Deutsche Initiative für NetzwerkInformation

Electronic Publishing in Higher Education

- Recommendations -

Summary

1. Due to new methods in the information and communication technology new, additional ways to produce and distribute scientific results have developed within the last years.The university as a whole, being a producer of scientific knowledge, has to take a position in the global competition.

    As an organisiation where libraries, media centres, computing centres and specialist societies cooperate, the German Initiative for Networked Information (DINI) herewith presents recommendations for electronic publishing at universities.

2. Universities and their scientists who are not only producers, but also main players and consumers, can take an active and shaping role in distribution through a comprehensive university network of document and publication servers by employing a well mapped-out policy. Texts and documents that are produced at universities like dissertations, professional qualifications, research reports, pre-prints, lecture notes, and other materials known as grey literature, are rarely published by publishing houses or distributed by booksellers.These materials can now be produced at much lower costs. They can also be distributed far better, and they an be more easily indexed and devoted to their use.

3. The network of document and publication servers forms the technological core of the publication process. The university should work out a policy that defines the basis of the technological and long-term approach for how to treat these documents. Following the acquisition policy of the respective university it should be decided which kind of documents will be included into the server, and which criteria of treatment, e.g. for long-term archiving, they are subject to. The following document contains recommendations that follow international standards:

    *   Securing server access
    *   Guaranteeing authenticity and integrity of documents
    *   Defining the criteria for long-term archiving
    *   Defining the accepted document formats and their conversion tools respectively, with orientation towards long-term standards like SGML and XML
    *   Defining the metadata set (orientation towards Dublin Core) and its entry
    *   Deciding on a search engine, and thus defining retrieval options

4. Use and provision of scientific documents in digital form via the internet are an improved form of scientific communication, as compared to the conventional publication in printed form. It is necessary, however, that all the parties involved adapt their working methods to these new opportunities. This starts right with the author who can support high-quality retrieval by specifically structuring the text. From the service institutions a reform of their work routine and their responsibilities will be demanded.
    A new "culture of electronic publishing" is necessary

5. Electronic publishing is still at the beginning of its development. This is why developing and widely using standards and principles is so important. With the W3C specifications of the Dublin Core Metadata Set, the Open Archives Initiative, and others, global efforts towards standardization exist. DINI supports these activities and contributes to their dissemination in Germany with its recommendations, and by organizing specific events. German universities should do everything to ensure the fast implementation of these standards.

6. Within the university legal, financial, personnel, and material foundations for supporting the publication process of electronic documents have to be established.

    *   Legal foundations are the agreements to safeguard authors' rights as well as the recognition of electronic-only documents as professional qualifications.
    *   Financial and material foundations on one side are mainly influenced by
        -costs for computer hard- and software,
        -personnel costs for systems maintenance ,
        and on the other hand by
        -savings by rationalization in comparison to previous publication methods, and
        -revenues from sales to third parties.
    *   Expenditures for personnel are defined according to the used technologies. These expenditures depend on the intensity of taking care of potential authors, the degree of processing the publication up to long-term archiving, and the integration of the electronic publication process into the technological course within the library and the computing centre.

7. Within German Higher Education several different approaches for treating electronic publications have been realized. Those decisive approaches will be presented here and will be standardized in crucial points. The specifications of the Open Archives Initiative will serve as the basic orientation[1].

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[1] http://www.openarchives.org

1   Introduction

Within research, education, and study several different types of publications are created. Dissertations, theses, post-doctoral qualifications, diplomas, pre-prints, research reports, minutes, lecture notes and other educational material, scientific articles, lecture timetables, study guides, university and department reports, all these materials are rarely published with publishing houses. This "grey literature" normally cannot be disseminated via bookstores. A widespread use of information technology and continuous networking inside and outside the university enables the provision of these documents in electronic form. Multi-media and audio-visual materials, programmes etc. can also be included herein. Yet the following paper focuses on text documents. To increase the speed and to improve the quality of communication at lower costs the provision and the archiving of these documents in electronic form should particularly be promoted.

To enable exchange and long-time archiving (whenever this seems feasible) of these documents we are striving for a far-reaching standardization according to national and international rules and regulations. Creation, provision, and archiving of university publications takes place besides the cooperation with publishers. Publishers will always be welcome partners for authors and universities for high-quality materials with good sales prospects.

However, there is only a small part of texts being published in journals and monographs. Due to the high costs of conventional publication and the price increase of journals and monographs chances of publishing and accessing results of scientific research have deteriorated. With the following recommendations a system of networked university document servers is strived for. In the current situation this network offers a basic structure for securing the scientific communication economically.

