEF IN FIGURES IN JUNE 2002

A very precise way to express the current status of the project is to show figures for several key activities:

- 31 libraries co-operate about the DEF portal. 12 big and 19 mid-sized libraries have all submitted information about their subject areas, they participate in harvesting of their web-sites, and they provide guidelines for the DEF portal.
- The DEF catalogue of catalogues gives access to app. 400 electronic net resources:
 - collections of journals, articles and reports
 - bibliographies
 - DEF libraries
 - DEF library catalogues
 - SBIGs
 - collections of links and virtual libraries chosen by reference librarians
- 6 subject gateways operate, and 5 more are under development
- 122 libraries have installed or will implement new library systems through DEF according to DEF technical standards
- DEF gives access to 42 DEF licences including app. 7,200 journals in full text. DEF licenses are defined as licenses negotiated and held by the Danish National Library Authority on behalf of the libraries.
- Each library can access from 1 to 52 licensed products
- 104 libraries (,sites') participate in DEF licenses, and these are covering an additional 194 institute libraries/institutes/hospitals
- retroconversion of app. 2.5 million catalogue cards from card catalogues from 14 research libraries is in progress for a total amount of 19 million DKr (2.6 million Euro)
- 35 libraries participate in 20 DEF-development projects concerning systems test, SBIGs, user education, user statistics / user satisfaction, digitising, e-learning etc.
- 11 user-run projects have been started
- 3 libraries and 10 publishers participate in 5 digitisation projects apart from digitising of selected core journals e. g.:
 - Weilbach Kunstner Leksikon gives information about 37,500 works of art and 6,000 Danish and foreign artists in 55 museums

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- Illustreret Tidende consists of 65 volumes, 58,000 pages and 4,000 pictures
- Archive for Danish Literature contains 70 of the most important Danish classical authors works consisting of app. 150,000 pages digitised in full text, selected portraits of authors and extended with critical materials.

CO-OPERATION IS CRUCIAL

The philosophy in the project development reflects the importance of national co-operation and consensus. No lasting solutions can be implemented without the participation and acceptance from the libraries. Therefore, the key words for all activities are co-operation, co-operation and co-operation. After some time everybody realised pooling resources gave a better result for everybody than trying on an individual basis. This opinion is obviously more easily obtained with some central money, which facilitates the process.

Another way to support co-operation in projects like DEF is to show good results. Therefore it is advantageous to choose activities, which quickly lead to improved conditions for the libraries and their users. Planning according to „least resistance” gives quicker results, but it is not the same as avoiding conflicts. A lot of confrontation is part of the process and normally every confrontation results in a peaceful and lasting consensus.

In order to achieve the results, co-operation and effort from the biggest libraries are of great importance. These libraries control most of the financial resources and material, they already have an organisation, which can deal with common issues, and they are ready for changes. The DEF project started co-operation with these libraries early, and their efforts have also been of great value for the smaller libraries.

National co-operation is not enough since international co-operation often is the key to solve general problems in building a digital library. DEF's existing international relations can be divided into the following two groups:

Commercial Relations:

This group primarily works with direct contacts to multinational suppliers of electronic journals and databases to guarantee efficiency in dealing and the

minimum of costs. Due to the complexity of the market the options available for the inexperienced purchaser are limited. Consequently it is necessary to establish a professional liaison or partnership with the supplier in order to secure the continuity of reasonably favourable deals and contracts.

Non-commercial Relations:

This group mainly consists of other projects or national initiatives similar to DEF and provides a valuable network of inspiration, knowledge and information.

In practice this involves activities within:

- research on and purchase of electronic licenses
- development of the technical architecture and user interfaces.

A joint initiative of purchasing electronic licenses is established primarily through close Nordic co-operation and through membership of ICOLC and ECOLC. The Nordic co-operation contains all aspects of purchase, renewal, service and filing of electronic resources and serves to underpin a joint Nordic effort in negotiations of prices and services with the suppliers. In the case of ICOLC and ECOLC, DEF at an early stage joined the work of ICOLC (International Coalition Of Library Consortia) in order to be able to participate in international efforts concerning contracts and purchase of electronic resources.

