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A Survey of Computer Applications in German Libraries

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I. Deutsche Forschungsgemeinschaft (DFG) / The German Research Society

First of all, I think it useful to give you a short information about the organization I come from and the links it has with the library computing scene. I am a staff member of the Scientific Library Group of the Deutsche Forschungsgemeinschaft (DFG) or in English: the German Research Soeciety.

The DFG is the main funding agency for basic research in Germany. It funds research projects in all areas of science, with a certain priority on university research. Traditionally the DFG also funds projects for scientific libraries in certain areas. One of these areas is library computing.

Another link between the DFG and library computing results from the financing mechanisms for higher education in Germany. The regional governments - which have the primary responsibility for scientific libraries - can get a 50% subsidy on investment costs for large data processing equipment by the central federal government. Precondition is that the investment has been positively evaluated by expert commissions of the DFG. For library computing equipment this evaluation is done by a sub-committee of the DFG library committee, the so called "Sub-Committee on Library Computing and Data Communications". Thus all major investments for library computing applications have to be evaluated by this sub-committee. Its published evaluation criteria and the technical and political recommendations it has given through the years to a certain extent are a mirror of the development of library computing in Germany.

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II. Historical Development of Library Computing in Germany

1. The Resource Sharing Paradigm

Looking now at this historical development I think one can easily identify three main phases.

In the first development phase the idea of using computers to improve the efficiency of mainly internal library operations stood in the foreground. The focus in that time was on resource sharing - mainly in cooperate cataloguing. The basic applications therefore were union cataloguing systems.

In the late 1970s and early 1980s the only computer systems, which seemed to be appropriate for library applications with their large database and information retrieval operations were of course big mainframe machines.

The main issue put forward in the recommendations of the Library Committee of the German Research Society in 1980, and the main result of this first development phase was the establishment of the regional library computing centers. It should not be concealed, that the concept of a multitude of regional centers instead of one big nationwide center gave rise to a quite controversal and surprisingly long lasting debate in the German library community.

2. Local Computer Based Services

Although in some libraries local computer applications date back as early as the 1970's, the real breakthrough of discussion on local systems came in the 1980s. The new uprising theme then were on-line public access catalogues.

With its recommendations of 1986 the DFG stressed the necessity to transform data resources accumulated in the regional union catalogues into visible, user oriented services on the local level.

The typical computing machinery installed in that phase were proprietary medium sized computer systems; although already in 1986 one saw the necessity to integrate library services into the evolving local university networks and to interconnect regional and local applications by wide area networks.

In the mid 1980s only a minority of libraries was already equipped with circulation control systems. So in most libraries these had to come first. With very few exceptions it was not before the late 1980s that the first on-line public access catalogues were installed on an operational basis.

A lot of libraries started local system planning and installation not before the late 1980s. This brought the advantage, that they could already profit from the third phase of development.

3. Open System Environments

This third phase rolled off when the effects of the personal computer revolution were realized in the library community and the ideas of open system environments spread. This occured around 1990. The Sub-Committee on Library Computing of the German Research Society fixed these ideas in its recommendations of 1991. But as these ideas were really flying in the air, there was a good basis for a common policy of system modernization, which was then initiated. This System Modernization Policy, which on the whole found a broad consensus in the community, is still going on today.

On the technical side the issues addressed were:

- using PCs and workstations instead of dumb terminals,
- to redesign systems towards a client-server-architecture, by which the storage and computing capacities of PCs and workstations could effectively be used,
- integrating library systems homogeneously into the local network structures of universities,
- switching to non-proprietary hardware, and
- migrate to open operating systems, especially UNIX.

Besides of functional advantages, these last two items were of significant importance with respect to the reduction of equipment costs.

Further issues were

- the use of commerically supported standard database systems; and
- the implementation of OSI-based interface standards, the most important library related standards being SR/Z39.50 and ILL.

Especially SR/Z39.50 has got a lot of support in Germany in the last few years. Of course there still are only few systems operational today; but at least there are operational SR-based systems in Germany.

4. Modernization of Library Services

With respect to library services the most important issues of the System Modernization Policy were:

- comfortable user access to nationwide library resources,
- fast document delivery services,
- enhanced bibliographic services; for example unified subject indexing

or current contents;

- extended primary information services; for example provision of CD-ROM based datasets.