In this paper we will demonstrate the changes in scientific communication and those in the scientific publication process. Following, there will be recommendations for universities and their services, for authors, and for specialist societies. After a general introduction important experiences, gathered nationally and internationally, will be shown. We also present principles and standards, and we will show how they can be put into usage, giving specific examples.

These recommendations were prepared by the electronic publishing working group of DINI.

Since changes are particularly fast in this field our demonstrations of the pracical parts might be valid for only a limited time. We are thus aiming at a regular update.

2   A New Culture Of Electronic Publishing

Due to the new methods in the information and communication technologies new ways for creating and distributing of scientific research have been opened. These ways complement each other in parts. Use and provision of scientific documents in digital form via the internet are an improved form of scientific communication compared to the conventional publication as printed documents. We are at the brink of a revolutionary change in scientific publication and it will, at least in parts, change the existing habits deeply. This mainly includes the possibility to open up cost-intensive publications that can hardly be financed using the traditional methods, to a world-wide audience via the internet. The infrastructure that is already there for research, education and study, offers a fine basis for a world-wide provision of ressources stored on university document servers. There is, however, no common acceptance of electronic publishing. Therefore one important precondition is to guarantee the authenticity and the integrity of these documents. They should be on a comparative security level as the traditionally published media. Electronic publishing also demands an improved infrastructure: Scientists need to be supported by all the services in using the relevant technologies for electronic publishing.

It should be stressed here that all included parties have to change their working habits. This is valid for scientific writing as well as for processing and disseminating the documents. It is not done with just writing the publication. Archiving and retrieval, for example, is now a responsibility of authors. Therefore a new working style and a new cooperation is necessary. This includes all parties, authors and services alike:

We have to delop a new "*culture of electronic publishing*" .

Current Situation and Development

The current methods in scientific publishing are mainly focused on paper. The computer is used as a typewriter, the layout on the screen shows a virtual printed page. There is no multiple use that would enable publishing on the internet, automatic cataloguing or printing on demand in a university printing service. Creating electronic university papers that need a high degree of flexibility in processing and in the choice of representation requires different working methods. It is not the typographic representation format (i.e. the print) that should be the primary goal, but the multiple use for internet, storage in a database, printing, and even long-term archiving. This is feasible with authors clearly defining the structures of their publication, or creating these documents according to given structures.

There is nothing particularly new about structures in publications. Publications have always been separated into chapters, sub-chapters, paragraphs, etc. In the future there has to be a more considerate handling of these hierarchies, the so-called structural elements. New about it is that now semantic information can be added to the electronic document. With this single structure elements can be defined according to their function, i.e. a chapter heading, or a particular statement at the beginning of a page representing the author`s name. To integrate descriptions into a library catalogue and to support a qualified search by technical means is made much easier.

Traditionally the access to electronic publications is realized in two ways:

- with the record, i.e. entering the publication into a library catalogue,
- publishing it on a server accessible via the internet.

Structuring the document leads to an effective support for these ways of access. They can be realized a lot faster than with the traditional paper documents or those electronic publications that only reproduce the paper form.

Depending on how deeply the scientific document has been structured by the author new search opportunities occur. If, for example, special terms, personal names, or mathematical formulas are tagged individually, in the future intelligent search engines will be able to find them. There might be a new search efficiency on internet servers that way.

This is, however, a working method that is still to be strived for. In Germany we find it with only a few places (e.g. Humboldt University Berlin). To a certain extend the technical pre-conditions are lacking, which especially goes for the field of text processing systems and their additional tools that would allow structural writing, and an adequate storing using international standard formats. There are also deficits in the know-how of almost all the persons engaged in the publication process, as there are within university-internal structural and per-sonnel coverage.

Production of Electronic Publications within the University

As for the course of business there will be new purviews with electronic publishing in universities. Sharing those tasks, they should be taken care of at computing centres, media centres, and university libraries:

- Consulting authors, information, courses, hotlines, www, e-mail
- Receiving the electronic version, entering metadata, cataloguing
- Converting documents into representation formats and archiving formats
- Protecting the documents by digital signatures and time-stamps
- Transferring the documents to be archived to a specially protected archive server, or the representation and research formats to a document server for provision in the internet.
- Maintenance and service of the document server and of the archive.

The following comparison will show the common grounds and the differences of three working procedures. It also shows that the courses of business have to be adapted to local requirements.