Also the European equivalent of the American ICOLC - ECOLC (European Coalition Of Library Consortia) - has Denmark's Electronic Research Library as a member and very active participant. Both organisations play a leading role in relation to suppliers of journals and the collective pressure from ICOLC and ECOLC is a valuable factor when trying to negotiate reasonable prices and contracts.

The development of technical architecture and user interfaces primarily takes place within the framework of the Nordic countries. Here models of interfaces, access control systems, methods of cross searching in catalogues and standardisation issues are discussed.

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CUSTOMERS AND SERVICES

DEF has two primary groups of users as targets for its services: libraries and researchers/students.

The libraries can be divided into two groups: the 12 big libraries and the rest of the research libraries in Denmark. In the latter group DEF has more difficulties in working directly with the libraries due to the large number of them, but more than 200 of these have been in direct communication with DEF.

The other very important user group is the end users consisting of researchers and students. The total number of academic researchers is app. 25,000, while the number of students exceeds 140,000.

The services provided for the two user groups are similar but not identical.

DEF services to Libraries

In relation to the libraries, DEF delivers a long list of services. DEF:

- catalyses
 - library co-operation
 - library resource sharing
 - transition from print to electronic
 - organisational changes
- supports standardisation
- participates in systems test and purchasing
- develops/subsidises infrastructure components and deff.dk:
 - tools for SBIGs
 - links and metadata pool
 - catalogue cross search (Z39.50)
 - journal database
 - LDAP-access control
 - journal cross search
 - webnice guided tour tool
- negotiates and administrates national licenses
- develops/subsidises library components from projects e.g.:

- SWIM (Streaming Webbased Information Modules) / MILE (Model for Information Literacy Education)
- user satisfaction measurement tool
- virtual reference service
- develops and supports Danish National Research Database
- promotes the Danish research libraries and DEF internationally and assembles international knowledge.

DEF Services to Researchers and Students

Also in relation to the researchers and students, DEF delivers an extensive list of services. DEF:

- provides one or more access points to electronic information
- allows remote access any time from any Internet connection to electronic information
- gives access to information through deff.dk:
 - SBIGs
 - quality checked links
 - catalogue cross search (Z39.50)
 - journal database
 - journal cross search
 - webnice annotation tool
- gives access to all important electronic journals and databases
- develops/subsidises library components from projects e. g.:
 - SWIM / MILE
 - Virtual reference service
- develops and supports Danish National Research Database.

NATIONAL INFRASTRUCTURE / DEF SYSTEM ARCHITECTURE

In order to make a solid basis for 24 hour access to the content and services in the digital library a system architecture project was launched. The project is following three main principles:

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- The architecture shall be the concrete practical implementation and realisation of the DEF-vision.
- The vision is a system of systems, meaning that no single central stand-alone system shall be built. A decentralised and networked approach shall govern the project.
- The system architecture project shall be the main project for 5 sub-projects:
 - DEF portal
 - DEF key
 - DEF catalogue
 - DEF SBIGs
 - Danish National Research Database.

DEF PORTAL DEVELOPMENT

The main access point to the digital library is the DEF portal (deff.dk). The DEF portal has passed 2 main versions in the development process.

The 1st generation was a catalogue of catalogues for the 12 big libraries. It was purely based on harvesting and besides giving access to the libraries' resources, the project was basis for a fundamental co-operation process between the 12 big libraries.

The 2nd generation portal is a catalogue of catalogues for 31 libraries. It is based on cataloguing in common database, and it gives Z39.50 cross access searching to more than the 12 big libraries. Furthermore it is possible to order material through the Danish Union Catalogue and to access the licensed material in DEF. The access to licensed material is based on IP-number control and allows in the existing schema only access from the library or its connected institution/campus.

The 3rd generation portal is under development now, and it will open at the start of the new academic year on September 2, 2002.