III. The Present Situation

The present situation of library computing in Germany is inevitably characterized by a superposition of all three of these development phases.

Nevertheless the System Modernization Policy has definitely had a visible impact in the last few years. This is especially true for local library systems. Almost all newly installed systems adhere to the more essential of the technical criteria outlined. Things are moving slower as far as modernization of services is concerned and of course on the side of the regional library centers. But this is only natural because of the size and complexity of their applications.

1. Regional Library Computing Centers

I will now try to give a short overview over the main computer applications presently installed in Germany. The core applications remain to be the Regional Library Computing Centers. At present we have 7 of them.

Their main function still is cooperative cataloguing. In the 7 regional catalogue databases today are stored about 22 Mio. title records and some 54 Mio. holdings data.

Traditionally the regional centers produce microfiche catalogues. This remains to be an important service product. In the last years, however, more and more machine readable data are retransfered from the regional centers back to local OPACS. Only two of the presently installed regional systems provide a realtime update facility for local OPACS.

Today nearly 190 German libraries are connected to the regional centers. For university libraries and major scientific universal libraries this is practically a 100% rate.

The number of 7 regional centers originates from the idea to assign 1 center to each of the traditional interlibrary lending regions. This is certainly very reasonable. On the other hand, efficiency and optimal operational scale have to be considered too. Thus the Sub-Committee on Library Computing of the German Research Society has recommended to reduce the number of centers in the long run; at least: definitely not to create new ones.

This recommendation has been a guideline in the process of German unification. There were no new regional centers being built up in the Eastern Countries. Instead the Eastern Countries have connected to the existing library centers in the western regions. Basic principle has been to look for cooperation among neighbouring regions. On the whole, this has been realized. An exception

is Saxony, which cooperates with Baden-Württemberg.

There will also be a cooperation between the Nordeutsche Verbund in Hamburg and the Union Center of Lower Saxony in Göttingen, which both opted for the PICA system. Göttingen will operate the common union database server. Thus in this case one could as well speak of one regional center on two sites.

A sincere problem of the present structure is the incompatibility of application systems in the regional library computing centers. Up to the present day this has prohibited any really interconnected computer application between the different regional systems. On the other hand a fast and comfortable access for library patrons to the catalogue data of all regional systems is especially important in Germany because of its regionally distributed system of special collection fields.

At present there are 4 different system types installed in the German regional library centers. The Sub-Committee on Library Computing of the German Research Society has favoured a policy to reduce these to ideally 2 system types in the future, which are able to interoperate on the basis of open communication standards. A completely unified system base in regional centers seemed not to be appropriate because of competition aspects and because it simply would not be possible to realise because of political preconditions.

A first and important step in reducing the system diversity was the introduction of the PICA-System in Germany. Up to now it has been adopted by 3 regional centers plus The Deutsche Bibliothek. This system fulfills by and large the technical critera of the System Modernization Policy and thus seems to be a sound basis for the future development of library computer applications in Germany.

The remaining regional library centers are all in a position to migrate to new system generations in the next 3 years. The centers presently are very eager to pull their migration planning activities together into one concerted action of a common "future system" development. This could really have a major positive impact on improved service quality and interoperability in the future.

2. Central Infrastructure Support

The present lack of interregional interoperability in conjunction with our decentralized special collection system in Germany made it inevitable to design appropriate supraregional databases for a unified bibliographic access to catalogue data of all regions and especially for interlibrary loan. These supraregional applications have been of special importance in the funding policy of the DFG in the last decade.

The two basic services, which are provided by the German Library Institute in Berlin are

- the Union Serials Database / Zeitschriftendatenbank (ZDB)

and

- the Union Monograph Catalogue / Verbundkatalog (VK)

Mr. Degkwitz [see pp. 275ff. of this issue] will touch upon that in more detail in his paper, so I can leave it out here.

Other important central service providers in addition to the German Library Institute are The Deutsche Bibliothek and the State Libraries in Berlin and in Munich. The Deutsche Bibliothek provides national bibliographic data and authority files. The State Libraries give editorial support for authority files and are engaged with computer applications for special materials, for example 16th and 17th century prints, incunabula and manuscripts.