General Workflow	local requirements (examples)		
	Humboldt University	University of Dortmund	System OPUS

Author

	courses for authors		
	style sheets		
create digital documents	Format:Word, LaTEX PDF (print)		Format: PDF, orginal format
document description (Metadaten)	WWW-form	WWW-form	WWW-form
transfer document/metadata in digital form	automatically	automatically	automatically
		send contract via E-Mail	

Library /
Computing Centre

		submitting contract & printed copies	
control transferred data	legibility, guidelines of several persons (according to format)		quality control checking contents (referee, department)
		conversion into PDF	
adding /correcting of metadata	entering metadata DNB subject index RVK	DNB subject index keywords	DNB subject index
creating the digital signature			
archiving/publishing - generating address - release/provision - e-mail to the author	releasing workflow database converting into SGML acceptance / creation of printed copies	generating address by staff	generating address release and e-mail automatically
integration or entering record into union catalogues	Aleph	Aleph union catalogue	SWB local catalogue (automatically)
automatical record for the DDB (theses, habilitations)	possible	possible	possible

To take the organisational changes that take place in the services into account, and to specifically steer the communication between the responsible people we recommend the use of an electronic workflow support system, a workflow database. Preferably it should be a platform-independent system that is, for example, web-based.

3   Principles

At the DINI Annual Convention in September 2000 Dortmund it was stated that "in Germany, many local or regional electronic archives have been developed on a departmental, university, or state level. In only a few cases the set-up of such archives followed either an acknowledged and compliant concept, or a concept that orients towards high accessibility or retrieval options. Persistency of data sets or their description with metadata - both are rarely given. Thus a retrieval from several hundred archives is, if ever possible, limited. This situation hampers national and international scientific communication severly, and it needs to improve as fast as possible "[2]

The Open Archives Initiative

Within the last years the Open Archives Initiative[3] has developed as an international initiative that has devoted itself to the world-wide provision of access to scientific electronic publications, especially those on pre-print servers. As the since 1999 increasing numbers of archives, libraries, universities, and museums show, the idea of world-wide networking and access to metadata has gained momentum. The frameworks that are currently being coordinated, i.e. the Open Archive Protocol, the Open Archive Metadata Set, and the access regulations, offer a chance for an international networking of literature ressources. It is mandatory that German universities participate in that.

To support and push forward the installation of the OAI technology DINI conducts workshops and special meetings.

To realize this approach technically we recommend the use of the following standards.

Metadata

For electronic documents an agreed conceptual and structural data model is of vital importance. Different applications can communicate more easily, and the retrieval structure is being kept with integrity. These requirements are met by data models based on Dublin Core[4].

As a standard of document description the Dublin Core Metadata Element Set has been established. This standard is continually being developed and updated by functioning bodies and by a institutionalized sequence of annual workshops. The international acceptance of the Dublin Core Metadata Element Set is based on the following reasons:

- The 15 defined elements are defined semantically, and are standardized.
- The elements can be repeated, without being mandatory for every single set.
- The data can be set up easily.
- The data can be used with other applications.
- The elements can be specified by using qualifiers. The recognition of the first qualifier set in July 2000 should be mentioned here.
- Further development and international implementation is guaranteed by the engagement of the OCLC (Online Computer Library Center)[5] and their close connection to the W3C and other standardizing organisations.

These Dublin Core Metadata are in all ways compatible and interchangeable with conventional indexing services. The Library Service Centre of the state of Baden-Württemberg real-

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[2] http://www.dini.de/dokumente/oai-appell-0912.pdf
[3] http://www.openarchives.org
[4] e.g. http://www.bsz-bw.de/diglib/medserv/konvent/konzept/konzept.html
[5] http://www.oclc.org/

ized a quality-oriented production of bibliographic data particularly with OPUS installations[6]. Entering the metadata of these with The German Library (DDB) also uses this option. The indexing service "Metaform" of the State and University Library Göttingen[7] contains a compilation and a comparative analysis of such Dublin Core applications.

In single, highly formalized fields efforts have been made to generate metadata automatically from the file itself. According projects exist for research papers in engineering. There automatical indexing is highly effective, as it is also in the important field of on-line medical documents[8]. It is of high interest to follow this path of automatically generating metadata, even though there is no alternative to manual indexing for general electronic publications in Higher Education.

Document Formats

In discussing the standards for electronic publishing the issue of document formats plays a key role. The term document format, however, not only stands for a fixed storage format for files (especially texts), but also for a model that allows to serve and integrate different media. The document format is the framework for capturing the connection, the interaction, and the information about the sequence of elements of a document, like text, image, sound, video, animation, and data tables. The following data model proves to be feasible. It builds on the unity of the following three components:

- **Contents** of a document. The information units that have to be conveyed are encoded as text, print,image, sound, etc.,
- **Structure** of a document: reflection of the setting up and the sequence of information units,
- **Layout** of a document: the visualization of how content and structure interact, as well as the visualization of particular parts of the content.