DEFF.DK: DEF PORTAL AND SERVICES 2002

The DEF portal (deff.dk), the services and the system architecture in version September 2002 are illustrated in fig. 1. Predominantly it is a 2-layer archi-

ture, where the connection between the software modules is realised by the Z39.50 protocol and tools from the Open Archives Initiative (OAI). The services in the upper level are based on software modules, which are nearly 100% self-contained, meaning that nearly no data are exchanged between the services. A common user interface design gives the user the impression that everything is tightly integrated. The background for this design is that it reduces complexity and time to develop in order to achieve a reasonably simple and efficient system in the project period. Also it allows the individual libraries to exploit the data in the low level for their own local solutions.

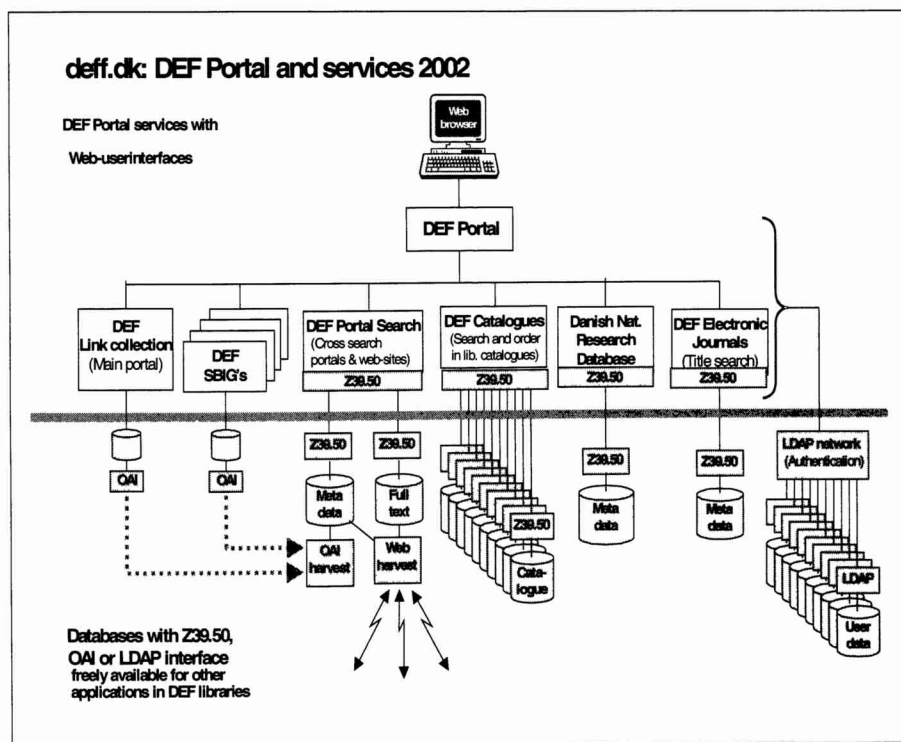


Fig. 1: *deff.dk: DEF Portal and services 2002*

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The following is a brief description of the functionality of the individual software modules in the upper level:

DEF Portal:

Welcome pages with introduction, help, sitemap etc.

DEF Link collection:

Searching or browsing in quality controlled links sorted into DEF's 26 subject categories giving access to Danish and international free resources, i.e. collections and subject portals/SBIGs

DEF SBIGs:

Searching and interaction with all SBIGs partly financed by DEF and based on tools developed by DEF

DEF Portal Search:

Searching or browsing in metadata from all DEF's SBIGs and full text search in harvested pages from the libraries websites

DEF Catalogues:

Searching in all bigger Danish libraries catalogues and selected international catalogues, ordering of material from the Danish libraries with delivery to home or own library

Danish National Research Database:

Searching in Danish research results, projects and profiles of institutions based on data deliveries from the administrations in the local institutions

DEF Electronic Journals:

Searching in journal titles and access to full text articles and databases for authorised users from any Internet connection at any time

In the low level there is one crucial network of modules:

LDAP network:

Authentication of authorised user for the DEF Electronic Journals

FURTHER DEVELOPMENT OF THE NATIONAL INFRASTRUCTURE / DEF-SYSTEM ARCHITECTURE

A later generation of the DEF portal could be based on a new modular technical solution. The existing portal has in an incremental way been paying less attention to a sophisticated programming structure than getting experiences and results to the project and its users. The new solution could separate different functions in different software modules, which is placed in a 3-layer architecture, see fig. 2.