3. Local Library Systems

With respect to local systems one can state that at present most of the university and major scientific universal libraries have installed or are in the process of installing second generation local library systems. At least there are defined, evaluated and mostly financed investment plans for second generation local equipment for practically all these libraries of the western countries.

Second generation in this context means, that the system - according to DFG standards - ideally should comprise:

- circulation control
- on-line public access catalogue
- acquisition system
- CD-ROM network and
- a library management and administration component

In reality circulation control and OPAC are the basic functionalities provided in almost every installation. Acquisition is part of most system concepts. Library management and administration play virtually no role up to now.

Libraries normally tend to implement the single modules in a stepwise, medium term installation plan, which extends over a couple of years. And again it should be stressed that these investments are ongoing. So still there is quite a number of German libraries today where OPAC or acquisition applications, and in some cases even circulation control systems are not yet running.

In the last years we have seen a real boom in CD-ROM networks. Several regions had special investment programs for this type of application. If this is a feature peculiar to Germany - which I don't know - it could perhaps partly be accounted to a pilot project on CD-ROM applications in libraries financed by the

DFG and undertaken at the University Library of Bielefeld between 1986 and 1989.

For the Eastern Countries there was a special investment program financed by the Ministry of Education short after the unification. Thus eastern libraries were able to setup library networks very quickly and install often transitory software solutions especially for cataloguing. Now, similar to the western regions, the eastern countries too are preparing investment plans to switch to second generation local systems, where they can reuse the standard equipment bought in the network programme. Except Saxony and Brandenburg, all eastern countries decided to join PICA regions. So they will adopt the PICA LBS3 system.

4. Local System Diversity

On the whole one can say, that the System Modernization Policy was rather successful on local library applications. The local systems installed since 1991 in university libraries to a high grade fulfill the criteria defined in the System Modernization Policy.

Local System diversity is nevertheless rather high. However, with local systems this need not be such a grave disadvantage as it is with regional centers. Local system types actually installed include

- some few mainframe based systems from the old ages of library computing;
- most systems today are UNIX based multiuser or network systems; the most prominent system lines being PICA LBS3 and SISIS, the product line of SNI corporation.

Interesting new developments are

- OLIX in Baden-Württemberg, which has implemented a clear-cut client server design based on the SR-Standard - with Standard extensions for update functions -, and
- SABINE/ELIAS, a development at the University of Saarbrücken, based on a special database design for linguistic data processing; this system combines very fast retrieval operations on large datasets with a nearly realtime update capability; and it has a very strong union system flavour.

Then we have a further system line, installed especially in North Rhine Westfalian libraries, built aupon

- DOS or OS/2 based PC network systems.

5. Research Projects & Experiments

An important component of the System Modernization Policy of the Sub-Committee on Library Computing of the German Research Society was the promotion of new, innovative project ideas to improve and enhance computerized library services. A series of single projects have been and are being funded by the DFG in this context. Additional projects have been funded by the regional governments and the two central federal ministeries concerned with library questions. Just to give you an impression, I list some characteristic project areas.

We had a couple of projects related to OPAC enhancements such as

- integrating images of title pages or table of contents into OPAC systems
- linguistic data processing systems to support OPAC subjects indexing and retrieval
- interfacing library services to standard desktop applications, for example word processors.

In the field of library services for electronically published document, a pilot project has been launched recently on the use of large storage devices to distribute electronic documents in a university network environment.

Another project line targets the interoperability issues and the acquisition of practical experiences with relevant OSI-Standards; here we had projects on

- a multifunctional bibliographic workstation, which provides a unified user interface for simultaneous, transparent cataloguing into multiple catalogue databases
- a prototype of a local library system based on the SR/Z39.50-standard, and
- a prototype for a local interlibrary loan application based on the ILL-standard.

IV. New Information Infrastructures

1. A Changing Information Environment

How does the present situation of German library computing relate to the fundamental restructuing of information environments we observe since a couple of years. The impact, that the INTERNET, with its fastly growing percentage rate of scientific information provision or electronic publishing might have on

scientific libraries of course is presently very vividly discussed in the German library community.