Based on this definition of a document we can now classify document formats for electronic publishing according to their field of use, and thus select the best-suited data or document format:

- **Creation or authors' format:** the document format that the author creates using a word processor.
- **Representation format:** this format serves to represent the document in different media. It allows different choices for the representation of the document in the web, in a database, or as a digital pre-print.
- **Retrieval format:** this format supports the full-text retrieval. Metadata and additional structured information can qualify such a search considerably.
- **Archiving format:** this format guarantees the long-term availability of these documents in terms of a stable use of different technical archiving models (like e.g. migration, or emulation) that can be put into practice within the Open Archival Information Systems (OAIS)[9] framework.

As mentioned before, with these recommendations we mainly refer to text-bound publications. There are no standards in the field of publishing multi-media presentations at this time.

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[6] http://elib.uni-stuttgart.de/opus/
[7] http://www.sub.uni-goettingen.de/
[8] http://cora.whizbang.com/
[9] http://www.ccsds.org/documents/pdf/CCSDS-650.0-R-1.pdf

A further working group[10] for the field of multi media materials has been established with DINI. This working group will also publish recommendations at a given time.

Creating a Document

Word processors like Microsoft Word, WordPerfect or LaTeX for creating electronic university publications are widespread since they are available for all the authors at any time. However, for creating publications these systems are only of limited use. Limited because they do not meet the demands of flexible processing, archiving, nor do they offer a free choice of representation, as there are the web, print, or e-book. The text setting system LateX is not very well suitable for creating electronic documents and their flexible processing since it is oriented towards paper print.

This contradiction between user friendliness of the modern word processing systems and their lack of flexibility, their disregarding of international standards like XML or even SGML, has been recognized world-wide. Many producers make efforts to adapt their products accordingly. For example, the freely available version 6 of Star Office now includes XML as an exchange format. Further developments are to be expected, without, however, to be able to predict when those results will be available, and what the degree of keeping the standards will be.

In this context it is of special importance that together with the different classes of documents corresponding descriptions of the internal structure, the so-called document type definitions (DTD), should exist. These DTDs should be as homogeneous as possible.

Within the DINI working group we have agreed that in the long term the mentioned requirements have to be met, and that even in today`s work there should be efforts to do so. The procedure at this time is that the authors themselves use all the options for structuring texts that are already included in the word processing programmes. Humboldt University Berlin and the project "DissOnline" of the German Research Foundation (DFG), for example, prescribe, or recommend respecively, the use of ready-made style sheets when using Microsoft Word. With certain restrictions these style sheets correspond to the envisaged DTDs. With the appropriate conversion tools it is possible to get XML-compliant documents almost automatically (see [11]).

In this context it is important that authors receive the necessary support with courses and advice. These are lasting duties for all the university information services like libraries and computing centres, and also for specialist societies.

Representation of a Document

The representation system should be as flexible as possible to allow extensions towards new purviews. It should be possible to add media elements in a new or further developed format without having to change the representation format as a whole, and prevent the user from additional installations. Open standards should be taken into consideration as far as possible.

The Adobe Portable Document Format (PDF) seems to meet these demands most. PDF has the definite advantage that the representation on the screen and in print are almost identical. It is widespread and it is already used as a quasi-standard. A PDF can be produced with all common word processing programmes, it is platform-independent and can thus be displayed within all browsers.

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[10] http://www.dini.de/workshops/der-med/virtlehr1.php3
[11] http://dochost.rz.hu-berlin.de/epdiss/downloads.html

It is widely discussed who is responsible (author or host) for producing the PDF of a document. Should the authors accept this task they will need the corresponding support by specialized personnel.

HTML was developed as a representation format for web browsers. An acceptable and layout-stable print version can not be produced from this.

Retrieval

Characteristic search strategies in digital libraries are at the moment:

Navigation (Browsing):

While browsing the user navigates in indexing or cataloguing services using a structure based on a classification scheme, a thesaurus, or other structured lists. The navigation results in a list of retrieved documents that can either be browsed or that can be used for a further specific search.

Search:

Users formulate search terms, maybe including Boolean operators, that describe their information need best to find relevant documents. A search can be conducted within single data fields or within several databases, for the latter using a combined search. Several databases offer "prefabricated" links of data fields that can be addressed directly. Within these field searches the user can either define the search term freely or choose them from an index.

Within field searches different forms can be found. They demand appropriate labelling of these elements in the database.