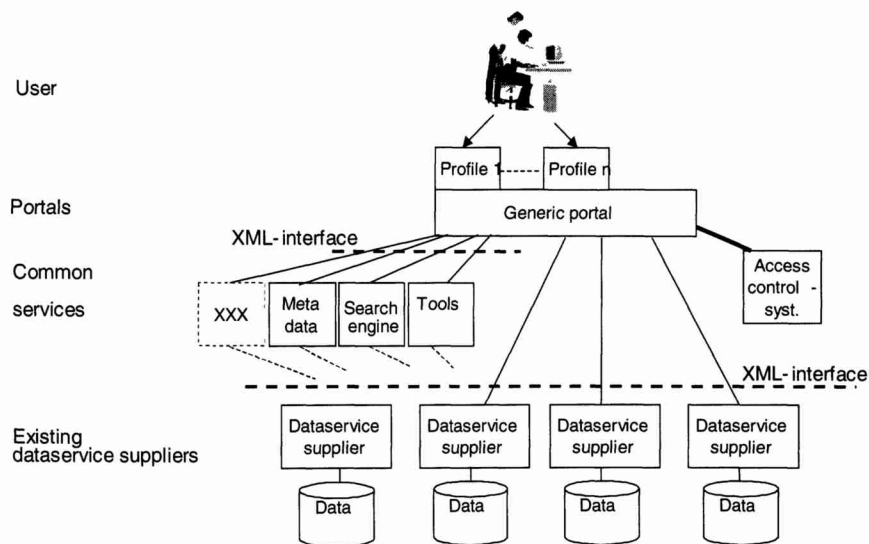


Fig. 2: 3 layer architecture

The architecture has 3 layers, the portal layer, the common service layer and the dataservice supplier layer. The layers are separated (and connected) by XML-interfaces.

The portal layer solely contains user interface functionality and can provide a personalised interface to the individual user.

The common service layer holds different modules with different main capabilities. Examples are a search module for the journals and a metadata module for SBIGs.

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The dataservice supplier layer will mostly contain existing data suppliers such as journal publishers.

Parallel to these 3 layers is the access control module. This module is functionally identical with the existing module. It verifies the user logins and undertakes the authentication and authorisation, where user identification and rights will be stored decentralised in the participating institutions. In this way only the right users can still get access to the allowed functions and data.

This architecture has several advantages. It effectively separates user interface discussions from work concerning other functionality, which will improve the final result, since user interface discussions tend to stall much development and progress. Also changes of the user interface will only be necessary in a single module. It allows thorough work with the common services, which in the end will provide the users with the necessary functionality for using the data. Furthermore the data suppliers are separated from the development of user functions. However the biggest advantage is that the libraries in principle can take the modules they like, change or build their own interface or add local functionality. In this way the libraries share common necessary modules and can still add their own flavour.

The described architecture shows the ideal solution. However it is not clear, if development all the way to this ideal is sensible and practical. Functionality from a complete solution from a vendor tends to be lost or difficult to integrate.

Another general issue is the way of acquiring and developing the modules: This could be done through a tender process, which allows both academic and commercial suppliers to deliver, if they can adhere to normal commercial rules, and it could be done by incremental upgrade of the existing modules or complete re-coding.

VISION ACHIEVED?

After 4½ years hard work it is interesting and necessary to evaluate, if the original vision was achieved. This will be formally done by an external party, but seen from the project management some simple comparisons can be made.

Key sentences from the vision report of DEF compared to the present situation are:

- network of electronic libraries: an extensive network is created between most of the research libraries, and solutions and services have been implemented based on the network concept.
- virtual access to all information resources in Denmark: virtual access is established to all major collections in the libraries, and digitisation is in progress for more resources under the constraint of financing.
- new standards and working relations: new standards have been chosen and obeyed. The co-operation pattern has been improved significantly.