I personally believe that the main consequences of these changes will not primarily concern technical aspects of library applications. The main impact of the evolving new information infrastructure must in my opinion rather be seen in a fundamental change of the competitive and cooperative environment libraries are acting in. The main change on short notice probably being a fundamental restructuring of the scientific journal market.

One of the traditional "market functions" - so to speak - of libraries up to now has been their offer to transform a typical publisher's product, namely: scientific journals, one can subscribe to, into a product type, the end user really demands, namely: copies of articles from these journals. With the technical tools available today this transformation can and in the near future probably will be done by publishers themselves. Thus libraries might in very short terms loose a significant share of their traditional market, if they do not get into new types of cooperative relations with publishers.

We all know that things do not stop here. Even publishers might be thrown out off this market segment, if scientists - as they already do extensively in certain research areas - switch to direct distribution of their research results. Of course this type of fast information exchange might in general be very positive for scientific advance. Dangers could arise, however, if the open forum of published research results would be abandoned in favour of private and secluded communication links between scientific in-groups.

This might create important new functions for scientific libraries. They could contribute to guarantee the free flow and accountability of information in the electronic age, for example by

- authorization of electronically distributed documents
- preserving them in a fixed, archivable and recallable status
- guaranteeing a permanent access to these documents
- distributing them to a public audience

and of course

- filtering the information overflow and guaranteeing certain quality standards on information.

The changes to be expected definitely will go beyond scientific journals. Learning materials will be distributed in electronical form and in a such a way, that the borderline between book and software, between text and pure data vanishes. Changing techniques of information production, f.e. the use of document description languages might in the near future challenge traditional library domains in formal cataloguing and subject indexing.

Thus Libraries will have to redefine and reposition their specific types of services in relation to a new environment.

I think it is important to note, that in the United States Libraries already are an essential and accepted part of the New Information Infrastructure Programme of the US Government. This is not, at least not yet, the case in the corresponding European deliberations.

2. The Virtual Library Paradigm

I think we already have a quite productive paradigm to organize our visions on future library service designs. Unfortunately I now have to refer to that somewhat overstrained term of the "virtual library". Of course this is a rather visionary picture. But I think it can be really a fruitful measuring rod, against which we can set our practical answers.

What does that mean: Virtual Library? I see essentially 5 features, which more or less can be realized with available techniques and seem to be desirable from a user's perspective:

1. Virtual Library, that means "Your PC is THE LIBRARY". The user PC or the user workstation, whether it is situated in the office or at home, will be the unviversal point of access and the main point of delivery of library services in the future.

2. THE LIBRARY is a worldwide library. That means: THE LIBRARY's resources are not limited by local or regional stocks, but comprise all documents, the user might be interested in, wherever they might be located. Beyond that, all these documents should be available from one really unified source - at least in the eyes of the user. That is, the user should not fe forced to sign on to different information services with possibly different user inferfaces, different cost structures and different invoicing mechanisms to get the document collection he needs for his everyday operations.

3. In THE LIBRARY you are able to find more and more items directly on the shelves. This is a really revolutionary feature we today learn from modern INTERNET search tools like WORLD-WIDE-WEB. Instead of the classical three step procedure: bibliographic search, ordering of documents and document delivery, these instruments make it possible, just as in a traditional open library magazine, to get direct access to target documents, wherever they may be located on remote machines. Thus: the search of an information item in tendency collapses with ordering and document transfer into one single step. This will be possible in the future for more and more electronically stored documents.

4. In THE LIBRARY the user not only finds texts, books and journal articles but also images, soundtracks, pictures and video - shortly: THE LIBRARY is a multimedia store.

And finally: The multimedia objects in THE LIBRARY are not closed,

sequentially organized blocks of large information units, but they are object orientedly structures and built up from small information objects, which are related to one another by hyper-links. Thus you can go into the document, access a single information object contained within it and navigate from there to other information objects in other documents. This too is a feature, we today learn from the INTERNET search tools.

Generally I think, that the virtual library paradigm gives a good indication of the features that next generation library information servers will have to support.

3. Possible Consequences for Library Computer Applications

But it in this context, let me put a perhaps very provocative question. To what extent will these next generation systems really have to be library specific computer applications?

Is it possible that in perspective there will be no need for library specific computer applications any longer? At least as far as user related software tools, such as information servers, OPACs or document order and delivery software is concerned? Circulation control or acquisition systems may be a different issue.