- The *full-text retrieval* not only allows the search within the bibliographic data but also within the full text. Highlighting the parts of the text relevant for the search is desirable.
- *Structure-oriented document search*: users are looking for content that should appear in certain parts of the document. This can be embedded programming code, semantically concrete document parts like verifications, abstracts, or others.
- *Related search*: references or quotations can be followed up, the referred documents can be added to the hit list if necessary. One should be able to find quoted, contained, or extensive documents as well.
- *Origin-oriented search*: if a relevant author or institution are known the user will search for documents by the same author or the same institution.

The following functions have to be possible here:

- Metadata search:
    -Search in structured data (XML, HTML etc.)
    -Flexible text search (full forms, reduced basic and cardinal forms (German, English) nominal phrases, compounds)
    -Search operators for different types of data and taxonomies (e.g. dates, personal names, technical measures/classification schemes.)
    -Searching for similar documents
    -Structuring of the results following user-defined criteria
- Full-text retrieval:
    -Search for relevant parts of a document, resulting from a conducted search
    -Searching within specific document structures

- Navigation/Browsing:
  -Browsing in attribute values and branches of the respective documents (e.g. authors' names, hierarchical classification systems)
  -Navigation between metadata and documents
  -Following referential links between documents, and /or metadata of other digital libraries via context-sensitive links (like SFX / OpenURL)
  -Browsing in aggregated documents (e.g. periodical - year - copy - article)
- Meta-Search:
  In the basis systems for a comprehensive search (meta-search) appropriate, standardized interfaces or (search) protocols should be employed (Z39.50 or http).

Authenticity and Integrity

While safeguarding authenticity and integrity of paper-bound publications is relatively no problem electronic publications require special measures to either prevent or to prove forgery and manipulations.

These requirements can be subdivided into:

- Protecting the document server.
- Protecting each of the contained documents.

Protecting the Document Server

Electronic documents should be stored on a server that is distinguished by an outstanding and commonly accepted policy. The following statements should be contained in this policy:

- The **identity of the document server** must be unambiguous and verifiable. This can be reached most likely with embedding the server into a public key infrastructure (PKI). In many universities this has not been given yet. With the Association for Supporting the German Research Nertwork (DFN) projects are being supported that help setting up a PKI.
- The **use of digital certificates** should be strived for.[12]
- Regulations for protecting **access to the document server** have to be established. These regulations aim at the following activities:
  Server administration by a restricted number of authorized staff only.
  Giving information about administration activities.
  Physical and software-based access protection.
  Registration and control of accesses.
  Protecting the unambiguous identity of the document server.
  Regular backup of data and consistency check.

Protecting single Documents

The **authenticity and the integrity of the digital document** has to be evident all the time. This means that it has to be proved in a comprehensible way that the published document has not been changed since its publication date, neither by the author, nor the systems administrator or any other third party. Procedures should be employed that use digital signatures and time-stamps according to the law[13]. This would enable to detect possible forgeries of electronic documents and thus a verification of their authenticity and their integrity would

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[12] http://www.pca.dfn.de/dfnpca/
[13] http://www.regtp.de/gesetze/start/in_04-05-00-00-00_m/index.html

be possible. Provider[14] of these certifying institutions according to the German Telecommunications Act are at the time being:

Telesec GmbH (http://www.telesec.de)
SignTrust der Deutschen Post AG (http://www.signtrust.de/start.htm)
D-Trust der Bundesdruckerei (http://www.D-TRUST.net/)
Bundesnotarkammer (http://dir.bnotk.de)

Due to the amendments of the Signature Act[15] it will be possible for universities to build up public key infrastructures that will use legal digital signatures without having to subject to the very strict regulations and expenditures of the original act.

Archiving and Long-Term Availability

Electronic materials require special efforts to guarantee their long-term availability.

"Long-term" in our understanding describes a period of time that at least reaches towards a future point of time where concrete statements about the prevailing technical environment can only be highly inaccurate. Therefore we have to guarantee the availability of electronic documents within a situation that is being defined by several unkown factors:

- the future hardware environment
- the future software environment
- the physical stability of data storage systems

Efforts are to be made at different places. In case The German Library will obtain the commission, a deposit system for electronic publications will be established there. This deposit system will support the use of several combined technologies for long-term archiving.

This will contain:

- Methods to preserving substance of the bitstream through mass storage systems, that contain integrated procedures for surveilling the ageing processes of data media, and that also contain technologies of refreshing.
- Establishing, standardizing, and permanent storage of metadata that are relevant for long-term archiving. These metadata serve for process controlling of long-term archiving activities.
- Automatic methods for data migration, as far as employing the migration strategy for keeping up availability is feasible and appropriate.
- Applying the hardware emulation for reproducing earlier technical systems.
- Implementing an "early warning system" to watch and assess technical change, as far as it has influence on the preservation of the digital cultural heritage.