After the first experimental years of DEF the project management completed a list of success criteria for the Steering Committee. The main criteria were:

- one main portal with single sign-on and personalised web interface
- cross-searching in library catalogues, electronic journals and reference databases
- information handling tools (alone or in groups)
- access to large amount of scientific information from work, home and on travel
- a national digitising policy combined with projects based on accepted technical standards, high value in respect of use and of spectacular interest for the media and the Danish population
- a new organisation and model for financing to continue the existing areas of co-operation for future benefit to the users
- close co-ordination with the Danish Virtual University project.

Of these criteria only the „personalised web interface” and the „Close co-ordination with the Danish Virtual University project” are lacking. The first is only implemented in a very simple way in connection with the presentation of electronic journals, and the latter has been given up, since the Danish Virtual University project has been stopped by the ministries.

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FUTURE OF DEF?

On December 31st, 2002, the DEF project period comes to an end. This means that all funding has been used or allocated for minor projects, which will end in a reasonably short timeframe after 2002.

The original thinking at the DEF project launch in 1998 was, that the funding would lift the research libraries to a higher level, and maintenance of this new level would be secured by new working routines and the normal, local budgets for the libraries. During the project years it became fairly clear, that this assumption was wrong, and Steering Committee and the Secretariat started to work for permanent funding. In May and June 2002 DEF has been analysed by three ministries:

- Ministry of Finance
- Ministry of Culture
- Ministry of Science

The result of the analysis has been decisive for the ministries' input to the proposal for the Danish Budget from 2003 and onwards. DEF awaits the disclosure of the total proposal in August 2002 with some optimism and will act accordingly afterwards.

EXPERIENCES IN MANAGING A NATIONAL PROJECT

During the first 4½ years a lot of experience has been assembled in managing a national digital library project. The most fundamental issue is that national and international co-operation is the gateway to success. It is impossible to achieve a success unless the national players are co-operating, and the only way to avoid duplication work is to co-operate internationally.

Another important area is to control increasing project complexity with many focus areas in the decentralised structure in Denmark. Both the many focus areas and the Danish structure tend to slow down progress, if decisions are not made at a reasonably quick pace.

The steering committee members' different background is both a strength and a weakness. It is valuable to have many experts participating in the group, but it can certainly be a challenge for a chairman to control. Furthermore it is of great importance to divide the responsibilities and work between steering

committee, secretariat and libraries. Specifically it is necessary to give financial room and mandate in negotiations and project management to the secretariat, and this has been one way to keep up the speed in the DEF project.

Development work has been done both with academic and commercial partners. Their way of working is very different and both have their pros and cons. Very simply put, academic work seems to be prosperous in the experimental phases, while commercial work fits better into a production system. One big difficulty is the necessary use of EU-tenders, which is time consuming and doesn't seem to result in the optimal solutions.

Finally a project management coming from outside of the library sector has gathered a lot of experience with libraries. These few sentences illustrate the meeting between the librarian's world and the world of a manager and computer engineer seen from the perspective of the latter:

- Decisions are necessary - everlasting discussions hinder progress.
- Libraries are accustomed to independence - in every aspect.
- Libraries lack some commercial experience and skills.
- Libraries believe themselves to be experts - also IT-experts.
- Nothing is secret in the library world or in its surroundings - not even commercial secrets.

These sentences are written with the best of intentions - the encounter with the library world has in all aspects been stimulating and enriching.

SUMMARY

The decision of launching DEF and the fulfilment of DEF have both proved to be a success. The funding and lots of hard work have upgraded the Danish research libraries to modern technological level and have secured new national co-operation for the years to come. The project work could be summarised in the following three statements:

- DEF has provided a remarkable improvement of service level for the users of the Danish research libraries
- DEF has provided a series of good results in the 5 years project period

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- This could never have been done without the joint effort from many libraries and a number of people, who all believed in the vision

A great thanks to all persons in the Danish research libraries, who have spent many hours in the common pull for the future of the Danish research library sector.