I definitely cannot give an answer to this question. But I think it is worthwile to think about, before far reaching decisions on new library system developments are taken.

The virtual library paradigm is realized today in a rudimentary form by INTERNET and its related software tools, such as WAIS, GOPHER, World Wide Web or MOSAIC.

In the near future we shall have digital and interactive television, which will probably open up a mass consumer market for search and retrieval applications to access compressed digitized videotracks. These will be stored on multimedia server machines and transfered via high-speed networks. I would expect a lot of spin off effects from this market to publishing and libraries. I think, it does not make an essential difference whether the object searched for and transfered into the user's PC is a compressed motion picture or a compressed text book or other multimedia format.

Thus we should pose the question, whether Library Services in the future should not generally be accessible by the standard software tools provided through these upcoming mass markets.

V. Strategies for the Future

1. Present Action Lines in Germany

As I said, we have just started to discuss the questions raised by these

developments in the German library community. With respect to these issues there is not yet a defined and formulated policy for future planning and funding.

Nevertheless, there are presently two action lines, which could be of special importance for the shaping of the future.

The first one is the activity, I already mentioned, of those regional library centers, which intend to migrate to a new system generation by building up a joint initiative for future system development. The regional library center of North Rhine-Westfalia, which heads this initiative, has already completed feasibility studies. Thus the project preparations advance on solid grounds. Financing questions, of course, will not be getting easier in the next years.

The Library Committee of the DFG has set up an expert commission to prepare recommendations - directed to political bodies - concerning the migration planning of regional centers.

Besides, there are presently several other working groups and task forces preparing practical measures to improve computer based library services, f.e. in document delivery, electronic publishing, the supraregional provision of CD-ROM based datasets and closer cooperation of libraries with university computing centers.

The second main strand of activity presently ongoing is a project to setup an Information Network of German Library Cooperatives and Special Information Centers. The project acronym is: DBV/OSI, which menas: Deutscher Bibliothekenverbund based on OSI standards.

2. The German Network Project - DBV/OSI

The project started in 1993. Project partners are The Deutsche Bibliothek as Coordinator, and the regional library centers of Baden-Württemberg, Bavaria, Lower-Saxony/Sachsen-Anhalt, the German Library Institute and two German Special Information Centers: STN-International in Karlsruhe, and the German Center of Medical Information in Cologne.

The project is jointly funded by the federal Ministeries of Research (BMFT) and Education and Science (BMBW) and by the DFG.

We consider this project to be of strategic importance, not only on technical grounds, but perhaps even more in shaping new forms of market coalitions and information service design for scientific information providers.

Technically, the project will in its first phase provide a network for search and retrieval which will be based on implementations of the SR and Z39.50 standards. The technical results will be operational in 1995. In a second phase the extension to document delivery and document transfer is planned. Of course this network will generally be open for additional service providers.

From a marketing point of view the essential feature is, that an end-user connected to one of the participant host systems can transparently access the

databases of all other network partners without reconnecting or changing the user interface. Thus for the end-user there is no need to tediously collect the information he needs from a lot of individual, small, and competing service producers.

The library sector will be organised to provide a comprehensive information service out of one hand. That is, the virtual library is organised as a universal information warehouse, of course for its definded market segment: the scientific user. And the counter, so to speak, over which the services of this information warehouse will be sold is the local library system. This in my view is an important point: The end-user will primarily access his local library system and from there he will be able to switch to all services of the information warehouse in a transparent way. Independent of how this is implemented technically, from a pure marketing point of view this essentially strengthens the position of local libraries in the new information environments. And it allows libraries to build upon one of their specific strategic advantages, namely their unique ability to integrate new electronic information services with their traditional domain in providing paperbased documents, which of course will not vanish in the forseeable future.

3. European Library Network Environments

Let me close with the remark, that another important goal of the DBV/OSI Project is the European network connection. We observe important parallel initiatives in other European countries at the moment. They all build up upon SR and related standards. Think of project ION, EDIL, Nordic SR, SOCKER just to name a few. So we already see the building blocks of a common European library network structure, which just will have to be put together, to form the basis for European libraries to be competitive service providers in the future scientific information environments.