Electronic university publications will be submitted to the processes of this deposit system as all the electronic publications in commercial publishing. International developments tend to implement distributed archiving models.

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[14] siehe Verzeichnis unter http://www.regtp.de/tech_reg_tele/start/in_06-02-08-00-00_m/index.html
[15] http://www.sicherheit-im-internet.de/themes/themes.phtml?ttid=38

The majority of these projects dealing with long-term availability of digital publications mean-while use the reference model "Open Archival Information System (OAIS)"[16]. This model stems from the context of the data archives of space travel, meteorology, and astrophysics. It claims to completely describe the functioning scale of an archiving system for any data at all. This includes:

- the transfer and the inclusion of data into the archive
- their secure placement in the storage systems
- the management of metadata relevant for long-term archiving
- applying methods for long-term archiving
- securing the permanent usability of the archived data
- establishing the interoperabilty of OAIS-compliant archives

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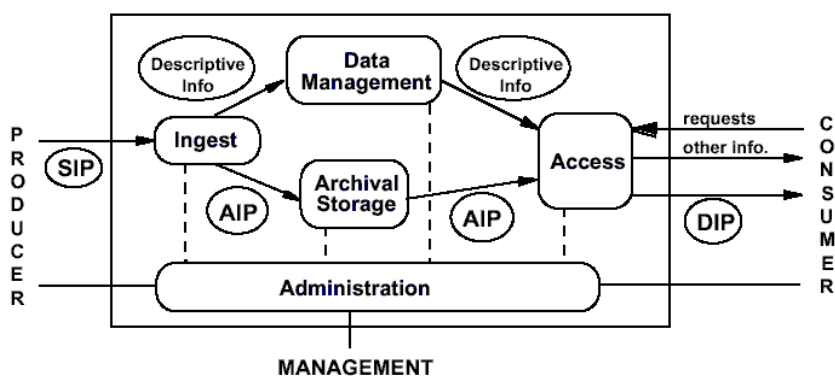
[16] http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html

4 Recommendations for Universities

With the "Recommendations for a Digital Information Provision by University Libraries" in July 2001 the German Science Council (Wissenschaftsrat) published a paper that pointed the way. In this paper the different efforts of several scientific organisations and committees are taken up. These demonstrations, which can be treated as guidelines for a further funding policy, the support of electronic publishing plays a central role. The universities are requested to discuss these topics and to organize their information services accordingly.

Several Views on Electronic Publishing

A specific extension of effective information services for electronic publishing requires an allocation of responsibilities between the universities' information services and the scienists who are represented nationwide by their specialist societies.

Electronic publishing can be seen from different points of view that have to be taken into consideration when building up those structures.

- The **author's point of view** is characterized by author' rights and copyright issues, and by the aim to reach a wide audience as fast as possible.
- The **user's point of view** is mainly defined by the need of retrieving and accessing scientific literature.
- The **libraries' point of view** starts out from their tasks of acquiring, indexing, and permanently providing literature.
- For **computing centres** particularly issues of ressource requirements (bandwidth, storage allocation), security, automation of the archiving process, and technical development are playing a key role.
- The **view of the university administration** is determined by the need of presenting the scientific output of a university, its adequate dissemination, and permanent availability.
- The viewpoint of a commercial **publisher** will see the technological process of electronic publishing under publishing and market aspects.

An expertise for all these areas can not be found with one single institution only. Scientists, university adminstrations, and information services have to cooperate to achieve the best possible results. The exact terms of this cooperation will vary between the universities.

Distinguishing core competences and defining new challenges and tasks play a key role for a smooth cooperation. This has been demonstrated by the German Science Council in their "Recommendations for a Digital Information Provision by University Libraries".[17]

Organisational Foundations

Electronic publishing at universities and the very close procedures of capturing, providing, and archiving scientific papers is not only and not primarily to be seen as a technological process since it needs a number of strategic decisions at the university. The value attached to electronic publishing at the university is of utmost importance. Does it take place within one department, several departments, or within the whole university, in cooperation with other universities, or within unions? Is it a commercial electronic university publisher that should be established, or is it the cooperation with a commercial publisher that is the primary goal? This kind of decisions which can lead to a self-determined identity of electronic publish-

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[17] http://www.wissenschaftsrat.de/texte/4935-01.pdf

ing at the university are not anticipated by these DINI recommendations here since they have a university-specific nature.

We recommend universities to have a corresponding policy worked out by all parties that are potentially involved in the publication process. Based on the strategic decisions a plan to its realization should be developed.

Legal Foundations

As mentioned before, the publications discussed here are mostly " grey literature", i.e. material not published by commercial publishing houses, nor as monographs, nor as journal articles. This is why it is extremely important that within the university legal preconditions are set up that enable publishing, and that safeguard the according standards.

The following points of view are decisive :

- For professional qualifications like theses and habilitations regulations for mandatory publication are to be set up in such a way that electronic publishings in standardized form are supported. For this there has been a resolution of the Education Ministers' Conference.[18] There are also some comprehensible examples at several universities. [19]/[20]/[21]
- In the (already mentioned as compulsory) university policy for electronic publishing the internal regulations of authors' and service providers' rights and responsibilities have to be laid down. It is advisable to draw up e.g. contracts between authors and the university for copyright protection. Examples can be found at the Technical University of Chemnitz[22].
- Some electronic journals are already offered on university servers for specialist societies or single interest groups. For this there should also be legal regulations, financial preconditions, and corresponding contracts (see [23/24]).

Securing Material and Personnel

The increase and the shifting of publishing towards electronic university publications has to be borne in mind at universities. Within the information services working groups for the arising tasks (course of business, maintaining the archives, maintaing the necessary hardware etc.) have to be established, and tasks have to be shifted within staff.

Since still in development offering a service for electronic publishing cannot be seen with a strictly economic eye. It is an investment into the future. Yet from the beginning it enables the rationalization of many conventional working methods.

Further Training

For Authors

A recommendable, long-term publication model bases on the use of XML/SGML as the archiving format. With this the basis for the "new culture of electronic publishing" is most likely supported. XML is the format that is often used for designing web appearances, tools for

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[18] http://www.uni-mannheim.de/mateo/kmkdiss.htm

[19] z.B. http://www.hu-berlin.de/presse/amb/amb98_14.html/http://www.sub.uni-goettingen.de

[20] http://www.hbz-nrw.de/arbeitverbund/ediss/muster.pdf

[21] http://elfikom.physik.uni-oldenburg.de/dissonline/recht.html

[22] http://www.bibliothek.tu-chemnitz.de/service/hss.html

[23] http://dochost.rz.hu-berlin.de/speps

[24] http://www.bis.uni-oldenburg.de/bisverlag/bisverl.html

authors of scientific works, however, only rarely exist. The conventional text editors so far include components that allow a later, almost automatic conversion into XML. While preparing the submission of the document authors therefore have to be trained specifically in using these tools (like style sheets) for structural mark-up.

We recommend to establish the following services:

- *Contact for authors:* The library will offer a contact for electronic publishing.
- *Web-based information system:* The software that has been developed for electronic publishing will be installed on the university server. The university's homepage will provide advice and information for interested authors (e-mail addresses, addresses of contact persons, a catalogue of author information).
- *General information lectures:* In short regular information lectures authors and contact persons in the institutes familiarize with the procedure of electronic publishing. Dates for educating the authors (e.g. style sheets) are being published within this framework. These events can also serve as multiplier training, especially when staff from the institutes is addressed specifically.
- *Authors' training:* Carrying out regular training or introductory classes for working with style sheets for text processing systems is considered to be essential. This will guarantee a high quality standard of the received documents. For authors it is important that the earlier they take part in these classes, the easier it will be later to prepare their documents for electronic publishing. As long as there are no adequate tools that allow direct writing and setting up an archiving format like SGML/XML the use of common text processors with aiming at a conversion into an archiving format will be trained.

For the service personnel

To teach the use of digital documents, the control, and the conversion into representation and archiving formats, it needs regular training of staff. These training courses have to be adapted to the specific tasks of the particular staff:

- Cataloguing of electronic documents, Dublin Core and metadata applications, handling the interface to The German Library (DDB)
- Controlling the legibility of documents (Word, WordPerfect, LaTeX), and enabling staff to advise and train the authors.
- Conversion into PDF
- Conversion into SGML
- Handling digital signatures and time stamps
- Dealing with the operating system, web software, and the server hardware

Staff should not only carry out their tasks but should also be able to give qualified advice to authors. This requires a higher intensity in teaching and training than there is at the moment.

We also recommend the cooperation in the joint project „DissOnline.de" via the liaison office at The German Library. A further training scheme is being set up there for libraries, computing and media centres. Because of the subject-centered exchange achieving a high and equal technological level of all engaged institutions is secured. This again can help to promote further standardization.

For readers

Tackling the provided search engines is rarely systematic. Intelligent search engines, however, can process extensive additional information containing description of the structure and the contents of documents. This works as long as these descriptions are expressed in a machine-readable form following international standards (DublinCore).

To put these into use within a search the users have to know about these options. They should know about the structural characteristics that can be employed with a conditioned

search. To use this option specifically it needs a wide dissemination of information and training for all scholars and students about metadata that can be handled by search engines, and about intelligent search strategies to be employed with a search.

For this task there are tools that provide the necessary support. A new search engine, for example, provides automated translations, from key words in physics up to the close standardized numbers of the PACS-Thesaurus, and, following from there, to the according MSC-classifications in mathematics.

5 Recommendations for Scientific Specialist Societies

Realizing the shift of scientific communication at universities demands active cooperation of the scientific specialist societies. Their members are the authors and users of their discipline, and they can launch specific initiatives to make full use of the opportunities of digital communication.

In 1995 the German "Information and Communication Initiative of the Specialist Societies" was founded. They see their task in a comprehensive discussion and agreeing on common standards.

Quality Control

One point of criticism with todays electronic publications is the not yet established review procedures that have been common with paper-bound publications for many years.

To compensate for this disadvantage the specialist societies are asked to actively take part in these review processes. We therefore recommend to define certifying levels, to establish appropriate metadata information that can be added to the document. Suitable metadata-producing tools should be provided and introduced in the same way for all disciplines covering the needs.

Certifying levels can only be effective if users who are interested in a particular document know about the requirements of the seal of quality of the given certifying levels. Realizing these has to take place as a common effort of both specialist societies and local libraries.

We recommend that the specialist societies together with DINI accompany and support the establishing, organizing, and structuring of local projects that aim on setting up and providing "university publication servers".

The specialist societies should, in cooperation with DINI, support and co-ordinate according funding proposals to the states, the Federal Government, and the German Research Foundation; they should analyze the experiences and disseminate the results. They should co-ordinate the metadata internationally and widely promote them.

Subject-Specific Initiatives

In the different disciplines "subject portals" are being set up. These portals pre-select from the available documents in the web that:

> were produced within this discipline,
> are relevant for working in this discipline,
> can help to promote the discipline in the public.

In cooperation with local libraries and union catalogues, and particularly with special collections libraries and central specialist libraries, the specialist societies should take care that the gained experiences and the developed technical standards are used for a further extension and maintenance of subject portals.

This also requires a coherent cooperation between the according specialist societies, the standardizing institutions, the libraries, and the scientists.

Further Training

The IT-competence (‚internet-literacy') that is required today asks for a corresponding training of students. Since specific knowledge is asked here, and single subjects offer specific information sources and also specific ways of document delivery and document sources, the IT competence must be taught within the specific disciplines at the university.

This requires competent training at the departments. These courses should be taught at the departments by teachers with a high level of IT knowledge. It requires units within the syllabus that can pass this knowledge. Classes and teaching-studying modules have to be planned, set up, and tested in real scenarios. For all this the internal and comprehensive cooperation of different players from teaching, university and department libraries, and information services is required. The specialist societies are asked to meet their high responsibilities in a cooperative way to quickly establish the necessary legal and organisational framework in the Education Ministers' Conference, the Rectors' Conference, and others.

We further recommend that specialist societies support the setting up of chairs at their departments, that they support a comparative embedding into the compulsory syllabus, and that they also support the building of a framework of contents which secures the transparency of this part of study (i.e. if the student wants to change from one university to another).

For an efficient use of ressources and to improve quality common distance learning pools should be created. As examples we would like to mention the project "Physik Multimedial" or the joint projects with universities in the U.S. for the MBA (Stuttgart, Hannover), and for „Distance Learning Bachelor" (Oldenburg) .[25/26]

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[25] http://www.physik-multimedial.de/
[26] http://www.uvm.nrw.de/Projekte/ProjekteFS

6 Prospects

These recommendations of DINI are a reflection of the current technical development. They want to give a general direction towards universities and their information services should orientate in the field of electronic publishing. Nationally and internationally there are many efforts and experiences with electronic publishing at a growing number of universities. Normally locally defined solutions are established that only in a few cases can be transferred to other universities. In terms of disseminating examples of "best practice" the DINI server offers descriptions of such solutions.

We include the following aspects in particular :

Recommendations for authors
Workflow for electronic publishing at universities
Document formats and conversion possibilities
Metadata - semantics and syntax
Retrieval - including the OAI Metadata Harvesting Protocol
Security aspects - how to realize them from a technical point of view
Guaranteeing the long-term availability of documents

Imprint

These recommendations for electronic publishing at universities can also be found on the DINI server under http:/www.dini.de. The final editing of this paper was actively carried out by the colleagues mentioned below. We appreciate critical comments, corrections, and additional remarks. To enable a better co-ordination of a possible upcoming discussion we would like to ask you to send your comments via e-mail to the General Secretariat under the following address: gs@dini.de.

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